

DO MACRO-FINANCIAL VARIABLES MATTER FOR EUROPEAN BANK INTEREST MARGINS AND PROFITABILITY?

(Preliminary version)

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I. OBJECTIVES

The main goal of this paper is to study the determinants of bank interest margins and profitability for some European countries in the last decade. We use a set of bank characteristics, macroeconomic and regulatory indicators as well as financial structure variables in order to explain interest margins and profitability. We evaluate whether European countries, sharing a common bond - European Monetary System membership - also share the same interest margin and profitability determinants. Beyond the usual micro variables, the paper examines whether bank size and capitalisation as well as inflation, economic growth, exchange rate policy, financial liberalisation and exchange rate turmoil, could be accepted as explanatory variables for bank performance. At the same time, we evaluate the impact of the EMS crisis of 1992/3/4 on the net interest margin and bank profitability, as well as the impact of the liberalisation of capital movements on Portuguese and Spanish banks.

II. BACKGROUND

This paper follows in the footsteps of Demirguç-Kunt and Huizinga (1999), Bartholdy, Boyle and Stover (1997) and Barth, Nolle and Rice (1997), and several specifications of the equation

$$\Pi_{ijt} = \beta_0 + \beta_i B_{ijt} + \beta_j X_{jt} + \beta_j C_j + u_{ijt} \quad (1)$$

will be estimated (with Π_{ijt} the net interest margin or ROA/ROE for bank i in country j at time t , B_{ijt} represents a vector of characteristics of bank i in country j at time t , X_{jt} is a vector of control variables for country j at time t , and C_j is a vector of country dummy variables).

The focus of the paper will be the investigation of possible influences of a standard set of bank-specific explanatory variables (along with other variables taking account of cross-country differences in the regulatory environment in which banks do operate) on bank profitability and interest margins. Although in many studies empirical results are essentially unchanged with respect to the used measure of bank performance, we will use three different indicators of ex-post bank performance: the robustness of our results is at stake. The bank specific variables we use are market share, operating costs, capital to asset ratio and loan to asset ratio (to account for bank-specific risk insofar as the dependent variable is not risk-adjusted). Among the macroeconomic variables we use the inflation rate, the unemployment rate, and the nominal effective exchange rate. We will also use dummy variables to account for the range of permissible activities as well as the existence of crises of the European Monetary System, and a time trend.

Some authors have claimed that the relationship between the explanatory and explained variables is not linear and is not stable (v.g. Swamy et al 1996). On the other hand, it is not easy to design a single model that completely describes bank

performance. Therefore we will test different specifications of the general model (1) in order to avoid the risk of misspecifying the functional form of the relationship. We will not, however, report all our results.

III. DATA SET AND VARIABLE DEFINITION

The dependent variable is a measure of ex-post bank performance. In order to test the robustness of our results we use four different alternatives: Interest Margin ($IM = \text{Interest received} - \text{Interest paid}$), Return on Assets (ROA) and Return on Equity (ROE). NIM is alternatively defined as $IM/\text{Total Assets}$ or IM/Equity . ROA is $\text{Pre-tax Profit}/\text{Total Assets}$ and $ROE = \text{Pre-tax Profits}/\text{Equity}$.

We include three types of explanatory variables in our estimation: microeconomic, domestic-macroeconomic, and policy and macro-financial variables. Among the microeconomic variables we include the ratio of the Total Employment Costs/Total Assets ($Labor/A$) as a proxy for operating costs, the Equity to Total Assets ratio ($Equity/A$), the Total Loans to Total Assets ratio ($Loans/A$) and bank market share (MS).

It is expected that banks with higher operating costs (higher $Labor/A$) will have higher net interest margins (in order to survive) and lower ROA and ROE (everything else constant, banks will have lower pre-tax profits). Differences in operating costs may also capture differences in business and product mix or even differences in the range and quality of services offered.

We expect that the higher $Equity/A$ ratio, the lower need to external funding and therefore higher NIM and profits. It is also a sign that well-capitalized banks face lower costs of going bankrupt and thus their cost of funding is reduced.

