BANK REGULATION AND CAPITAL AUGMENTATIONS IN SPAIN*

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ABSTRACT

The increasing importance of bank prudential regulation in an era of financial liberalization and intense competition, together with the lack of empirical research on capital adequacy in the Spanish banking sector, shape the motivation for this research. This paper examines the impact of the solvency regulation on capital augmentations of banking institutions operating in Spain.

RESUMEN

La creciente importancia de la regulación de solvencia bancaria en una época de desregulación financiera y de competencia intensa junto a la escasez de trabajos empíricos sobre las normas de recursos propios han dado lugar a esta investigación. Este documento examina el impacto de la regulación de solvencia sobre los aumentos de capital de las entidades de depósito que operan en España.

1.- INTRODUCTION.

Capital adequacy rules have become a central issue in the banking markets during the last decade. The process of bank structural deregulation has resulted in intense competition, and in turn, the potential emergence of new and higher risks in banking. In order to counteract these potentially negative effects, banking authorities have focused on the enhancement of bank solvency regulation. The 1985 Spanish capital requirements are a good example of this.

As with any type of regulation, capital adequacy requirements seem to affect the decisions of the banking firm. One of the main decisions of the banking firm in the new regulatory environment, capital augmentation, is likely to be strongly influenced by the solvency rules. Capital augmentations are defined as changes in the total amount of capital.

This paper analyzes the impact of the Spanish bank capital regulation on capital augmentations of banking institutions operating in Spain during 1987-90, during which deregulation and the 1985 risk-based capital rules have been two major forces in the Spanish banking industry. This study will focus only upon private and savings banks, which account for over 97 % of Total assets of the Spanish banking sector during 1987-90[1].

[1]Banco Exterior is included among the private banks.

2.- BANK CAPITAL ADEQUACY AND CAPITAL AUGMENTATIONS IN SPAIN.

2.1.- Bank Regulation and Capital Adequacy in Spain.

Traditionally, the Spanish banking sector has been one of the most regulated industries in the economy. However, from the late 1960s to 1990s, a process of deregulation has taken place in Spanish banking that resulted in many decisions of the banking firm being liberalized (i.e.: entry and expansion, interest rates, investment coefficients and lowering of cash ratios). Spain's entry into the EC in 1986 and the application of the Single Market in 1992 enhanced this deregulatory process. Supervisory re-regulation (such as the reform of the capital adequacy ratio in 1985) came also into effect to match the increased risk potential for banking institutions that may be associated with the process of liberalization and as a consequence of it, with the process of intensifying competition.

In 1985 risk-based capital adequacy requirements were introduced in Spain. The severe banking crisis that the Spanish banking sector suffered during 1978-83[2] together with the international trend towards the application of risk-based capital rules seem to lie behind the 1985 risk-based capital legislation. The 1985 Spanish capital adequacy ratio is a mixed one in which two main elements co-exist simultaneously[3]:

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[2]See, for example, Cuervo, Parejo and Rodríguez (1992, pp 236-241) for a short analysis of the causes of the banking crisis in Spain.

[3]The Spanish regulation on capital adequacy has been changed recently (13/1992 Law and 5/1993 Bank of Spain Circular) to implement the BIS Accord and the EC Directives.

1) A **Selective or Risk Assets Ratio (RAR)** in line with the July 1988 Basle or BIS (Bank for International Settlements) Agreement (on International Convergence of Capital Measurement and Capital Standards) and EC Directives on Own Funds and Solvency Ratio (89/299 and 89/647 respectively)[4]. This is computed as follows:

$$\text{SELECTIVE RATIO} = \frac{\text{REGULATORY DEFINITION OF CAPITAL}}{a_1 * b_1 + a_2 * b_2 + \ldots + a_n * b_n} \geq 1 \qquad (2.1)$$

where:

$a_1 \ldots\ldots a_n$ are the different risk asset categories.

$b_1 \ldots\ldots b_n$ are the selective ratio or own funds needs for each asset category in the Spanish legislation.

2) For deposit-takers there is also a **Global or Generic Ratio** computed on a non-weighted balance-sheet. The minimum generic ratio must be a 5 % of the total investments net of provisions and depreciation.

As far as the definition of regulatory capital is concerned, there are differences between private and savings banks in the Spanish legislation. The capital definition for private banks includes share equity, disclosed reserves, general provisions, and subordinated debt. However, the capital definition for savings banks includes foundation funds, disclosed reserves, general provisions, Social Works Funds and subordinated debt[5]. Hence, savings banks appear to have a more limited set of possibilities to augment capital externally, since they cannot issue share equity.

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[4]There are certain differences between the 1985 Spanish capital legislation and the Basle Agreement and EC Directives in terms of definition of own funds, risk asset categories and weights, and the minimum standard required. See Price Waterhouse (1991) for a review of the main differences between the Basle Agreement, EC Directives and the 1985 Spanish rules.

[5]A new capital instrument denominated 'participation capital' (cuotas participativas) was introduced in 1988. However, as of the end of 1990, no savings banks had issued any participation capital.

2.2.- Main Trends in Capital Adequacy and Augmentations in Spain.

This section analyzes two issues: (i) the extent to which Spanish banks have fulfilled the minimum regulatory capital standards, and (ii) some preliminary evidence of bank capital augmentations in Spain during 1987-90.

As far as (i) is concerned, the information related to the fulfillment of the regulatory standards by banks operating in Spain is unfortunately very limited. A great deal of the information available is related to savings banks and large private banks. Table 1 shows the level of fulfillment of Spanish regulatory capital standards by Spanish savings banks (end of 1988 and 1990). One can observe that the capital adequacy position has improved during the period 1988-90: only three savings banks did not reach the minimum selective ratio required. Therefore, savings banks appear well-capitalized according to Spanish regulatory standards.

The fulfillment of EC solvency ratio standards by Spanish savings banks at the end of 1990 is displayed in Table 2. It can be observed that all the Spanish savings banks appear to be well above the EC minimum ratio required (8%). From this evidence it seems that EC regulatory capital standards are less demanding than the requirements currently applied in Spain. Hence, when the EC Solvency Ratio comes into effect, the Spanish banks appear to be well-prepared for the challenge.

It is also interesting to study the position of a sample of large private banks in terms of BIS capital ratios. Table 3 shows average BIS capital ratios data for selected banks of five European countries for 1988 and 1990. It can be noticed that the Spanish banks appear to have average values well above the BIS minimum required (the minimum required is 7.25 % at the end of 1990 and 8 % at the end of 1992). In addition, if one compares the values for Spain with those for the other countries, the Spanish banks in the sample seem to be very well-capitalized.

TABLE 1: FULFILLMENT OF SPANISH REGULATORY CAPITAL STANDARDS BY SAVINGS BANKS (End of 1988 and 1990)

	GENERIC COEFFICIENT		
	1988	1990	
		Number	% of Aggregate Assets
Less than 5%	11	0	0.00
5-6%	30	19	15.52
6-7%	18	18	22.68
Over 7%	18	26	61.80
TOTAL	77	63	100.00
	SELECTIVE COEFFICIENT (actual/required ratio)		
Less than 1	14	3	0.80
1 - 1.5	51	43	68.49
1.5 - 2	10	16	29.82
Over 2	2	1	0.89

SOURCE: CECA (1989, 1991).

TABLE 2: FULFILLMENT OF EC REGULATORY STANDARDS BY SPANISH SAVINGS BANKS (End of 1990)

EC Solvency Ratio	Number of Banks	% of Aggregate Assets
8 - 11 %	14	11.60
11 - 14 %	24	32.40
14 - 17 %	16	30.13
17 - 20 %	4	17.42
Over 20 %	5	8.45
TOTAL	63	100.00

SOURCE: CECA (1991).

