Macrothink Institute™

International Finance and Banking
ISSN 2374-2089
2021, Vol. 8, No. 1

How Are Non-Performing Loans Influencing the Banks' Efficiency?

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Received: November 3, 2020 Accepted: April 20, 2021 Published: May 15, 2021

doi:10.5296/ifb.v8i1.17906 URL: http://dx.doi.org/10.5296/ifb.v8i1.17906

Abstract

Non-Performing Loans portfolio (NPLs) is a major issue faced by the financial system worldwide and in Greece as well with extremely influence during the financial crisis decade.

The purpose of this research is to investigate and determine if and how the NPLs influence the efficiency indicators of the Greek banks and specifically how they affect efficiency of the banks.

The empirical investigation of Non-Performing loans included a comparative study of indicators of efficiency of the Greek banks, National Bank of Greece, Piraeus Bank, Alpha Bank, Eurobank, Attica Bank and the Co-operative Banks of Epirus, Crete, Thessaly, and Serres, for the year 2017.

The conclusions resulted concern the display of financial size of the bank sample, the correlation of loans with outflows, the multifaceted analysis of linear regression to control the effects of loans and finally the effect of lending on the banks' performance.

Keywords: Non-Performing Loans, efficiency, Greek banks, credit risk, legal frame of NPLs

This paper is a revised and expanded version of a paper entitled "The impact of Non-Performing Loans' on the Banks' Profitability" presented at the 7th International Conference on Business and Economics (ICBE) of the Hellenic Open University, TITANIA hotel, Athens, Greece, May 7, 2021.

1. Introduction

Since 2008, the international financial system has suffered an unprecedented crisis, which has affected the Greek banking system. Banks recorded significant losses during this period and their capital fell sharply, while some banks reached the brink of bankruptcy and were considered unsustainable, as a result of which they were absorbed by other, stronger banks. In 2011 Greek banks fell to eight, in 2012 to seven and in 2013 to five. The five strongest banks that survived the crisis are the National Bank, Piraeus Bank, Alpha-Bank, Eurobank and Attica-Bank (Diakomihalis et al., 2016).

The fact that the NPL term has not been determined has led the European Banking Authority (EBA) to harmonize its definitions and ways of determining them for all European Union countries using an extended term, which is defined as Non-Performing Exposures (NPEs). According to the EBA and the regulatory provisions of the Bank of Greece, non-performing exposures (NPEs) include:

(a) Exposure delays equal to or greater than 90 days,

(b) Exposures that present certainty of "unlikely to pay" without particular delay or with a delay equal to greater than 90 days determined by quality criteria, and

(c) Any claims that have been filed regardless of whether they have been declared bankrupt.

In addition, there is the issue of the difference between "non-performing loans" and "overdue loans". According to the Bank of Greece, the difference is that the new definition of Exposures is wider than that of NPLs as it includes not only loans but also all other debit instruments such as debit securities, advances, and off-balance sheet exposures (EBA, 2018; BoG, 2017).

Greece is one of the European Union member states that has been hit hardest by the global debt crisis. High public and private debt, over-taxation and the trade deficit are the elements that constructed the Greek economy until the crisis eruption in parallel with the falsification of public deficit data by the Greek state, in collaboration with Goldman Sachs. This falsification was justified by the Greek state, as a mean to show that Greece complied with the Stability and Growth Pact, creating a climate of lack of confidence in Greece on the part of the European Union (Camaione, 2014).

In 2015, financial stability in Greece was threatened by the increase in non-performing loans and the outflow of bank deposits. Thus, the need to deal with the so-called "red loans" with urgent legislation was considered crucial, as the "non-performing exposures" reached 55.4% in consumer loans, 43.3% in business and 39.8% in housing (Report of the Management of the Bank of Greece, 2016).

After the intervention of the Bank of Greece, Greek banks proceeded with write-offs amounting to 660 million euros, in order to immediately manage non-performing loans, and in parallel the state expedited the proceedings of cases of non-performing loans, while from 2010 (Law 38699 / 2010) provides debtors with the ability to adjust the debts of their households, including their non-performing loans even in foreign currencies.

In 2017, the Greek banking system showed improvement in profitability before taxes, maintained capital adequacy at satisfactory level, diversified funding sources and managed to slightly reduce the stock of non-performing loans, according to the objectives set by the implementation of the third Program of Financial Adjustment.