The ratio $Loans/Assets$ is the ratio $\text{Total debtors and equivalent}/\text{Total Assets}$. Traditionally, banks are intermediaries between lenders and borrowers. Other things constant, the more deposits are transformed into loans, the higher the interest margin and profits. However, if a bank needs to incur higher risk in order to have a higher loan-to-asset ratio, then profits may decrease.

We also expect that bank market share (MS) is positively correlated with our dependent bank profitability variables. The market share variable captures effects that are not related to efficiency, such as product differentiation. Assuming price competition, a bank is able to sell at higher prices and to have a higher market share if its products are differentiated from those of its competitors. This positive relationship between market share and profitability may not exist, however, if we have product differentiation but market demand is small relative to firm size. The MS variable is defined as bank's Loans divided by Country's Domestic Credit¹.

Among the domestic macroeconomic variables we include the real GDP growth (GDP), the unemployment rate (UR)² and the inflation rate (INF)³. Adverse macroeconomic conditions hurt banks by increasing the share of non-performing loans in the economy. Thus we expect an increase in the real growth of GDP to increase bank performance. Low or declining aggregate growth rate may weaken the debt servicing capacity of domestic borrowers and contribute to increasing credit risk. We expect higher unemployment rates to have a negative effect on bank interest margins and profitability. High inflation is associated with high nominal interest rates and may also be viewed as a proxy for poor macroeconomic management. High inflation is often associated with higher relative price volatility, which makes the accurate assessment of credit and market risks more difficult. On the other hand, a significant and rapid reduction in the rate of inflation could lead to lower nominal income and cash flows, affecting the liquidity and solvency of financial institutions.

With regard to policy and financial variables we include the nominal effective exchange rate index (EXR)⁴ to capture the impact of the exchange rate policy on bank performance. To attest the effect of financial liberalization we include a dummy variable (DCFPS). In Portugal and Spain, the final step towards financial liberalization was the liberalization of short-term capital movements in 1992 in Portugal and in 1993 in Spain, while in the other two countries all capital movements were already free. Accordingly, DCFPS variable is equal to 1 if the country is

1 We were unable to get information on total bank loans at the country level. Therefore, the denominator is Domestic Credit of the country.

2 The Eurostat definition of unemployment as a % of civilian active population.

3 The Eurostat definition of the annual % change of the GDP deflator at market prices.

4 The Eurostat definition of the nominal effective exchange rate, base 100=1991; performance vis-à-vis the rest of the 22 industrialized countries.

Portugal and the year is 1992 and beyond, or the country is Spain and the year is 1993 and beyond.

To capture the impact of the European Monetary System (EMS) crisis, we include another dummy variable (CRIS). The EMS crisis started in August 1992 and ends up, for most of the member's countries, in August 1993, with the widening of the exchange rate bands. Portugal is the exception. In fact, the Portuguese escudo continued to be under pressure until the last EMS final realignment, in March 1995. Therefore, the CRIS variable is equal to 1 if the year is 1992 or 1993 (all countries), or 1994 and the country is Portugal.

We also include 3 country-dummy variables to attest for other specific national relevant factors: D1 variable is equal to 1 if the country is Portugal; D2 variable is equal to 1 if the country is Spain; D3 variable is equal to 1 if the country is France.

Finally, we include a time trend variable: YEAR.

In this paper we study banks from four different EU countries (Portugal, Spain, France and Germany). Table 1 shows the distribution of banks, by country and year. The sample is reasonably balanced, and bank-specific variables (table 2) do not show any 'strange' figures. Accounting data from DATASTREAM is used for banks from Spain, France and Germany. As for Portuguese banks, accounting data from banks' annual balance sheet and income statement is used. As for UR, INF, EXR and Domestic Credit, we use "Économie Européenne", n° 70, 2000 (Commission Européenne, Direction Générale 'Affaires Économiques et Financières').