TABLE 3: AVERAGE **BIS** CAPITAL RATIOS FOR SELECTED BANKS OF FIVE EUROPEAN COUNTRIES (End of 1988, 1989 and 1990) (%)

COUNTRY	NUMBER OF BANKS	1988	1990
France	5	> 8.40	> 8.72
Germany	5	> 9.60	> 9.80 E
Italy	11[a]	> 9.86	10.02 E
Spain	9[b]	9.97	11.51
U.K.	9	10.65	10.53

a) In 1988, only seven Italian banks were selected.
b) In 1990, only eight Spanish banks were selected.
E = estimation undertaken by Morgan Stanley.

SOURCE: Morgan Stanley (1990, 1991).

In order to investigate bank capital augmentations the researcher has computed the aggregate capital base during 1987-90. Llewellyn's definition of capital base (1989) has been employed. Tables 4 and 5 show the aggregate capital structure of the Spanish private banks and savings banks respectively. There are two main differences between the capital base of private banks and that of savings banks: (i) savings banks do not have share equity, and instead they have foundation funds (F. funds), and (ii) savings banks have a component denominated Social Works Funds (S.W. Funds or *Fondos de la Obra Social*). One can observe that the capital base appears to have been increasing at a considerable rate during 1987-90. Although all the components of the bank capital base have been raising during the period, subordinated debt seems to have an increasing share in the capital structure for both private and savings banks.

The increasing importance of subordinated debt can also be observed from its contribution to the rise in bank capital in Tables 6 and 7. The Bank of Spain allowed the inclusion of this instrument in the bank capital adequacy regulation created in 1985. However, the Bank of Spain's limit placed on the subordinated debt ratio (subordinated debt as a proportion of the total own funds could not exceed 30 per cent) appears to restrict clearly the

TABLE 4: AGGREGATE CAPITAL STRUCTURE OF THE SPANISH PRIVATE BANKS (in Spanish pesetas million)*

		1987	1988	1989	1990
	Share Capital	566,625	731,582	831,010	903,708
plus	Reserves	1,069,582	1,476,899	1,472,254	1,671,714
Equals	Equity	1,636,207	2,208,481	2,303,264	2,575,422
plus	Subord. Debt	41,882	117,222	209,942	326,632
plus	Bad debt Prov.	550,311	553,480	528,598	540,402
Equals	CAPITAL BASE	2,228,400	2,879,183	3,041,804	3,442,456

* The aggregate contains 123 private banks.

SOURCE: Consejo Superior Bancario (1987-90); Own results.

TABLE 5: AGGREGATE CAPITAL STRUCTURE OF THE SPANISH SAVINGS BANKS (in Spanish pesetas million)*

		1987	1988	1989	1990
	F. Funds	974	974	974	31,473
plus	Reserves	662,608	814,500	900,390	1,112,465
plus	S.W. Funds	90,272	106,136	123,447	178,635
plus	Subord. Debt	21,059	125,115	144,374	162,842
plus	Bad debt Prov.	189,780	218,137	246,205	287,281
Equals	CAPITAL BASE	964,693	1,264,862	1,415,390	1,772,696

* The aggregate contains 76 private banks during 1987-89 and 64 banks in 1990.

SOURCE: CECA (1987-90); Own results.

TABLE 6: CONTRIBUTIONS TO RISE IN SPANISH PRIVATE BANKS CAPITAL (1987-90) (in %)

	1987	1988	1989	1990
Share Capital	13.12	25.35	61.15	18.15
Reserves	59.21	62.58	- 2.87	49.78
Subord. Debt	9.11	11.58	57.02	29.12
Bad debt Prov.	18.56	0.49	- 15.30	2.95
CAPITAL BASE	100.00	100.00	100.00	100.00
Δ CAPITAL BASE	311,812	650,783	162,621	400,652

SOURCE: Consejo Superior Bancario (1987-90); Own Results.

TABLE 7: CONTRIBUTIONS TO RISE IN SPANISH SAVINGS BANKS CAPITAL IN 1987-90
(in Spanish pesetas million and % share)

	1987	1988	1989	1990
Foundation Funds	0.00	0.00	0.00	8.53
Reserves	72.95	50.60	57.06	59.36
Social Works funds	- 1.71	5.28	11.50	15.44
Subordinated Debt	3.75	34.67	12.80	5.17
Bad debt Provision	25.01	9.45	18.64	11.50
CAPITAL BASE	100.00	100.00	100.00	100.00
Δ CAPITAL BASE	102,313	300,169	150,528	357,305

SOURCE: CECA (1987-90); Own Results.

possibilities of the use of this instrument to augment capital. This can be observed in the fact that the use of this instrument has decreased for savings banks in 1989-90 and for private banks in 1990.

One can also observe in Tables 6 and 7 that reserves are the component that most contributes to rise in capital (except in the extreme observation of 1989 for private banks). This seems particularly true for the savings banks since they cannot issue share equity.

Finally, one must also refer to the impact that mergers have had on capital augmentations of Spanish banks during 1987-90[6]. This results from the fiscal gains that could emerge from a process of increasing in size through mergers. The Spanish legislation exempts asset revaluations from the corporate income tax resulting from mergers. Therefore, the "hidden value" in the banks' balance sheet may emerge by means of a merger at no tax cost, and, then augment capital[7].

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[6]Specifically, two large private banks merged in 1987 (BBV), and twelve savings banks were involved in mergers in 1990. More bank mergers have taken place since 1991.

[7]The effects of mergers on bank asset revaluations and capital augmentations is neither included nor calculated in the model estimated later on, since the present paper aims to develop a general model of bank capital augmentations in Spain. The impact of mergers on bank capital augmentations is examined in a different paper, which is currently being prepared by the author.

3.- THE CAPITAL AUGMENTATION DECISION IN THE BANKING FIRM: THEORETICAL BACKGROUND.

3.1.- Modelling Bank Capital Augmentations.

It is necessary to study the determinants of bank capital augmentations according to the banking theory, and particularly, to appraise the role of capital regulation as a determinant of bank capital raising.

The researcher defines capital augmentation as capital growth; in other words, the amount that bank capital increases in a certain period. Capital augmentations may be nominal and/or real. A nominal capital augmentation implies an increase in book-value capital. A real capital augmentation is generated by an increase in market-value capital. In this paper we will only consider nominal capital augmentations.

The capital decision of the banking firm has been largely appraised by the economic literature. An optimal capital structure is one that maximizes the value of the firm. In his 'classic' paper, Santomero (1984) argues that the capital decision of the banking firm is a complex issue since the optimal choice of size and leverage is determined by the assumed financial environment and the *raison d'être* of the bank. Therefore, the regulatory environment is a key variable in the bank capital decision.

In unregulated competitive markets, with no bankruptcy costs, corporate income taxation or other market imperfections, Modigliani and Miller (1958) showed that there is no optimal capital structure. Restoring one or more of those excluded conditions can produce an optimal debt/equity ratio, that is, an optimal capital structure. For example, Modigliani and Miller (1958) show that allowing interest on debt to be tax-deductible provides an incentive for firms to substitute debt for equity in their financial structure. However,

when there exist bankruptcy costs, increasing leverage provides a growing offset to the incentives to expand debt.

When bank capital is unregulated, its level reflects only the shareholders' optimality. Pringle (1974) argues that market-determined capital structures are preferable to those imposed by regulators. However, Taggart and Greenbaum (1978) believe that the market-determined capital positions may vary widely according to the regulatory setting.

