



# The determinants of banks' profits in Greece during the period of EU financial integration

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## Abstract

**Purpose** – This paper aims to examine the determinants of performance of Greek banks during the period of EU financial integration (1990-2002).

**Design/methodology/approach** – The approach is to use an unbalanced pooled time series dataset of 23 banks.

**Findings** – High return on average assets (ROAA) was found to be associated with well-capitalized banks and lower cost to income ratios. Size was positive in all cases but statistically significant only when the macroeconomic and financial structure variables entered the models. Turning to macroeconomics and financial structure, the growth of gross domestic product (GDP) has a significant and positive impact on ROAA, while inflation has a significant negative impact.

**Originality/value** – The paper's value lies in showing that money supply growth has no significant impact on profits, whereas the ratios banks' assets to GDP, stock market capitalization to banks assets and concentration are all statistical significant and negatively related to ROAA.

**Keywords** Greece, Banking, Performance criteria, European Union

**Paper type** Research paper

## Introduction

Over the last years, a number of significant changes occurred in the Greek banking system as a result of its adaptation to new conditions such as the deregulation of national markets, the establishment of the single EU market and the internationalization of competition.

The major changes in the Greek banking system were realized after 1992, when the Greek Parliament passed the Second Banking Directive concerning establishment, operation and supervision of credit institutions. Moreover, over the last years, the major Greek banks have enhanced their business abroad, mainly in the Balkans, and have strengthened their position in the domestic market through mergers, acquisitions and strategic alliances. The result was a substantial restructuring of the banking sector and a new equilibrium in the Greek financial market. The wave of mergers and acquisitions had an effect on the concentration in the Greek banking market which remains high, although lower than in five other EU Member states (Netherlands, Belgium, Sweden, Finland and Denmark).

As it concerns the type and ownership of banks, commercial banks are the ones that dominate the Greek banking system. The most significant change relative to ownership has been the withdrawal of the state from commercial banking in recent years, which reduced the number of directly or indirectly state controlled banks from ten in 1995 to three in 2003.

It becomes obvious from the above, that a number of changes took place in Greece prior to its entry into the euro zone. In addition, the adoption of the euro by Greece on January 2001 has accelerated other changes not only to monetary conditions, but also to the operational environment as well. The increased competition, along with the



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stability and low inflation has led to a decline of the interest rate spread[1] while another source of income generation from foreign exchange transaction has been lost. Therefore banks were forced to generate new products and seek new customers.

It is reasonable to assume that all these changes must have some impact on the profitability of Greek banks[2]. Therefore, knowledge of the underlying factors that influence the profits of banks is essential.

The purpose of this paper is to extend earlier work on the determinants of profitability of Greek commercial banks and examine to what extent the profits of banks are influenced by internal factors (e.g. bank's-specific characteristics) and to what extent by external factors (e.g. macroeconomic, financial industry structure) during the period of EU financial integration. The conclusions drawn could prove useful not only for future decisions of Greek banks' managers but also for the banking sectors in other medium-sized economies that are undergoing structural changes such as most accession EU countries, particularly those in central and eastern Europe.

The rest of the paper is structured as follows: the literature review section reviews the literature on the determinants of banks profitability as well as the studies on Greek banking. The section determinants and variables selection describes the variables selected to measure the performance of the banks along with those chosen to test the factors that affect it. Data and methodology section describes the methodology and the data used in the study. Results section presents the empirical results. Finally, in conclusions and further research section, the concluding remarks are discussed.

## Literature review

### *Studies on the Greek banking system*

Up-to-date the number of studies that examined the Greek banking market is limited. Most of these studies have focused on the comparative performance of banks and their efficiency (cost efficiency and economics of scale) rather than on the determinants of their profitability.

Zopounidis *et al.* (1995) demonstrated a multicriteria decision-making methodology for the evaluation of the performance of a sample of 28 Greek banks over the period 1989-1992. An additive utility model was assessed to obtain the final ranking of the banks.