Table 1: Number of banks from each country in the data set

Years	Portugal	Spain	France	Germany	TOTAL
1986	8	5	0	8	21
1987	8	6	0	8	22
1988	8	7	2	8	25
1989	8	7	2	8	25
1990	8	7	3	8	26
1991	8	7	3	9	27

1992	8	7	14	9	38
1993	8	6	15	9	38
1994	8	7	15	9	39
1995	8	7	17	9	41
1996	8	13	18	10	49
1997	8	14	19	10	51
1998	0	14	19	10	43
1999	0	8	15	9	32

Table 2: Descriptive statistics of some variables (%)

	IM/ Assets	PTPROFI T/Assets	EQUITY/ Assets	LABOR/ Assets	LOAN/ DEP	MS
Mean	2.54	1.06	6.25	1.43	109.45	4.18
Max	8.01	6.29	26.02	3.14	989.36	33.24
Min	-1.67	-2.62	0.98	0.11	27.48	0.02
Std. Dev.	1.57	0.95	3.52	0.60	70.60	5.98

V. RESULTS

Equation 1 was estimated by least squares with the panel of 477 observations. The White heteroskedasticity test was performed and did not allow the acceptance of the null hypothesis. Therefore, we used White-consistent standard deviations. Results are in tables 3 to 5.^{5,6}

⁵ Under the suspicion that two explanatory variables (Equity/Assets and Loan/Assets) could be endogenous, we used the Hausman endogeneity test. The null hypothesis of exogeneity was accepted at the 5% level, but rejected at the 10% significance level. Therefore we reestimated equation (1) by TSLS. Results were not substantially different and are not reported.

⁶ Results are robust to the use of Assets or Equity in the denominator of the dependent variable, and we do not report them all.

Table 3: Least square results. Dependent Variable is IM/ASSETS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.799791	0.366014	-2.185135	0.0294
LABOR/A	1.397429	0.136901	10.20757	0.0000
EQUITY/A	0.110296	0.023534	4.686731	0.0000
LOAN/A	0.023527	0.004637	5.073225	0.0000
MS	0.008137	0.007843	1.037518	0.3000
UR	-0.030525	0.034397	-0.887425	0.3753
INF	-0.102139	0.036798	-2.775660	0.0057
EXR	-1.77E-05	0.000147	-0.120431	0.9042
CRIS	0.002852	0.001449	1.968705	0.0496
DCFPS	-0.013428	0.003592	-3.738193	0.0002
D1	0.023207	0.004198	5.527786	0.0000
D2	0.019599	0.006007	3.262728	0.0012
D3	-0.002845	0.001698	-1.675304	0.0946
YEAR	0.017382	0.007952	2.185830	0.0293
YEAR*YEAR	-9.60E-05	4.24E-05	-2.263364	0.0241

Table 4: Least square results. Dependent Variable is ROA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.197540	0.224592	0.879554	0.3796
LABOR/A	0.094415	0.087026	1.084907	0.2785
EQUITY/A	0.200242	0.014238	14.06423	0.0000
LOAN/A	0.007695	0.002590	2.971416	0.0031
MS	0.015280	0.003841	3.978588	0.0001
UR	-0.037868	0.019437	-1.948246	0.0520
INF	-0.043461	0.020308	-2.140148	0.0329
EXR	2.00E-06	8.09E-05	0.024734	0.9803
CRIS	0.000682	0.000890	0.765738	0.4442
DCFPS	-0.004374	0.001891	-2.313033	0.0212
D1	0.001854	0.002211	0.838656	0.4021
D2	0.012096	0.003240	3.733250	0.0002
D3	-0.003270	0.001042	-3.138169	0.0018
YEAR	-0.004278	0.004881	-0.876439	0.3812
YEAR*YEAR	2.25E-05	2.61E-05	0.862377	0.3889

Table5: Summary of results									
	IM/ASSETS		IM/EQUITY		ROA		ROE		
C	↘	**	↘		↗		↗		
LABOR/A	↗	*	↗	*	↗		↗		
EQUITY/A	↗	*	↘	*	↗	*	↗	*	
LOAN/A	↗	*	↗	*	↗	*	↗		
MS	↗		↗		↗	*	↗	*	
UR	↘		↘		↘	***	↘	*	
INF	↘	*	↘	**	↘	**	↘	*	
EXR	↘		↘		↗		↗		
CRIS	↗	**	↗	**	↗		↗		
DCFPS	↘	*	↘	*	↘	**	↘	***	
D1	↗	*	↗	*	↗		↗		
D2	↗	*	↗	*	↗	*	↗	*	
D3	↘	***	↗		↘	**	↘	***	
YEAR	↗	**	↗		↘		↘		
YEAR*YEAR	↘	**	↘		↗		↗		