In the banking literature, there are various theoretical models and perspectives to appraise the capital investment decision[8]. One of the 'classic' theoretical models which provide the determinants of bank capital augmentations is that of Peltzman (1970). His model can be represented as follows[9]:

$$(d \ln K/dt) = f(\Pi, \ln k, \Pi^0, g, R) + (d \ln D/dt)^* \qquad (3.1)$$

where (d ln K/dt) represents the rate at which capital is augmented, Π is the rate of return on capital in banking, k is the ratio Capital / Deposits, Π^0 represents the rate of return on investments alternative to banking, g stands for the ratio of government bonds to deposits as a measure of the default risk of bank portfolios, R represents the set of variables which measure the impact of bank regulation and $(d \ln D/dt)^*$ is expected deposit changes. Consequently, this model emphasizes that among the determinants of capital augmentations one should include regulation, portfolio risk, return on capital and the adjustment to deposit changes. Thus, although more theory and the characteristics of the Spanish banking system should be incorporated into the model, Peltzman seems an appropriate starting theoretical point from which to examine the impact of regulation on bank capital augmentations in Spain. From this model one can classify the determinants of bank capital augmentations

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[8]See, for example, Santomero (1984) for a survey of the main perspectives employed to examine the capital decision.

[9]See Peltzman (1970) for a complete version of the model.

into two classes: managerial (and market-based) determinants and regulatory determinants.

The researcher has selected Peltzman's theoretical model of capital augmentation in the banking firm since it seems a very good theoretical approximation to the way Spanish banks decide on capital augmentation. In a field survey that the researcher undertook among the largest Spanish private and savings banks in April-May 1992, it was found that the key variables that the Spanish bankers suggested were highly consistent with Peltzman's model[10].

Fundamentally, the main variables that the interviewed Spanish bankers, suggested as determinants of the capital augmentations they undertake are the following:

1) Spanish capital adequacy regulation: according to the bankers interviewed, this was the most important variable when deciding on capital augmentations. Regulation is also a key variable in Peltzman's model.

2) Regulatory capital and bank portfolio risk: Spanish bankers suggested that if their regulatory capital is found inadequate, they tend to augment capital, rather than change bank portfolio mix and growth. In other words, they tend to adjust capital to portfolio mix; they rarely alter portfolio composition and risk. In Peltzman's model, the relationship is also one-directional: capital augmentation is the dependent variable and is influenced by two variables coming from bank's portfolio (deposits and portfolio risk).

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[10]After several conversations on the telephone, and in order to systematize the opinions of Spanish bankers on the way they decide on capital augmentations, questionnaires were sent out to twelve of the largest private and savings banks in Spain. Seven questionnaires were answered and returned.

3) Profitability: in the field survey, Spanish bankers stated that the main managerial variable affecting capital augmentation was profitability. Profitability is also a key variable in Peltzman's theoretical model, although his model does not consider related issues like retained earnings or dividend pay-out.

3.2.- Market-based and Managerial Determinants of Bank Capital Augmentations.

The economic literature on bank capital augmentations has defined the following variables as main managerial determinants of bank capital raising: the cost of capital, with the related issues of profitability, retained earnings, dividend policy and access to external sources of funds (Derry, 1982; Zimmer and McCauley, 1991; Gardener, 1992), portfolio risk and liquidity (Peltzman, 1970; Mayne, 1972; Mingo, 1975, Dietrich and James, 1983; Yeager and Seitz, 1985).

A) The Cost of Capital: Profitability, Retained Earnings, Dividend Policy and External Sources of Capital.

A major issue when depository institutions make decisions on capital investment is the study of the costs of the different methods to augment capital. Central to the analysis of the cost of funds is the fact that the average cost of funds is influenced by the mix of funds employed by the bank. One major objective of financial structure management in a profit-maximizing firm is the minimization of the cost of funds. Profitability may be increased by lowering the cost of funds, since this increases the spread between cost of funds and return on assets, *ceteris paribus*.

Fundamentally, there are two main ways for a firm to augment capital: first, the internal capital generation or retained earnings (where profitability and dividend policy are important issues), and, second, having access to external sources of capital (issuing different equity instruments). Both methods to increase capital are to be examined next.

A bank's major source of capital is its earnings stream, a fact especially true for banks without easy access to capital markets. In Tables 6 and 7, we found empirical evidence that the main source of capital for both private and savings banks operating in Spain was their earnings stream and, more specifically, their retained earnings. This was especially true for the Spanish savings banks since they cannot issue share equity. Therefore, the first response of bankers facing the need for additional capital is probably, retained earnings. However, bankers must appraise their capital costs, especially, the costs to their shareholders. It seems generally accepted that increasing capital through the retention of earnings is the least painful and most desirable method available (Derry, 1982; Sinkey,1992). However, this method is not without costs. According to Mingo and Wolkowitz (1977), the cost of capital of retained earnings is the opportunity cost of funds to the shareholders.

When market or regulatory forces require a depository institution to augment its capital beyond its internal capital generation rate and the institution does not reduce balance sheet growth and/or does not change balance-sheet business mix, the institution must turn to external sources of capital. Although both equity and debt capital are available for such purposes, under the new international and EC capital guidelines established for 1992, common equity has been assigned a more critical role. Accordingly, preferred stock and subordinated debt will count less in the eyes of the regulators in terms of meeting capital requirements. Healthy banks need to have access to external sources of capital to permit growth opportunities to be accomplished without unduly extending the bank's capital cushion or unduly increasing the internal retained earnings. Problem banks need to have access to external sources of capital to replenish the erosion of their capital

account due to asset losses.

The access to capital markets and capital financing is a major issue when the external sources of capital are considered. In finance theory, the assumption of equal access to capital markets is frequently invoked[11]. However, in the real world of banking capital markets, equal access is a fiction, as numerous banks simply have no opportunity to tap domestic capital markets and obviously they have no access to foreign capital markets. Therefore, any model considering the determinants of capital investment should take into consideration the fact that there exist differences among credit institutions in the possibilities of tapping domestic and foreign capital markets.

In Spain, savings banks and many private banks are not quoted on any Stock Exchange. This appears to give lower possibilities of tapping domestic and international capital markets to those banks than for banks quoted on domestic and/or international Stock exchanges. This is a feature that should be captured in our empirical model for the Spanish banking system.

As far as the determination of the cost of capital, most models in the literature suggest measures based on market values[12]. Again, since there are many Spanish banking institutions (savings banks and many private banks) with no market value of capital funds, the models cannot be generally applied to our sample of the Spanish banking system.

In order to overcome the problem of not having market values for most of the banking institutions in Spain, one needs to find in the literature a measure of cost of capital that can be generally applied to the Spanish banking institutions. One of the measures of cost of capital, which has been one of the measures most frequently found in the literature is the current

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[11]See, for example, Modigliani and Miller (1958); Copeland and Weston (1988, p.439) review the main assumptions of the finance theory with regard to capital markets.

[12]See Yeager and Seitz (1985, p.105) and Gardener (1992).

rate of return on equity (ROE) (Derry 1982). The advantage of this measure is that it is available for all the banks in the Spanish banking sector[13].

B) Portfolio risk.

The portfolio risk of banking institutions is affected by market-based variables and regulation. In this section the researcher only considers the portfolio risk as a managerial determinant of bank capital investment and the effects of regulation on portfolio risk are left out.