As the data showed, in 2017 Greek banks recorded higher consolidated earnings before taxes compared to 2016 (287 million euros in the first 9 months of 2017, 148 million euros in the first nine months of 2016).

These gains came from the increase in net income from commission, from the reduction in operating costs, from the significant reduction in interest expense and from the marginal improvement in the capital adequacy of the banking system.

The Common Equity Tier 1—CET1 index stood at 17.1% in 2017 compared to 16.9% in December 2016 and remained at a higher level of about 15% than the European average.

The liquidity conditions of the banking system improved in 2017, since private sector deposits increased by 5 billion euros since 2016 as a result of the use of electronic payments in the context of capital constraints and repatriation of funds by foreign banks. Thus, the balance of private deposits in December 2017 amounted to 126.35 billion euros. Of that, € 103.9 billion came from household deposits and € 22.4 billion from business deposits.

The total deposits (deposits of the private sector and the General Government) in the banking system amounted to 137.8 billion euros in December 2017, recording an increase of 4.5%.

In 2017, the dependence of Greek financial institutions on the financing mechanism of the Euro system (European Central Bank) and Emergency Liquidity Assistance (ELA) for extraordinary liquidity gradually decreased to 33.7 billion euros in 2017 compared to 66.6 billion euros in 2016.

In terms of credit expansion, the balance of loans to the private sector amounted to 183.9 billion euros at the end of 2017 compared to 195.2 billion euros at the end of 2016. The reduction in private sector financing lasted all 2017 but at a slower pace and this is due to the partial reduction of loan interest rates but also to the improvement of economic activity, as reported by the Bank of Greece.

The medium-term forecasts for financial stability in 2018 appeared to be favorable, expecting positive growth rates with the Gross Domestic Product being estimated by the Bank of Greece to increase to 2.4%. The single monetary policy of the euro area also contributed to this.

2018 was full of new challenges, such as the implementation of the International Financial Reporting Standard 9 (IFRS 9), the implementation of the pan-European simulation of extreme situations by the ECB and the strict framework for handling forecasts for new Non-Performing Loans.

However, despite the generally positive picture of the operation and environment of the Greek banking system, the stock of Non-Performing Exposures (NPEs) was maintained at

high levels, resulting in September 2017 to 100.4 billion euros, covering a percentage of 44.6% of total exposures compared to 44.8% in December 2016.

The present study examines the financial indices of the four systemic Greek Banks, and of Attica bank, as well as 4 more Cooperative Banks, Epirus, Thessaly, Crete (Pankritia) and Serres.

The reasons that prompted the European Community to set up an institutional framework to address the crisis caused by non-performing loans are being analyzed. For this analysis, Profitability and Efficiency indicators, Capital Structure, Liquidity and Valuation Indicators were used.

The paper has the following structure: Section 1 contains the Introduction, which is followed by Literature review at Section 2. Section 3 describes the aims and objectives of the research. Section 4 contains Data and Methodology. The results are presented and analyzed in Section 5, and finally the last Section 6 demonstrates the Conclusion of the paper. The paper is completed with the References and the Appendix with 20 Tables describing all research's data, calculations, and results.

2. Literature Review. Non-Performing Loans

The phenomenon of non-performing loans (NPLs) has emerged in the last decade and has negatively affected the economies of many countries. Non-performing Loans (NPLs), according to the ECB, are characterized the loans when:

(a) show a delay of more than 90 days

(b) the creditor is deemed to be unable to fully meet his credit obligations, without liquidation of the security, regardless of the existence of overdue debt or the number of days of delay (ECB, 2017).

The problem of the non-existence of a single definition for the term "Non-Performing Loans" has been pointed in many studies with the result of each country having its own way of determining NPL (Kalfaoglou, 2015).

The recent rise in non-performing loans is widespread in all banks and is evident in both the private and business lending sectors.

Louzis, Vouldis and Metaxas (2012) have studied the relationship between credit quality and macroeconomic conditions, seeking to link banking stability to the financial and business cycle. Quagliarello (2007) also found that the business cycle affected the non-performing loan ratio of Italian banks during its total research period, from 1985 to 2002.