The liberalization and the profitability of the Greek commercial banks during the period 1989-1991 were examined by Alexakis *et al.* (1995). The results suggest that the determinants of profitability of Greek commercial banks were highly different from those in other countries during the periods of intense regulation in Greece.

Vasiliou (1996) applied the statistical cost accounting methodology to investigate the profitability differences between high-profit and low-profit Greek banks over the period 1977-1986. He concluded that asset management and to a lesser extent liability management play a role in explaining interbank differences in profitability in Greece during the period 1977-1986.

The cost structure and the scale economies in the Greek banking system during the years 1980-1989 were examined by Karafolas and Mantakas (1996). They constructed a model that uses a translogarithmic cost function which includes the size of assets, capital, labor and technological progress. They found that although operating cost-scale economies existed, total cost-scale economies were not present.

The competitive conditions in the Greek banking system over the period 1993-1995 were examined by Hondroyiannis *et al.* (1999) who used the Rosse-Panzar statistic and found that bank revenues were earned as if under conditions of monopolistic competition.

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Kosmidou and Spathis (2000) examined the impact of euro on Greek banks through a cost–benefit analysis by estimating the costs, benefits and outcome that would arise from the introduction of the euro. The results indicated that profits would rapidly increase in the long-term period.

Vasiliou and Frangouli (2000) investigated the impact of financial variables (asset utilization and leverage multiplier) and concentration ratio of the Greek commercial banking market on banks' return on equity over the period 1993-1997. The results indicated that financial variables are very important determinants of banks' profitability while market structure is found to have no influence on banks' performance.

In a later study, Stathas *et al.* (2002) applied the multicriteria method PROMETHEE to rank the banks according to their financial performance over multiple criteria (liquidity, profitability, capital structure, investment activity, development) during the period 1995-1999.

The cost efficiency over the period 1993-1998 was estimated by Christopoulos *et al.* (2002). They found that large banks are less efficient than smaller ones as well as their economic performance, bank loans and investments are positively related to cost efficiency. However, Spathis *et al.* (2002) used a multicriteria methodology to investigate the differences of profitability and efficiency between small and large banks over the period 1990-1999 and found that large banks are more efficient than small ones.

Tsionas *et al.* (2003) applied Data Envelopment Analysis to estimate economic efficiency, total factor productivity (TFP) change and technical change of the Greek banking system for the period 1993-1998. The results indicated that most of the banks operated close to best market practices, while allocative inefficiency costs appeared to be more important than technical inefficiency costs. In addition, the positive but not substantial TFP change of the Greek banking system was associated to efficiency improvement for the medium-sized banks and to technical change improvement for larger institutions.

In a more recent study, Mamatzakis and Remoundos (2003) used a methodology based on the structure–conduct performance (SCP) framework to examine the determinants of the performance of Greek commercial banks over the period 1989-2000. They used financial ratios, bank's size, status of ownership, stock market performance, market concentration, money supply and consumer price index as independent variables and found that profits are mainly explained by the financial ratios. They also reported that economics of scale and the money supply significantly influence profitability.

#### *Determinants of bank performance*

A review of literature and cross-reference studies provided many studies that examined the determinants of banks' profits. These studies consider internal factors, such as management policy decisions and external factors like economic environment and examine either a particular country or a number of countries.

Molyneux and Thorton (1992) were among the first who examined the determinants of banks profitability in several countries using a sample of 18 European countries over the period 1986-1989 and found a positive association between the return on equity and the level of interest rates, bank concentration and the government ownership.

Berger (1995b) and Angbazo (1997) among others examined the US banking sector. Berger (1995b) found that return on equity and capital-to-asset ratio are positively

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related over the period 1983-1992. The results of Angbazo (1997) for the period 1989-2003 indicate a positive association between the bank interest spread and the default risk, opportunity cost of non-interest bearing reserves, leverage and management efficiency. Similar studies were conducted in a number of emerging countries such as Colombia (Barajas *et al.*, 1999) and Malaysia (Guru *et al.*, 1999).