In the marketplace, the two main factors to perceive whether a bank is solvent or insolvent are its portfolio risk and its quantum of capital. Insolvency occurs when the liabilities of a business exceed the value of its assets. The amount of shrinkage in assets that can occur without resulting in insolvency is related to the amount of capital in the financial structure. Thus, the risk of insolvency depends positively upon the risk of asset value shrinkage (that is, portfolio risk), and negatively upon the amount of capital in the financial structure. In other words, the lower is the bank portfolio risk, the lower the amount of capital needed in the respective financial structure.

In the literature, one can find many classifications of bank portfolio risk and no generalized risk taxonomy can be exhaustive. Gardener (1989a) and Sinkey (1992, p. 401) include the following risks in their portfolio risks classifications: credit risk, country risk, liquidity risk, interest rate risk, leverage (debt servicing) risk, currency risk and contingent (arising from commitments) risk[14].

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[13]See Zimmer and McCauley (1991) for a review of the main problems with the use of ROE as a measure of cost of capital.

[14]See Sinkey (1992) for a study of these types of portfolio risk.

The interaction between the amount of capital and portfolio risk shapes the philosophy of the Risk Asset Ratio (RAR). Sinkey (1992, p. 715) maintains that supervisors focus upon credit risk for commercial banks. Sinkey argues that the link between capital and credit risk is capital's ability to absorb losses due to default by bank's customers. He emphasizes that since credit risk has been the major risk faced by commercial banks in the past and most likely will be the critical risk for the future, the Spanish capital rules and the Basle Agreement (1988) ignore other sources of bank risk. However, at present, the Basle Committee is now also looking at risks like liquidity and interest rate risk.

C) Liquidity.

Sealey (1983) considers the importance of liquidity in the depository institutions by maintaining that since a large part of the services provided to the public by a depository intermediary is in the form of liquidity services, any model that ignores liquidity cannot adequately deal with this type of intermediary. One needs, then, to consider liquidity in our model of bank capital augmentations to reflect adequately the nature of the banking firm.

Regulators tend to focus mainly on capital adequacy, but as Crouhy and Galai (1986) maintain, recent history shows that illiquidity, rather than the lack of capital *per se*, is a primary cause of banking firms economic insolvency. A liquidity crisis might itself result from a loss of public confidence in the bank. The inability of the bank to maintain confidence might be associated in some ways with the insufficient capital base of a bank. Then the cost of liquidating assets plays a vital role in explaining why a bank confronted by liquidity problems has become insolvent.

Therefore, one of the main functions of bank liquidity is to demonstrate to the marketplace, which tends to be risk-averse dominated, that the bank is "safe". The same role is played by the bank capital adequacy. As a conclusion,

we could say that good liquidity management could lead to less liquidity risk and *ceteris paribus*, less risk held by the bank. If banks hold less risk, *ceteris paribus*, the adequate capital required for a bank is also lower. Thus, in this sense, the better the liquidity management, the lower the capital adequacy needs for a bank.

3.3.- The Impact of Capital Adequacy Regulation on Bank Capital Augmentations.

The microeconomic effects of bank capital adequacy regulation on bank capital augmentations are our main area of concern in this paper. There is some theoretical literature which has analyzed the impact of solvency regulation on the bank capital augmentation process. Two main cases will are examined:

1) The Impact of Capital Adequacy Regulation on Bank Capital Augmentations with no Deposit Insurance.

Peltzman (1970) argues that the critical test of regulatory effectiveness in microeconomic terms is the degree to which regulators succeed in getting the bankers' investments decisions to conform with regulatory standards.

Banking theory seems to support the view that capital requirements may have significant effects on bank conduct and structure (Gardener, 1989b). In this context, Mingo and Wolkowitz (1977) document a model with strong neoclassical microeconomic roots in which profit maximization is assumed to be managements's goal with the primary external constraint being the regulator's soundness requirement. By solving the model, they determine how the bank's balance sheet would be adjusted in response to a change in regulatory

requirements. They hypothesize the following balance sheet:

$$A + A' + C = D + K \tag{3.2}$$

where A = loans, A' = government securities, C = required cash reserves, D = total deposits and K = capital.

In their model bank profits are defined as the difference between revenue and costs which can be written as:

$$\Pi = pA + RA' - gK - hD \tag{3.3}$$

where p is the rate of return on loans, r is the rate of return on government securities, g is the cost of capital, and h is the cost of deposits.

Mingo and Wolkowitz assume that the manager maximizes bank's economic profits (Π) subject to a regulatory-imposed soundness constraint (τ). The soundness function measures a bank's strength by comparing the weighted quantities of assets to the weighted quantities of liabilities in a bank's balance sheet. The soundness function is

$$\tau = aA + a'A' + cC + kK - cD \tag{3.4}$$

where all lower letters represent the weights associated with balance sheet entries. The weights are all positive values, and $c > a' > a$. Therefore, for bank with given total assets and capital, an increase in loans necessarily comes at the expense of a decline in securities or cash (which have larger soundness weights). Additional bank capital (K), no matter what the asset form in which the capital proceeds are held, implies greater soundness. Greater deposits (D) imply less soundness, unless deposits are held entirely in the form of cash.

When solving the model[15], the impact on bank capital of an increase in regulatory-imposed soundness is given by the following expression:

$$\frac{dK}{d\tau} = \frac{(a'+k)\left[\frac{Ap_{AA} + 2p_A}{(a' - a)}\right]\frac{dA}{d\tau}}{[Kg_{KK} + 2g_K]} \qquad (3.5)$$

which gives a positive value, under reasonable governing parametric conditions. Thus, they demonstrate that under reasonable governing parametric conditions, a regulator-imposed improvement in soundness will result in an increase in bank capital.

2) The Impact of Capital Adequacy Regulation on Bank Capital Augmentations with Deposit Insurance.

A major issue on the impact of solvency regulation on bank capital augmentations is the existence of a deposit insurance system and its effects on capital augmentation.

With no deposit insurance and ignoring non-deposit liabilities, the balance sheet identity requires that total assets are equal to total deposits plus capital; hence, greater capital implies that, for any given asset portfolio, there is a lower probability of asset losses resulting in a decline in depositors' net worth. However, if deposits are insured, depositors are unlikely to worry about a bank's capital position. Consequently, Mingo (1975) argues that for purposes of attracting and maintaining deposits funds, deposit insurance would appear to be a direct substitute for capital in the eyes of bank management.

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[15]The model is solved via Lagrange multipliers.

Buser, Chen and Kane (1981), in a study of the deposit insurance and the value of the banking firm, argue that exclusive reliance on an explicit flat-rate premium would interfere with the simultaneous promotion of sound banking practices by supervisors and regulatory oversight for nonmember banks of the deposit insurance. Buser, Chen and Kane maintain that the deposit insurance fund currently achieves a comparable effect by employing a risk-rated structure of implicit premia in the form of regulatory interference. Regulatory standards for capital adequacy emerge as the critical element in the insurers' pricing strategy, in that those standards determine the anticipated net value of deposit insurance to stockholders as a function of bank leverage.

4.- THE EMPIRICAL MODEL OF CAPITAL AUGMENTATIONS FOR THE SPANISH BANKS.

4.1.- Background.

The main purpose of this section is to develop a general empirical model of capital augmentations for Spanish banks. In order to build our model, we need to survey the empirical methodologies that have modelled bank capital augmentations, and then, to refine on these methodologies to better reflect the characteristics of the Spanish banking system.