The high and rising levels of non-performing loans in many central and eastern European countries continue to put strong pressure on the balance sheets, with potential adverse effects on banks' lending activities. Klein's study of non-performing loans in central, eastern, and southeastern Europe (CESEE), on the one hand, looked at the determinants of non-performing loans and, on the other hand, the effects of the feedback from the banking sector on the real economy, aiming to assess how the economy will be affected in the near

future due to the increase in non-performing loans.

Berger and DeYoung (1997) studied the relationship between cost/efficiency and capitalization of US commercial banks, for the period 1985–1994, interpreting the fact that non-performing loans affect the cost/efficiency ratio as a case of "bad luck", but the cost/effectiveness ratio leading to Non-Performing Loans as a case of "bad management" (Klein, 2013).

The determinants of non-performing loans (NPLs) in the Greek banking sector, is the main study subject of Louzis, Vouldis and Metaxas (2012), who searched the relative factors separately by loan category. The results show that, NPLs in the Greek banking system, for all loan categories, can be explained by macroeconomic variables and management quality. Besides, differences in the quantitative impact of macroeconomic factors among loan categories are evident, with non-performing loans being the least responsive to changes in the macroeconomic conditions. Finnaly, Louzis, Vouldis and Metaxas (2012) supported the hypothesis of Berger and DeYoung (1997), according to which, low-cost efficiency for the banks may lead to NPLs increase.

Cifter et al. (2009) examined the Turkish financial system from 2001 to 2007 and revealed a lagged impact of industrial production on the non-performing loans (Louzis et al., 2012). Salas and Saurina (2002) (referred in Louzis et al., 2012), estimated a significant negative contemporaneous effect of GDP growth on the NPL ratio, while Kalfaoglou (2006) pursue to "quantify the resilience of Greek banks to internal and external shocks related to credit and market risk", revealing the credit risk impact as the most significant risk component (referred in Louzis et al., 2012, p. 9).

The unexpected increase of credit provided in the recent decades by the banks it might be attributed probably to disorganization of banks and possibly to the full or partial deregulation process of financial markets, along with the technological development and improvement of banking transactions and services (Cingolani, 2013; Panopoulou, 2005; Rinaldi & Sanchis-Arellano, 2006).

On one hand, deregulation in the banking sector might have strengthened competition among banks (Salas & Saurina, 2003) and on the other, competition presumably had increased banks' risk, increasing bad loan participation through weak screening and lax lending criteria, which has affected their loan portfolios (Manove, Padilla, & Pagano, 2001; Bolt & Tieman, 2004; Jeong & Jung, 2013).

Kingu et al. (2018) have examined the impact of Non-Performing Loans on bank's profitability and found that the existence of non-performing loans is related negatively with profitability in commercial banks in Tanzania.

It has been invented for medicine, "prevention is better than cure", but it has perfect application in business and specifically when the risk of a negative advancement, such as a bankruptcy prediction or a not easily manageable amount of NPL in the industry.

Patwary and Tasneem (2019) aim to investigate the root causes and unfavorable impact of the

non-performing loans, concluded that non-performing loan ratio and provision maintenance ratio are statistically significant to the ROA ratio.

Makri et al. (2014) aimed to identify the factors affecting the NPL in the Eurozone, before the eruption of the recent financial crisis. Their study revealed strong correlation between NPL and on one hand with various macroeconomic values such as public debt and GDP increase and on the other with bank related factors, such as capital adequacy, ROE and rate of NPL.

During periods of crisis or increased uncertainty and in order to reduce the risk, financial institutions increase their cash and diversify their portfolios. Some scholars argue that a negative relationship has been recorded between the level of liquidity and profitability (Molyneux & Thornton, 1992), but various studies have conflicting conclusions, with some showing a negative correlation and others a positive correlation between the liquidity ratio and profitability (Bourke, 1989; Spathis, 2001; Miller & Noulas, 1997). Risk-taking involves the implementation of appropriate strategies for making profits based on assumed risks.

3. Research Aim and Objectives

The research purpose of this paper is to highlight whether Non-Performing Loans–NPLs affect the data related to the efficiency of Greek banks.

The research objectives set out for the above research aim are the following:

• The first research goal concerns the recording of the financial values of the banks that constitute the sample of the research, i.e., the description with properly selected statistical indicators on which the research questions are answered.

• The second research objective concerns the correlation with the use of simple loan correlation coefficients with the data of outflows or the profitability of the banks.