In a most recent study Demirguc-Kunt and Huizingha (1999) considered a comprehensive set of bank characteristics (such as size, leverage, type of business, foreign ownership), macroeconomic conditions, taxation, regulations, financial structure and legal indicators to examine the determinants of bank interest margins and profitability in 80 countries over the period 1988-1995. They found that: (i) well-capitalized banks have higher net interest margins and are more profitable, (ii) banking sectors, where banking assets constitute a larger portion of the GDP, have smaller margins and are less profitable and that a larger stock market capitalization to bank assets is related negatively to margins, (iii) bank concentration ratio positively affects profitability, (iv) macroeconomic factors implicit and explicit financial taxation, deposit insurance and the legal and institutional environment also explained variation in interest margins.

### **Determinants and variables selection**

As it was mentioned earlier, the purpose of this paper is to develop a model that will reveal the factors that influence the profits and margins of Greek banks. In general, the literature on banks performance mentioned that the profitability determinants can be divided in two main categories namely the internal determinants (i.e. those factors that are influenced by the bank's management decisions and policy objectives) and the external determinants (i.e. economic and industry conditions). The variables chosen to measure the performance of banks along with those chosen to test the factors that affect it are presented in Table I and discussed below. In addition, correlations between the independent variables are presented in Table II.

#### *Performance measures*

This study uses the ratio of return on average assets (ROAA) as a measure of bank performance. Return on assets is the net profit after tax divided by total assets and indicates the returns generated from the assets financed by the bank. Average assets are being used in this study, in order to capture any differences that occurred in assets during the fiscal year.

#### *Internal determinants*

Five bank characteristics are used as internal determinants of performance. They are the cost-to-income ratio, the ratio of equity to total assets, the ratio of bank's loans to customer and short-term funding, the ratio of loan loss reserves to gross loans and the bank's total assets which represent expenses management, capital adequacy, liquidity, asset quality and size, respectively.

The cost-to-income ratio (COST) measures the overheads or costs of running the bank, the major element of which is normally salaries, as percentage of income and it is used to provide information on variation of bank costs over the banking system. Although the relationship between expenditure and profits appears straightforward implying that higher expenses mean lower profits and the opposite, this may not always be the case. The reason is that higher amounts of expenses may be associated with higher volume of banking activities and therefore higher revenues. Therefore, in

| Variables                                                       | Description                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Dependent</i>                                                |                                                                                                                                                                                                                                                                                                                                                         |
| ROAA                                                            | The return on average total assets of the banks                                                                                                                                                                                                                                                                                                         |
| <i>Independent</i>                                              |                                                                                                                                                                                                                                                                                                                                                         |
| <i>Banks characteristics (internal factors)</i>                 |                                                                                                                                                                                                                                                                                                                                                         |
| COST                                                            | This is the cost-to-income ratio. It provides information on the efficiency of the management regarding expenses relative to the revenues it generates. Higher ratios imply a less efficient management                                                                                                                                                 |
| EQAS                                                            | This is a measure of capital adequacy, calculated as equity to total assets. High capital-asset ratios are assumed to be indicators of low leverage and therefore lower risk                                                                                                                                                                            |
| LODEP                                                           | This is a measure of liquidity calculated as loans to customers and short-term funding. Higher figures denote lower liquidity                                                                                                                                                                                                                           |
| LOSRES                                                          | This is the ratio of loan loss reserves to gross loans. It indicates how much of the total portfolio has been provided for but not charged off and is used as a measure of bank's asset quality and risk. Given a similar charge-off policy the higher the ratio the poorer the quality and therefore the higher the risk of the loan portfolio will be |
| SIZE                                                            | The accounting value of the bank's total assets                                                                                                                                                                                                                                                                                                         |
| <i>Macroeconomic and financial structure (external factors)</i> |                                                                                                                                                                                                                                                                                                                                                         |
| GDPGR                                                           | The annual change in the GDP (in constant US\$ 1990)                                                                                                                                                                                                                                                                                                    |
| INF                                                             | The annual inflation rate                                                                                                                                                                                                                                                                                                                               |
| MSG                                                             | The growth of the money supply as measured by currency circulation (in constant US\$ 1990)                                                                                                                                                                                                                                                              |
| MACPASS                                                         | The ratio stock market capitalization to total assets of the deposit money banks <sup>a</sup> . This variable serves as a proxy of financial development as well as a measure of the size of financial market and the relationship between bank and market financing (in constant US\$ 1990)                                                            |
| ASSGDP                                                          | The ratio total assets of the deposit money banks divided by the GDP (ASSGDP). It reflects the overall level of development of the banking sector and measures the importance of bank financing in the economy (in constant US\$ 1990)                                                                                                                  |
| CONC                                                            | The C <sub>5</sub> concentration measure calculated by dividing the assets of the five largest banks to the assets of all banks operating in the market                                                                                                                                                                                                 |