There is a well-established U.S. empirical literature which has evaluated the impact of regulation on bank capital augmentations (Peltzman, 1970; Mayne, 1972; Mingo, 1975; Dietrich and James, 1983; Keeley, 1988). One of the most

advanced and refined models of bank capital augmentations is that of Dietrich and James (1983). Dietrich and James' empirical model has the following desirable features for our research:

1) It is the most advanced and refined model of bank capital augmentations. In addition, their model includes the variables that Spanish bankers in our field survey expressed to be determinants of capital augmentations: regulation and profitability.

2) They employed data during a period (1971-75) where most ceilings on U.S. interest rates had already been eliminated. Therefore, the competitive environment of their tests was the most similar of all the models we have examined to the Spanish case during 1987-90.

As far as the main disadvantages of their model, it must be said that they do not distinguish among banks in terms of the intensity of regulation. In our case, it may be necessary to distinguish between private and savings banks since savings banks appear to have lower legal possibilities to augment capital. Another disadvantage is that some variables that theory suggest as determinants of bank capital augmentations (i.e. liquidity and access to capital markets) are not included in their model.

The empirical evidence appears to be mixed: there are studies with no evidence of supervisory impact on bank capital (i.e. Peltzman 1970; Mayne, 1972, Dietrich and James, 1983; Marcus, 1983), and at the same time, there are studies with strong evidence of regulation on bank capital augmentations (Mingo, 1975; Hislop, 1987; Keeley, 1988; Wall and Peterson, 1988).

4.2.- Model and Variable Specification.

Our general model for bank capital augmentations in Spain has been constructed by both considering banking theory, the main empirical models found in the literature and by refining the model to reflect more closely the Spanish case in terms of capital augmentations. Our general model can be expressed as follows:

$$\%\Delta K = \beta_0 + \beta_1 PF + \beta_2 CK + \beta_3 PK + \beta_4 LQ + \beta_5 \Delta D + \\ + \beta_6 KR + \beta_7 DI + \beta_8 KM + \varepsilon \qquad (4.1)$$

where:

$\%\Delta K$ = variable representing banks' capital augmentations
PF (and PF^*) = variable representing banks' profitability
CK = variable representing banks' cost of capital
PK = variable representing banks' portfolio risk
LQ = variable representing banks' liquidity
ΔD = variable representing deposits growth
KR = variable representing capital adequacy regulation
DI = variable representing deposit insurance
KM = variable representing access to capital markets.

The actual definitions and forms of the different variables are as follows:

A) Capital Augmentation

Three different definitions of capital will be considered in order to investigate the impact of regulation on different capital accounts. The following three definitions of capital augmentations ($\%\Delta K$) are employed:

A.1) Supervisory Tier 1 Capital Augmentation ($\%\Delta K_1$)[16]: when this definition is employed, the dependent variable of the empirical model is the annual increase in the sum of book-value share equity and published reserves in the case of private banks; and foundation funds, published reserves, the Social Works funds in the case of the savings banks. This seems to be the preferred definition by regulators since it emphasizes increases in permanent capital within the banking firm.

The researcher will compute the values of $\%\Delta K_1$ as follows:

$$\% \Delta K_{1t} = \frac{(\text{Tier } 1)_t - (\text{Tier } 1)_{t-1}}{(\text{Tier } 1)_{t-1}} \qquad (4.2)$$

A.2) Supervisory Tier 1 plus Tier 2 Capital Augmentation ($\%\Delta K_2$)[17]: the dependent variable with this definition, is the annual growth in the sum of Tier 1 (above) and subordinated debt (Tier 2). This is the actual definition of bank capital applied by Spanish regulators, but we must be aware that the subordinated debt is limited to 30 % of total own funds.

The values of $\%\Delta K_2$ will be computed in the following way:

$$\%\Delta K_{2t} = \frac{(\text{Tier } 1 + \text{Sub. Debt})_t + (\text{Tier } 1 + \text{Sub. Debt})_{t-1}}{(\text{Tier } 1 + \text{Sub. Debt})_{t-1}} \qquad (4.3)$$

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[16]Peltzman (1970), Mingo (1975) and Dietrich and James (1983) employed definitions of capital very similar to K_1.

[17]Mingo (1975) performed tests including long-term borrowed capital in the definition of capital.

A.3) Book-Value Capital Base Augmentation ($\%\Delta K_3$)[18]: in this case the dependent variable will be the growth of the capital base computed as in Chapter 4. Therefore, in the case of the private banks, the book-value (BV) capital base augmentation will represent the growth in the sum of share equity, reserves, bad loans provisions and subordinated debt. In the case of the savings banks, it will include the growth in the sum of foundation funds, reserves, Social Works funds, bad loans provisions and subordinated debt.

The values of $\%\Delta K_3$ will be calculated as follows:

$$\%\Delta K_{3t} = \frac{(\text{BV Capital Base})_t - (\text{BV Capital Base})_{t-1}}{(\text{BV Capital Base})_{t-1}} \qquad (4.4)$$

B) Profitability (PF and PF^*)

The first independent variable considered is profitability. One can find in the literature several measures of profitability: Return on Equity (ROE), Return on Assets (ROA), profit margin, etc[19]. In order to avoid representing both profitability and cost of capital with the same variable, the researcher has selected a measure of profitability whose denominator is total assets[20]. The profitability measure relevant for the capital augmentations of year t is that of year t-1, since the retained profits of year t-1 are those which make capital augment in year t.

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[18]Mayne (1972) employed a definition of capital very similar to K_3.

[19]See Revell (1980) for a review of the main banking profitability measures.

[20]Sinkey (1992, p.271) maintains that ROA is the preferred accounting measure of banking profitability.

Since savings banks do not pay out dividends, one can assume that savings banks have a retention ratio whose value is 100 %. Therefore, the profitability measure (PF) will be ROA in t-1 calculated in the following manner in the equations for the savings banks:

$$PF_t = \frac{(\text{Before-Tax Net Income})_{t-1}}{(\text{Total Assets})_{t-1}} \qquad (4.5)$$

However, for a private bank that is expected to distribute its profits between dividend payout and retained earnings, ROA in t-1 may not be the best variable to represent internal capital generation, since it does not capture the dividend policy of the private banking firm. Therefore, retained earnings will be employed instead of net income. The profitability measure employed for the private banks is the following:

$$PF^* = \frac{(\text{Retained Earnings})_{t-1}}{(\text{Total Assets})_{t-1}}$$

C) Cost of Capital (CK)

The second independent variable is cost of capital. There are no market values for savings banks and most private banks operating in Spain, and no dividends payout for savings banks. Thus, if one wishes the cost of capital variable to be the same for all the banks, one cannot take a definition which includes market values and/or dividend payouts.

As it was discussed in section 3.2, the researcher will employ the present rate of ROE to represent a proxy of this year's cost of capital[21]. It can be expressed as

$$CK_t = \frac{(\text{Before - Tax Net Income})_t}{(\text{Equity})_t} \qquad (4.7)$$

D) Portfolio Risk (PK)

In the literature, there seems to be a predominance of the capital-market measures of bank risk[22]. However, the researcher will not employ market-based measures of bank portfolio since there is very limited data for the Spanish banks and no general model could be suggested. Instead, similar measures to those found in the literature of capital augmentations will be utilized.

Our portfolio risk variable will be built employing the ratio of Spanish Government securities ('riskless assets') in a bank's portfolio to total assets. The portfolio risk variable is defined as the annual increase (or decrease) in the percentage of riskless assets in the balance sheet, since our variable of interest (capital augmentations) is also defined in terms of increases. The higher the ratio PK, the less risk from default associated with the portfolio, and, *ceteris paribus*, the lower the capital augmentation needed.

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[21]See Derry (1982).