* significant at the 1% level (two-tailed).
** significant at the 5% level (two-tailed).
*** significant at the 10% level (two-tailed)

VI. SOME COMMENTS ON THE RESULTS

1. The determinants of NIM and Pre-tax Profits are not the same. In particular, we have found that CRIS and Labor/Assets impact on NIM only, whilst MS and UR are relevant for explaining ROA(E).
2. Regarding bank-specific variables, the net interest margin reacts positively to operating costs, but pre-tax profits do not. This means that less efficient banks (that is, banks with higher operating costs) charge higher interest rates on loans (or pay lower rates on deposits), therefore passing those costs onto customers. However, competition does not allow them to 'overcharge' and thus all banks achieve similar profitability ratios.

3. Well-capitalised banks (ie, banks with higher equity/assets) face lower expected bankruptcy costs and thus lower funding costs and higher interest margins on assets. In general, this advantage ‘translates’ into better profitability ratios.
4. The loan-to-asset ratio has a positive impact on interest margins and profitability. This could mean that in our sample-period banks did watch carefully the lending process. That is, they did not grant credit at all costs (relaxing credit selection and monitoring), just for the sake of organic growth. Thus, they seem to have been able to maintain low levels of non-performing loans, thereby increasing profits and margins.
5. The market share variable is not significant when we explain the Net Interest Margin. If we consider that MS captures product differentiation as well as market power, then it appears that banks do not differentiate traditional loan and deposit products (and do not exert market power in these markets) but rather less ‘conventional’ bank products and services. It also means that market structure is not relevant in those traditional activities; however, they do exert market power in some other bank products and services such as off-balance activity.
6. Although with a negative sign in all regressions, the unemployment rate (as a proxy for the cyclical behaviour of the economy) is relevant in the two last equations only. Results are not better if we use the GDP growth rate instead. Also, results are not better if we use lagged values of UR and GDP.
7. The inflation rate is relevant in all models. Inflation brings along higher costs but also higher income. It seems that bank costs increase more than do bank revenues. This contradicts findings from other studies (Barth *et al* 1997, Claessens, Demirgüç-Kunt and Huizinga 1998, Hanson and Rocha 1986, Demirgüç-Kunt and Huizinga 1999, Demirgüç-Kunt and Huizinga 2000, Denizer 2000), but goes along the lines of earlier research (Wallich 1977, Petersen 1986).
8. The nominal effective exchange rate does not have any impact on bank performance. However, the EMS crisis of 1992/3/4 seems to have had a positive impact on the net interest margin on assets but not on bank profitability. Under pressure, European authorities reacted by increasing short-term interest rates and that has had some impact on median and long-term rates. However, credit rates react generally faster than do deposit rates and thus the positive impact on the

interest margin. At the same time, exchange rate instability increases risk in cross-border bank activity and losses could have occurred in foreign exchange transactions. Other bank costs may have also increased, thus offsetting increased bank revenues.

9. Portuguese and Spanish banks suffered from the full liberalisation of capital movements, both in terms of interest margin and profitability. Given the increased competition brought about by liberalisation, fund holders did look for more efficient banking systems and more profitable applications, thus flowing out of these two countries.
10. Banks in Portugal and Spain perform generally better than banks in Germany. However, French banks at the lower end of the spectrum. We can consider that in these four countries we have bank-based financial systems. And “after controlling for the level of financial development, there is some evidence that a more market-based financial structure would lead to lower levels of bank profits” (Demirgüç-Kunt and Huizinga 2000, p.12). That seems to be the case of Portugal and Spain vis-à-vis France and Germany. The bank sector in Iberian countries thus represents for firms a larger source of funds than does the capital market, leading to superior performances for Portuguese and Spanish banks. As for France and Germany, 1995 data shows that total bank assets represent 119% of GDP in Germany (against the 99% in France), whilst stock market capitalization represents 34% of GDP in France and 24% in Germany (Demirgüç-Kunt and Huizinga 1999, table3). Using the same reasoning, banks in France face more intense competition from the stock market and therefore show lower interest margins and profitability.

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