**Notes:** The data for the calculation of internal factors and CONC were obtained from Bankscope Database. The data for the external factors were obtained from Euromonitor International Database which uses sources such as International Monetary Fund's (IMF) International Financial Statistics (IFS), International Financial Statistics and World Economic Outlook/UN/national statistics and World Bank. <sup>a</sup>Total assets of the deposit money banks is the summation of IFS lines 22a through 22f

**Table I.**  
Variables description

order to assess the efficiency in expenses management, we use a measure of costs relative to income. It is expected that this variable will have a negative impact on performance because efficient banks are expected to operate at lower costs.

The ratio of equity to total assets (EQAS) is used in this study as a measure of capital adequacy. Capital adequacy refers to the sufficiency of the amount of equity to absorb any shocks that the bank may experience. It is expected that the higher the

|         | LOSRES      | EQAS       | COST       | LODEP      | SIZE       | GDPGR      | INFL        | MSG        | ASSGDP     | MACPASS    | CONC |
|---------|-------------|------------|------------|------------|------------|------------|-------------|------------|------------|------------|------|
| LOSRES  | 1           |            |            |            |            |            |             |            |            |            |      |
| EQAS    | 0.1709614   | 1          |            |            |            |            |             |            |            |            |      |
| COST    | -0.11116608 | 0.275658   | 1          |            |            |            |             |            |            |            |      |
| LODEP   | -0.1289756  | 0.139973   | -0.2221155 | 1          |            |            |             |            |            |            |      |
| SIZE    | 0.0791904   | -0.1613467 | -0.212275  | -0.080138  | 1          |            |             |            |            |            |      |
| GDPGR   | -0.0157125  | 0.1507205  | 0.1346447  | 0.1770323  | 0.2585045  | 1          |             |            |            |            |      |
| INFL    | -0.0451898  | -0.4084183 | -0.0193127 | -0.2327148 | -0.3810872 | -0.3714702 | 1           |            |            |            |      |
| MSG     | -0.0435326  | 0.1545443  | -0.1628953 | 0.0223498  | 0.0708942  | 0.1387719  | -0.173176   | 1          |            |            |      |
| ASSGDP  | -0.0347192  | -0.0166379 | 0.0259049  | 0.1787555  | -0.0143925 | -0.0239693 | -0.3177423  | -0.0067767 | 1          |            |      |
| MACPASS | 0.0569833   | 0.412443   | -0.1033535 | 0.0591764  | 0.3154898  | 0.1238301  | -0.7265586* | 0.4830071  | -0.2500049 | 1          |      |
| CONC    | -0.0154386  | 0.0285536  | 0.172672   | 0.0758561  | 0.1632959  | 0.7220657* | 0.0393346   | -0.2269083 | -0.5206759 | -0.0843939 | 1    |

**Note:** \*Significance at the 0.01 level (two-tailed)

**Table II.**  
Independent variables  
correlations

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equity to assets ratio, the lower the need to external funding and therefore the higher the profitability of the bank. In addition, well-capitalized banks face lower risk of going bankrupt which reduces their costs of funding.