[22]See Sinkey (1992, p.407-410) for a review of the main market measures of bank risk applied to the banking firm.

Our variable representing portfolio risk (PK) is as follows[23]:

$$PK_t = \frac{(\text{Ratio A})_t - (\text{Ratio A})_{t-1}}{(\text{Ratio A})_{t-1}} \tag{4.8}$$

where

$$\text{Ratio A} = \frac{(\text{Public Sector Securities})}{\text{Total Assets}} \tag{4.9}$$

E) Liquidity (LQ)

Our measure of liquidity will be expressed in terms of annual increases of the liquidity ratios. Our liquidity ratio (Liq. ratio) is cash accounts (cash and Bank of Spain's balances) to total assets. Our variable (LQ) is measured as follows:

$$LQ_t = \frac{(\text{Liq. Ratio})_t - (\text{Liq. Ratio})_{t-1}}{(\text{Liq. Ratio})_{t-1}} \tag{4.10}$$

[23]Peltzman (1970), Mingo (1975) and Dietrich and James (1983) employed similar measures of portfolio risk. Cash accounts are not included since they are represented in the liquidity variable.

F) Deposits Growth (ΔD)

The percentage growth in deposits is included as an explanatory variable because our empirical model for Spain represents an attempt to explain the capital augmentation process apart from straightforward responses to deposit changes[24]. The variable will be defined in the following manner:

$$\Delta D_t = \frac{(\text{Total Deposits})_t - (\text{Total Deposits})_{t-1}}{(\text{Total Deposits})_{t-1}} \qquad (4.11)$$

G) Capital Regulation (KR)

In order to measure the response of bank capital augmentations to regulatory standards of capital adequacy, one must employ a variable that contains a formula used by regulators in bank examinations. The impossibility of computing the risk-based capital ratios because of the lack of regulatory data on the different types of assets held by banks in their portfolios leads our analysis to focus on the generic ratio, which can be estimated with the data available.

Our capital regulation variable (KR) for the Spanish banking system will be computed as the negative inverse of the ratio of each bank's observed regulatory capital to the amount of regulatory capital desired by the Spanish regulators in the generic ratio.

[24]See Peltzman (1970).

Therefore, KR is calculated as follows:

$$KR_t = - \frac{\text{Generic Ratio Capital desired by Regulator}_t}{\text{Actual Regulatory Capital}_t} \qquad (4.14)$$

In the literature, the ratio employed to measure the impact of capital regulation on bank capital augmentations is the ratio of supervisory required capital to capital actually held by banks (Peltzman, 1970; Mingo, 1975; Dietrich and James, 1983). This variable measures the regulator-desired increment to bank capital. These authors define the regulatory capital variable (denominated ABC') as the negative inverse of the ratio of each bank's observed accounting equity capital to the amount of capital desired by the regulator. The inverse formulation is used to permit a nonlinear response to regulatory pressure, i.e., a capital response decreasing in absolute value as the regulator's ABC variable increases. The nonlinear response to regulatory pressure reflects the likelihood that relatively greater pressure to augment capital is exerted by regulators on banks with accounting capital far below the required capital than on banks whose accounting capital almost achieves the required standard. They use the negative formulation for convenience, so that if regulation is effective, the expected sign on the ABC' coefficient is negative[25].

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[25]In particular, ABC' = -1/ABC where ABC is the measure of capital adequacy utilized by regulators. The relationship between capital changes and the regulator's capital adequacy measure (ABC) is hypothesized to be of the form

$$\%\Delta K = - \beta \frac{1}{ABC} \qquad (4.12)$$

so that

$$\frac{\delta \ \%\Delta K}{\delta ABC} = \frac{\beta}{ABC^2} \qquad (4.13)$$

Thus, using ABC' permits a nonlinear response. Since the first term is

H) Deposit Insurance (DI)

One of the main hypotheses this research aims to test is that Spanish regulators have been able to prevent bankers from substituting deposit insurance for bank capital. The Spanish Deposit Guarantee Fund is not obligatory in theory, but in fact all banks are members of the Fund. This fact prevents us from representing this variable as a dummy.

The variable employed to represent the deposit guarantee will contain the annual contribution to the Deposit Guarantee Fund for every bank, which varies according to the increase (or decrease) of the deposits in every bank. In order to account for the different sizes of the banks, the annual contribution to the Deposit Guarantee Fund (DGF) will be divided by total assets. Total assets are employed instead of total deposits in order to avoid multicollinearity of this variable with the deposit growth variable. Thus, the deposit insurance variable (DI) will be computed as follows:

$$DI_t = \frac{(Contribution\ to\ DGF)_t}{Total\ Assets_t} \qquad (4.15)$$

I) Access to Capital Markets (KM)

In order to reflect the different access possibilities to capital markets, a dummy variable (KM) has been created. This variable is equal to 1, when the bank is quoted on any Stock Exchange, and is equal to zero when the bank is not quoted on any Stock Exchange. This variable will not be included in the empirical model for the savings banks since no savings bank in Spain is quoted in any Stock Exchange.

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expected to be less than zero if regulation is effective, multiplying the ABC ratio by -1 implies the expected sign of β is less than zero.

5.- MAIN RESULTS IN THE EMPIRICAL MODEL OF CAPITAL AUGMENTATIONS FOR SPANISH BANKS.

5.1.- Background and Results.

The cross-section regression analysis presented here has been undertaken for the three definitions of capital augmentation examined above for 1987-90. We have distinguished between private and savings banks as a result of their differences in terms of the possibilities to augment capital[26]. The original samples contain 121 private banks and 76 savings banks for 1987-89 and 64 savings banks for 1990. 1986 data was also necessary to compute several growth rates. Due to the existence of a certain number of extreme observations, it has been necessary to trim the samples by leaving out those 'outliers'. The sample of private banks has been reduced to a larger extent, since it is a far heterogeneous set of data. Most banks deleted from the samples are small banks[27].

The final samples are: 69 private banks and 58 savings banks in 1987; 83 private banks and 53 savings banks in 1988; 92 private banks and 51 savings banks in 1989, and 75 private banks and 48 savings banks in 1990.

It is important to note that in the preliminary statistical analysis, that although Spanish banks appear generally well-capitalized, several private and savings banks appeared not to have fulfilled the generic capital ratio standards. It is also interesting to note that in order to identify potential multicollinearity, the researcher estimated the correlation matrices for the

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[26]Data source for private banks: Consejo Superior Bancario (1987-90). Data source for savings banks: CECA (1987-90).

[27]Cooper and Weekes (1983, p.157) and Foster (1986, p. 100) suggest this (reduced sample approach) to improve the fit of the model.

independent variables. Despite the fact that there is a large number of independent variables computed from accounting data, all the correlation coefficients were well below 0.80 in absolute terms, which is the critical value for high correlation between two variables[28]. This appears to indicate that multicollinearity is not a serious problem in this analysis.

The researcher also undertook heteroskedasticity tests[29]: the results indicated that the null hypothesis (homokedasticity) was accepted in all cases.

Although in theory, autocorrelation should not be a serious problem in cross-section analysis, we have also computed the Durbin-Watson (DW) statistics to check for first-order autocorrelation. No DW value indicated that there was autocorrelation in the equations estimated.

The results for private and savings banks are displayed in Tables 8 and 9 respectively[30].

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[28]See Cooper and Weekes (1983, p.195) and Kennedy (1992, p.180).