Another important decision that the managers of commercial banks must take refers to the liquidity management and specifically to the measurement of their needs related to the process of deposits and loans. For that reason the ratio of bank's loans divided by customers plus short-term funding (LODEP) is used as a measure of liquidity. Higher figures denote lower liquidity. Without the required liquidity and funding to meet obligations, a bank may fail. Thus, in order to avoid insolvency problems, bank often hold liquid assets, which can be easily converted to cash. However, liquid assets are usually associated with lower rates of return. It would be therefore expected that higher liquidity would be associated with lower profitability.

The ratio loan loss reserves to gross loans (LOSRES) indicates how much of the total portfolio has been provided for but not charged off and is used as a measure of bank's asset quality. Given a similar charge-off policy, the higher the ratio the poorer the quality and therefore the higher the risk of the loan portfolio will be. On one hand, the risk-return hypothesis implies a positive relationship between risk and profits. On the other hand, bad asset quality may have a negative impact on bank profitability by reducing interest income revenue and by increasing the provisions costs.

Bank's size (SIZE) is considered to be an important determinant of its performance. The reason is that large size may result in economies of scale that will reduce the cost of gathering and processing information (Boyd and Runkle, 1993). The empirical results are mixed, since some studies found economies of scale for large banks (European Commission, 1997; Berger and Humphrey, 1997; Altunbas *et al.*, 2001) and other economies of scale for small banks or diseconomies for larger banks (e.g. Vander Vennet, 1998; Pallage, 1991). As in most studies of banking, we use total assets of the bank as a proxy for its size to account for size-related economies or diseconomies of scale.

#### *External determinants*

The literature suggests that the environment in which banks operate influences them, like any firm. Therefore, the financial market structure, the economic condition of the country, the legal and political environment all may influence the performance of the banks. In this study, two sets of external determinants are examined: the macroeconomic and the financial structure indicators.

Gross domestic product (GDP) is among the most commonly used macroeconomic indicators, as it is a measure of total economic activity within an economy. The gross domestic product growth (GDPGR), calculated as the annual change of the GDP, is used as a measure of the macroeconomic conditions. GDPGR is expected to have an effect on numerous factors related to the supply and demand for loans and deposits. A positive relation is expected between the performance of the banks and this variable.

Another important macroeconomic condition, which may affect both the costs and revenues of banks, is the inflation (INF). As Staikouras and Wood (2003) point out that inflation may have direct effects (e.g. rise in the price of labor) and indirect effects (e.g. changes in interest rates and asset prices) on the profitability of the banks. According to Perry (1992), the effect of inflation on bank performance depends on whether the inflation is anticipated or unanticipated. In the former case (i.e. anticipated inflation) the interest rates are adjusted accordingly resulting in revenues, which increase faster

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than costs, with a positive impact on profitability. In the later case (i.e. unanticipated inflation) the banks may be slow in adjusting their interest rates, which results in a faster increase of bank costs than bank revenues that consequently have a negative impact on bank profitability.

According to the quantity theory of money, changes in the supply of money lead to changes in nominal GDP and the price level. Money supply refers to the quantity of money available and it depends on the monetary policy that is being followed. The money supply is basically determined by Central Bank's policy; nevertheless it is affected by the behaviour of households that hold money and banks in which money is held. Mamatzakis and Remoundos (2003) used the supply of money as a measure of market size and found that it significantly influences bank profitability. In this study, we use the growth of the supply of money (MSG), and it is expected to have a positive impact on banks profits and margins.

We also examine how the performance of the banks is related to the relative development of the banking industry and the stock market using the ratios total assets of the deposit money banks[3] divided by the GDP (ASSGDP) and stock market capitalization divided by total assets of deposit money banks (MACPASS) as well as banking industry concentration (CONC). ASSGDP reflects the overall level of development of the banking sector and measures the importance of bank financing in the economy. Demirguc-Kunt and Huizinga (1999) found that banks in countries with a more competitive banking sector, where banking assets constitute a larger portion of the GDP, have smaller margins and are less profitable. MACPASS reflects the complementarity or substitutability between bank and stock market financing. Demirguc-Kunt and Huizinga (1999) found that stock market capitalization to bank assets is negatively related to margins, and suggested that relatively well-developed stock markets can substitute for bank finance. We therefore expect, both ratios to be negatively related to bank's performance. CONC is calculated as the total assets held by the five largest commercial banks in the country divided by the total assets of all commercial banks in the country. According to the SCP hypothesis, banks in highly concentrated markets tend to collude and therefore earn monopoly profits (e.g. Short, 1979; Molyneux *et al.*, 1996). However, not all studies, have found evidence to support the SCP hypothesis. From the 45 studies reviewed by Gilbert (1984) only 27 provide evidence that the SCP paradigm hold. Berger (1995a) points out that the relationship between bank concentration and performance in the USA depend critically on what other factors are held constant.

## Data and methodology

### Data

This study uses accounting data of individual banks as well as a number of country- and market-specific data drawn from the years 1990-2002. Bankscope Database of Bureau van Dijk's company was used as a source of banks' financial data and banking sector concentration, while country- and market-specific data such as inflation, GDP, stock market capitalization, etc. were obtained from Euromonitor International Database. The time period was selected considering that it offers recent time series observations and it constitutes a period of major changes for the Greek banking system.

Banks should meet the following two conditions in order to be included into the sample. First they had to be commercial banks. Second, they should have annual

accounting statements (balance sheet and income statement) for at least one year between 1990 and 2002 in the Bankscope Database.

The above procedure yielded an unbalanced panel data of 23 commercial banks over the period 1990 to 2002, consisting of 154 observations. When the variable of concentration is included in the study, the number of observations falls to 125. The reason is that in that case only the period 1995-2002 is examined due to data availability on Bankscope database.

### *Model formulation*

In order to examine to what extent the profits of Greek commercial banks are influenced by internal factors (e.g. bank's-specific characteristics) and to what extent by external factors (e.g. macroeconomic, financial industry structure), the following model is considered:

$$z_{it} = c_{o_{it}} + c_{m_{it}} Y_{m_{it}} + c_{d_{it}} Y_{d_{it}} + \varepsilon \quad (1)$$

where  $c_{o_{it}}$  is a constant,  $i$  refers to an individual bank,  $t$  refers to year,  $z$  is the dependent variable that refers to the ROAA,  $Y_m$  is a vector captured from the internal factors of a bank and  $Y_d$  is a vector captured from the external factors of a bank and  $\varepsilon$  is an error term.

The model (1) is estimated through fixed effects regression. Based on the Breusch-Pagan test (Baltagi, 2001), we calculate the Lagrange Multiplier (LM) statistic. Comparing the relevant statistic of each model with  $\chi^2_{0.1, n}$ , where  $n$  refers to the number of variables, we do not reject the null hypothesis that the errors are homoscedastic. Therefore, we consider that the fixed effects method used in our analysis is appropriate. Finally, White's transformation is used to control the cross-section heteroscedasticity of the variables.

### **Results**

This section presents the empirical results of the regressions. Table III shows the results of the regressions. The first column reports the results when only bank characteristics (i.e. internal factors) are considered while the second when macroeconomic variables and financial structure (i.e. external factors) indicators enter the equation. As expected, we observe slightly differences in the coefficients and the significance of the variables when the external factors are introduced. The explanatory power of the model (in terms of adjusted  $R^2$ ) that examines the determinants of ROAA increases slightly when the external factors are considered.