[29]Following Newbold (1984, p.586), the researcher estimated a simple linear regression, in which the dependent variable is the square of the residual (e_i^2), and the independent variable is the predicted value ($\hat{y}_i$). Let R^2 be the coefficient of determination in this auxiliary regression. Then, for a test of significance level α, the null hypothesis (all the error terms have the same variance) is rejected if nR^2 is bigger than $X^2_{1,\alpha}$, where $X^2_{1,\alpha}$ is that number exceeded with probability α by a chi-square random variable with 1 degree of freedom.

[30]The researcher undertakes two-tail tests since banking theory is not conclusive with regard to the expected sign of the coefficients of the different independent variables. The level of significance chosen for is α = 0.05 (95 % confidence).

TABLE 8: REGRESSION ESTIMATES FOR PRIVATE BANKS (1987-90)

	1987			1988			1989			1990		
	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3
Constant (1)	0.02018 (0.81)	0.01988 (0.78)	0.02009 (0.78)	-0.00586 (-0.16)	0.00797 (0.20)	0.01006 (0.25)	0.04033 (0.98)	0.02613 (0.72)	0.00351 (0.10)	0.04869 (1.60)	0.06906 (1.82)	0.06140 (1.61)
PF*	1.130 (0.54)	1.030 (0.48)	1.678 (0.77)	8.643 (1.80)	2.121 (0.42)	3.227 (0.62)	4.676 (1.38)	6.345 (2.13)	6.512 (2.32)	5.509 (2.43)	4.554 (1.62)	3.740 (1.31)
CK	0.15514 (2.57)	0.14746 (2.38)	0.14466 (2.32)	0.2669 (2.34)	0.4702 (3.90)	0.3715 (2.99)	0.2250 (2.23)	0.17131 (1.93)	0.17382 (2.08)	-0.06627 (-0.68)	-0.0108 (-0.09)	-0.0586 (-0.48)
PK	-0.03801 (-1.31)	-0.04031 (-1.36)	-0.01985 (-0.66)	0.02045 (0.82)	0.00868 (0.33)	0.01226 (0.45)	0.01303 (0.69)	0.01939 (1.16)	0.01561 (1.00)	0.01184 (0.65)	0.00633 (0.28)	-0.00163 (-0.07)
LQ	-0.00512 (-0.65)	-0.00454 (-0.56)	-0.00023 (-0.03)	0.00370 (0.19)	0.00361 (0.18)	0.00723 (0.35)	-0.00736 (-0.50)	-0.00218 (-0.17)	-0.00111 (-0.09)	0.01659 (0.40)	0.02707 (0.53)	0.03075 (0.59)
ΔD	0.03880 (2.33)	0.03968 (2.33)	0.02036 (1.18)	0.01437 (0.59)	0.00784 (0.30)	0.03373 (1.27)	0.10699 (2.71)	0.02424 (0.70)	0.05106 (1.56)	-0.00334 (-2.61)	-0.00305 (-1.92)	-0.00331 (-2.07)
KR	0.01664 (0.95)	0.01491 (0.83)	0.00651 (0.36)	-0.05170 (-1.45)	-0.02963 (-0.79)	0.01635 (0.42)	-0.04096 (-0.98)	-0.05682 (-1.54)	-0.07225 (-2.09)	0.07236 (2.20)	0.1068 (2.61)	0.06983 (1.69)
DI	-0.62 (-0.02)	-3.41 (-0.10)	8.70 (0.26)	-52.20 (-0.74)	-58.46 (-0.78)	10.34 (0.13)	-28.25 (-0.89)	-17.89 (-0.64)	-19.58 (-0.74)	65.91 (2.75)	65.00 (2.18)	93.32 (3.10)
KM	0.03591 (1.56)	0.04131 (1.74)	0.02736 (1.15)	0.08379 (1.90)	0.06026 (1.29)	0.05955 (1.24)	-0.05846 (-1.52)	-0.05377 (-1.59)	-0.07797 (-2.45)	0.07196 (2.71)	0.08969 (2.71)	0.04820 (1.44)
Number Observ.	69	69	69	83	83	83	92	92	92	75	75	75
R^2	0.305	0.298	0.214	0.345	0.371	0.278	0.274	0.245	0.327	0.646	0.600	0.538

NOTE: (1) The t-statistics values are in parentheses.

TABLE 9: REGRESSION ESTIMATES FOR SAVINGS BANKS (1987-90)

	1987			1988			1989			1990		
	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3	ΔK_1	ΔK_2	ΔK_3
Constant (1)	-0.11186 (-1.21)	-0.14934 (-1.51)	-0.0209 (-0.16)	-0.31958 (-4.21)	0.2135 (1.08)	0.1052 (0.63)	-0.16214 (-2.86)	-0.13463 (-1.67)	-0.22182 (-2.81)	0.01157 (0.13)	-0.00532 (-0.07)	0.0168 (0.16)
PF	12.162 (8.40)	13.317 (8.63)	10.662 (5.27)	13.397 (10.48)	1.571 (0.47)	-0.098 (-0.04)	16.979 (12.31)	13.036 (6.67)	12.160 (6.34)	10.077 (7.73)	8.6096 (7.22)	6.214 (3.99)
CK	0.25892 (5.48)	0.19989 (3.97)	0.17927 (2.72)	0.09555 (1.78)	0.1970 (1.42)	0.1269 (1.08)	0.00135 (0.04)	0.03418 (0.66)	-0.04166 (-0.82)	0.19266 (2.72)	0.11044 (1.71)	0.05369 (0.64)
PK	0.07286 (0.93)	0.08290 (1.00)	-0.0315 (-0.29)	0.00481 (0.20)	-0.18394 (-2.96)	-0.16769 (-3.18)	-0.02396 (-1.05)	-0.01086 (-0.34)	-0.01119 (-0.35)	0.00169 (0.12)	-0.01411 (-1.13)	-0.02795 (-1.72)
LQ	0.02393 (0.65)	0.03465 (0.88)	0.05406 (1.05)	0.05948 (1.39)	-0.2380 (-2.15)	-0.17296 (-1.84)	-0.02429 (-0.96)	0.06572 (1.82)	0.07913 (2.24)	0.14479 (1.84)	0.14781 (2.05)	0.08585 (0.91)
ΔD	-0.1977 (-1.35)	-0.1552 (-0.99)	-0.0855 (-0.42)	-0.24248 (-2.44)	-0.7107 (-2.76)	-0.2824 (-1.30)	-0.0130 (-0.12)	0.0030 (0.02)	0.01828 (1.19)	-0.2825 (-0.97)	0.0802 (0.30)	0.0126 (0.04)
KR	-0.14999 (-4.14)	-0.18430 (-4.78)	-0.10609 (-2.10)	0.29753 (-9.58)	-0.13331 (-1.65)	-0.17297 (-2.54)	-0.08130 (-2.94)	-0.03930 (-1.00)	-0.04250 (-1.11)	-0.15154 (-2.83)	-0.1381 (-2.82)	-0.08213 (-1.29)
DI	-88.7 (-0.73)	-84.7 (-0.66)	-165.7 (-0.98)	472.7 (1.49)	-233.3 (-0.28)	-152.5 (-0.22)	305.5 (1.52)	468.6 (1.65)	925.2 (3.31)	-196.6 (-0.74)	-71.6 (-0.29)	132.4 (0.42)
Number Observ.	58	58	58	53	53	53	51	51	51	48	48	48
R^2	0.842	0.819	0.641	0.843	0.433	0.422	0.830	0.571	0.545	0.770	0.733	0.455

NOTE: (1) The t-statistics values are in parentheses.

5.2.- Economic Interpretation of Findings.