The first bank level variable is the ratio loan loss reserves to gross loans. The impact of loan loss reserves to loans on ROAA is negative and statistically significant whether we consider bank characteristics alone or not. This is reasonable since loan loss reserves is the cumulative stock of loans loss reserves that changes according to the amount of new loan provisions added each year. Provisions are subtracted from operating profit before provisions, taxes and extraordinary items to arrive at operating profit before taxes and extraordinary items and consequently after subtracting taxes and extraordinary items to profits after tax, the numerator of ROAA. Bank management may use provision charges to smooth out profits. Banks can reduce the variability of reported income by making higher provisions than necessary when credit quality and net income are high, during favorable economic conditions. In this case, provisions would not have to increase as much if credit quality was to deteriorate or

|                         | Dependent variable ROAA <sup>a</sup> | Dependent variable ROAA <sup>b</sup> |
|-------------------------|--------------------------------------|--------------------------------------|
| LOSRES                  | -0.225265 (0.0017)*                  | -0.103891 (0.0448)*                  |
| EQAS                    | 0.351498 (0.0000)**                  | 0.415789 (0.0000)**                  |
| COST                    | -0.758659 (0.0000)**                 | -0.647711 (0.0000)**                 |
| LODEP                   | -0.107983 (0.0000)**                 | 0.008185 (0.7932)                    |
| SIZE                    | 0.013775 (0.4603)                    | 0.095324 (0.0001)**                  |
| GDPGR                   |                                      | 0.339281 (0.0000)**                  |
| INF                     |                                      | -0.294034 (0.0000)**                 |
| MSG                     |                                      | -0.016322 (0.5300)                   |
| ASSGDP                  |                                      | -0.683984 (0.0000)**                 |
| MACPASS                 |                                      | -0.248818 (0.0000)**                 |
| CONC                    |                                      | -0.421234 (0.0000)**                 |
| Adjusted R <sup>2</sup> | 0.628694                             | 0.636916                             |
| Breusch-Pagan test (LM) | 6.417 ( $\chi^2_{0.1,5} = 9.236$ )   | 8.928 ( $\chi^2_{0.1,11} = 17.275$ ) |
| Prob (F statistic)      | 0.0000**                             | 0.0000**                             |

**Notes:** <sup>a</sup>23 Banks, period 1990-2002, No. of observations = 154, *p*-values in parentheses; <sup>b</sup>23 Banks, period 1995-2002, No. of observations = 125, *p*-values in parentheses; \*Significant at the 5 per cent level, \*\*\*significant at the 1 per cent level

**Table III.**  
Unbalanced pooled  
ROAA models

economic conditions are hard. As mentioned in the 2002 Governor's annual report of the Bank of Greece, the favorable economic environment facilitated banks to follow such a policy over the last years in order to upgrade the quality of their loan portfolios by increasing their loan loss provisions and write-offs.

The ratio equity to assets is positively related to bank's performance and statistically significant. This is consistent with previous studies (e.g. Berger, 1995b; Demirguc-Kunt and Huizinga, 1999; Abreu and Mendes, 2001) and implies that well-capitalized banks face lower risks of going bankrupt, which reduces their costs of funding.

Unsurprisingly, the poor expenses management is one of the main contributors to poor profitability performance as the relatively high significant coefficient of the cost-to-income ratio shows. Regarding Greek bank's operating expenses, it should be mentioned that they account for significantly higher percentage of their total assets than in other EU countries. Probably, the main reason is that administrative and personnel expenses are relatively inelastic and almost double than in other EU countries (Bank of Greece, 1998, 1999).

Concerning the liquidity results, the relation with ROAA is negative and significant when we consider only bank's characteristics, while it becomes positive but insignificant when the macroeconomic and financial structure variables enter the equation. As higher figures of the ratio of bank's loans to customers plus short-term funding (LODEP) denote lower liquidity, the results imply that less liquid banks have lower ROAA which is inconsistent with our expectations. However, Bourke (1989) also found a significant positive relationship between liquidity and bank profitability.

The relation between size and bank's performance is positive, a fact that supports the results of Spathis *et al.* (2002) who examined the differences of profitability and efficiency between small and large Greek banks over the period 1990-1999 and found large banks to be more efficient. However, it should be mentioned that the effect of size is insignificant for ROAA when we consider only bank-specific characteristics and

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becomes significant only when the macroeconomic and financial structure variables enter the equation.