In order to analyze the findings presented in the previous section, the economic interpretation of our results will be divided into the following main areas:

1) Model Evaluation: the first considerations are in terms of how well the model explains and predicts the conduct of the private and savings banks operating in Spain. One can observe that the R^2 values for the savings banks' regressions are much higher than for the private banks' regressions. This indicates that savings banks appear to fit much better in our model of capital augmentation than private banks. This seems to be the case for all the years and the three definitions of capital augmentations employed in our empirical analysis of this chapter.

2) The Impact of the Regulatory-Based Variables on Bank Capital Augmentations in Spain during 1987-90.

A) *The Impact of Capital Adequacy Regulation*: first of all, one can note that the variable KR is only statistically significant in three of the regressions for the private banks. In addition, the sign of the variable changes across different years and across definitions of capital augmentations. This makes the impact of capital regulation even more unclear for the private banks. However, the impact of capital regulation for savings banks seems to be completely different. In 8 (out of 12) regressions for savings banks, the variable KR is statistically significant and the sign is negative. The negative sign implies that capital regulation appears to have made savings banks augment their capital during the period examined.

The reasons why the effects of capital regulation seem more important for savings banks than for private banks must be explored. First of all, capital adequacy regulation seems more strict for savings banks than for

private banks. Capital regulation may not be more strict for savings banks than for private banks in terms of the solvency ratios, but it certainly seems more strict in terms of the capital instruments that both types of institution can employ. Savings banks' management has less legal possibilities for increasing capital, which in turn, also reduces the leeway that management has with regard to augmenting capital.

B) *The Impact of Portfolio Risk*: the variable representing portfolio risk (PK) is only statistically significant in two regressions for the savings banks (in 1988 with a negative sign) and in no regression for private banks. This appears to imply that the portfolio risk has only a very limited impact on capital augmentation in banks operating in Spain. This seems to be against the philosophy of the present risk-based capital regulations (Bank of Spain, BIS, EC), which associate capital with portfolio risk. A possible explanation of the limited impact of portfolio risk on capital augmentations could be found in the evidence provided earlier on. It was found that the Spanish banking system as a whole seemingly kept very good risk-based capital standards. Therefore, *ceteris paribus*, there appears to be no strong need to change portfolio risk to maintain regulatory capital standards.

C) *The Impact of the Deposit Insurance*: its impact on capital augmentations seems very weak since it is only statistically significant in one regression for both private and savings banks. This would appear to confirm the evidence found in the field survey among the largest private and savings banks in Spain: most banks in the survey argued that the impact of deposit insurance on capital growth was unclear. In other words, no evidence can be provided with regard to whether deposit insurance makes banks augment capital or on the contrary, makes banks reduce capital.

The positive coefficient of DI in 1989 for savings banks could be statistically significant as a consequence of the impact of the regulatory decrease in the contribution to the Deposit Guarantee Fund for the savings banks. In this connection, a possible explanation is that as a result of

the lower contribution to the Deposit Guarantee Fund, savings banks could have decided to allocate more resources to augment their capital.

3) The Impact of the Managerial Variables on Bank Capital Augmentations in Spain during 1987-90.

A) *The Impact of Profitability*: profitability (PF) seems a key managerial variable for savings banks since it is statistically significant in 10 (out of 12) regressions. Naturally, it is highly significant for ΔK_1 (Tier 1 capital augmentation) since in practice the only way for savings banks to increase Tier 1 capital is through profitability (Reserves and Social Works Funds). Anyway, it is also significant for the other two definitions of capital augmentation since both definitions include Tier 1, and this reflects the great importance of profitability for all the definitions of capital for savings banks.

The important impact of profitability on capital augmentations for savings banks seems to contrast with the reduced impact of profitability for private banks. The variable representing profitability (PF^*) is statistically significant only in three equations. This is an unexpected result since private banks may not need to rely on profitability so much as savings banks, but it was shown earlier on that the main source of capital for private banks is retained earnings.

B) *The Impact of Cost of Capital*: the interpretation of the variable representing cost of capital must be made with care since the present ROE has been employed as a measure of cost of capital. ROE may also be understood as a measure of profitability. The variable representing cost of capital (CK) is statistically significant in 8 regressions for the private banks, and in 4 regressions for the savings banks. Thus, it would appear that cost of capital is more important for private banks than for savings banks.

The sign of the impact of cost of capital on capital augmentations is positive, which would appear to imply that the higher the cost of capital, the higher the capital augmentation. The latter does not support the economic theory which says that the higher the cost, the more expensive the capital augmentation and, *ceteris paribus*, the lower the capital growth.

A possible explanation for the positive sign may be as follows: the higher the profitability required (cost of capital) by shareholders, *ceteris paribus*, the harder bank managers will try to reach that level of profitability. If that level of profitability is achieved, as happened in Spain during 1987-90, the higher the retained earnings that can be allocated to capital after fulfilling shareholders' required return. In other words, with high levels of earnings like in the Spanish banking system in 1987-89, both high required returns (cost of capital) by shareholders and investors and high retained earnings can be accommodated at the same time. In 1990, the situation changed as a result of the 'accounts war' (guerra del pasivo), in which the financial cost of deposits increased dramatically, and in turn, profitability came under pressure.

C) *The Impact of Liquidity*: the variable representing liquidity (LQ) is only statistically significant in three regressions for savings banks and in no regression for private banks. Therefore, the impact of a bank's liquidity on capital augmentations appears very weak for the Spanish banks, particularly for the private banks. Liquidity does not appear to be a very important variable in terms of capital augmentations in the Spanish banking system, particularly for private banks.

D) *The Impact of Deposit Growth*: the deposit growth is statistically significant in five regression for the private banks and in two regressions for the savings banks. In the case of the private banks, the behaviour of the variable deposit growth changes in 1990, when the sign is negative (in previous years the sign was positive). The effects of the

'accounts war', in which Spanish banks, particularly private banks, began to offer high interest rates on current accounts, seem to lie behind the change of sign. The high interest rates on sight accounts, attracted many deposits and it seemed that capital could not follow the fast pace of deposit growth.

E) The Impact of Access to Capital Markets: the impact of the access to capital markets was tested through a dummy variable (KM) only for the private banks quoted on the Stock Exchange. From Table 8, one can note that this variable is only statistically significant in three regressions (one in 1989 and two in 1990).

The variable KM appears to have played an important role in 1990, since the variable is statistically significant and with a positive sign. The high interest rates on deposits seem to have made private banks rely on external sources of capital to a larger extent in 1990 than in previous years, as a consequence of the pressure on profitability.

6.- IMPLICATIONS AND CONCLUSIONS.

This paper has examined the impact of bank regulation on bank capital augmentations in Spain during 1987-90. After a severe banking crisis during 1978-83, new risk-based capital adequacy requirements were introduced in Spain in 1985. These capital standards are in line with the 1988 Basle Accord and the EC Directives. Preliminary evidence seems to suggest that Spanish banks are well-capitalized during 1987-90.

Employing banking theory, a field survey among Spanish bankers, and the empirical methodologies available, an empirical model of capital augmentations is developed for Spanish banks. One of the main findings in this model is that capital adequacy regulation seems to be a stricter constraint for savings banks. At a micro level, one can argue that the non-existence of shareholders in savings banks seems to make a stronger case for capital regulation of savings banks than of private banks. However, the competitive neutrality of regulation does not appear to be maintained in this case.

Finally, the somewhat confusing picture of findings drawn in the previous section can result from: (i) banking theory appears to be inconclusive in many decisions of the banking firm, (ii) two contradictory forces (deregulation and capital adequacy re-regulation) were influencing the Spanish banking markets during 1987-90.

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