Turning to the macroeconomic and financial industry structure variables we observe that GDPGR has a significant and positive impact on ROAA, while inflation has a significant negative impact. The money supply growth has no significant impact on profits. The results about GDPGR support the argument of the association between economic growth and the financial sector performance. It is worthwhile to point out that Greek banks operated under conditions of relative high GDP growth over the last years as Greece achieved an average growth rate considerably higher than in the EU as a whole. Referring to the inflation, it seems that while it might bring higher revenues it might also bring higher costs with the second increasing more than the first. Although this contradicts with the findings of some studies (e.g. Claessens *et al.*, 1998; Demirguc-Kunt and Huizinga, 1999), it is consistent with the results of Abreu and Mendes (2001) that examined Portugal, Spain, France and Germany over the period 1986-1999.

The financial structure indicators, banks' assets to GDP (ASSGDP), market capitalization to banks assets (MACPASS) and concentration are all statistically significant and negatively related to ROAA. The results about ASSGDP are consistent with the findings of Demirguc-Kunt and Huizinga (1999) who found that in countries where banking assets constitute a larger portion of the GDP, banks have smaller margins and are less profitable. This effect was smaller in richer countries that already had relatively developed banking sectors. The negative and significant impact of MACPASS to bank's performance is also consistent with the results of Demirguc-Kunt and Huizinga (1999) implying that the stock market development offers substitution possibilities to potential borrowers, which consequently decreases banks' profits. Finally, it seems that concentration is less beneficial in terms of profitability to the Greek commercial banks than competition.

### **Conclusions and further research**

Over the last years a number of important changes occurred in the Greek banking industry, leading to increased competition and pressure bank profitability.

This paper analyzed how the bank's management decisions and policy objectives and the overall banking environment affected the performance of banks in terms of their ROAA during the period 1990-2002. An unbalanced pooled time series dataset of 23 Greek commercial banks operating during the above period provided the basis for the econometric analysis.

The results indicate that individual bank characteristics explain a substantial part of the within-country variation in bank ROAA. High ROAA was found to be associated with well-capitalized banks, with efficient expenses management (lower cost-to-income ratio). Size was positive in all cases but statistically significant only when the macroeconomic and financial structure variables entered the models.

It seems that despite the improvements, Greek banks must keep up their modernization, since they will soon have to compete with other EU banks of a significantly higher size. Although the personnel expenses are slowly decreasing over the last years, they remain higher than in other EU countries, indicating that the Greek banking system remains overstaffed. Therefore, in order to be competitive and profitable, Greek banks have not only to expand their operations and improve the quality of their services but to reduce their operating costs as well.

Referring to macroeconomic and financial structure indicators, GDPGR has a significant and positive impact on ROAA, while inflation has a significant negative

impact. The money supply growth has no significant impact on profits. The financial industry structure indicators, banks' assets to GDP (ASSGDP), market capitalization to banks assets (MACPASS) and concentration are all statistical significant and negatively related to ROAA.

Future research could include more variables such as taxation and regulation indicators, exchange rates as well as indicators of the quality of the offered services. Another possible extension could be the examination of differences in the determinants of profitability between small and large or high-profits and low-profits banks. A statistical cost accounting methodology could also be used.

### Notes

1. The spread between the interest rate on short-term lending to enterprises and the interest rate on savings deposits declined to 6.6 per cent in January 2001 from 10 per cent in January 1998.
2. The profits after tax as a percentage of average total assets increased from 0.48 per cent in the period 1988-1990 to 0.94 per cent in the period 1991-1994 followed by a decrease to 0.69 per cent over the period 1995-1997. Pre-tax profits in 1999 were 100 per cent higher than in 1998, probably due to the appreciation of equity prices in 1999, while in 2002, the return on total assets fell from 1.4 per cent in 2001 to 0.7 per cent (Bank of Greece, 1998, 1999, 2002).
3. Total assets of the deposit money banks are the summation of International Monetary Fund's International Financial Statistics lines 22a through 22f.

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