• The third research goal concerns the multivariate analysis of linear regression for a detailed and thorough control of the effects that loans can have in the form of loans on outflows or efficiency indicators in banks. In particular, the research's objective is characterized by the measurement of the effect of loans on net income, net profit before taxes, ROE and ROA ratios.

• The fourth research goal is to control the impact of loans on the sign of efficiency, i.e., to investigate whether the increase in loans leads to a change in profitability to positive or negative.

4. Data and Methodology

The research technique used is the quantitative analysis and in particular the statistical analysis of data. The data used refer to the nine Greek banks mentioned above. All the data are recorded in the appendix where they are listed in the form of tables and are categorized into items such as balance sheet accounts, usage results, loans and indices.

All data in total concern 45 variables. For the compilation of the data, the reports of the banks, the websites of the banks and the reports of the Governor of the Bank of Greece and the data

concerning the year 2017 were studied, since it was the year for which the data were published in sufficient completeness regarding the number of banks set as a target to be analyzed.

The financial situation of a bank focuses on its overall financial performance, the monitoring of which consists of the following five categories (Dimopoulou, 2007):

• The security of administrative management

• Capital adequacy

• The quality of its assets

• Profitability

• Liquidity and sensitivity to market risk

The measures of analysis of the financial situation of a bank draw data from the balance sheet and profit and loss statement. However, no measure of analysis alone is sufficient to interpret financial information as it cannot provide the desired information about the efficiency of a banking institution. That is why it is necessary to take into account a variety of analysis measures to assess the overall situation of a bank.

Efficiency ratios of credit institutions describe the financial measurements used to assess their ability to make a profit, in proportion to the costs incurred over a given period of time. When these indices record high prices compared to competing companies, they are an indication that the credit institution is moving positively.

The data analysis methodology is the statistical approach, i.e., the use of statistical methods in order to conclude with the results of inductive or descriptive statistics. The software used to analyze the data is SPSS Version 20. Both descriptive and inductive statistics are used to answer the research questions.

Descriptive statistics deals with capturing sample data, while inductive statistics deals with drawing conclusions based on sample data but generalizing the conclusions in the form of laws that apply to the population. The population here can be understood as either the wider sum of Greek banks, or the total of banks in a more general context beyond Greek territory.

The methods used refer to the extraction of the mean value, the median, the standard deviation, the minimum and maximum value with respect to the descriptive indicators. Pearson correlation test and Spearman correlation test were used for inductive statistics. In addition to the use of correlation coefficients, the mean value control for independent samples, the well-known t-test control were used, while the multivariate regression analysis was also used.

Multivariate regression analysis is the method most widely used in the third research objective, to study the effect on dependent variables such as net equity, ROE and ROA indices and pre-tax profits from a set of independent and predictable variables, which were chosen to be the variables concerning the loans. The use of the technique of multivariate

linear regression analysis was used in two versions. The Enter method and the Backward method.

5. Results

The first research goal is to capture the financial size of the sample banks. The 45 variables are grouped in different tables depending on their functional unit. Table 1 shows the descriptive data for the balance sheet accounts of the sample banks. Similar tables follow in the course, in which accounts such as loans of credit, financial indices, expenses, results statement, etc. are recorded (Table 2). In each of the tables the average value, the median, the standard deviation, the minimum and the maximum value are given. All these indicators are considered as a satisfactory package so that they can describe and understand what each variable is for all the banks in the sample.

Table 1. Descriptive data for the balance sheet accounts of the sample banks.

From Balance Sheet	Mean	Median	Std. Deviation	Minimum	Maximum
Loans and Customers Receivables after Allowances	18.544.110.669,28	2.192.074.000,00	21.225.684.052,50	47.828.981,55	44.719.530.000,00
Total Assets or total value of the Bank	28.725.951.257,15	3.560.371.000,00	32.844.142.373,17	59.085.926,37	67.416.562.000,00
Liabilities to Customers (Depositsς)	17.240.486.316,28	1.924.131.000,00	19.806.757.507,69	52.222.517,49	42.715.272.000,00
Liabilities to Credit Institutions	5.227.030.019,35	943.451.000,00	6.206.314.787,78	802.715,13	13.991.000.000,00
Total liabilities	24.893.756.731,73	2.927.666.000,00	28.487.101.566,91	54.063.284,58	57.872.364.000,00
Net Worth or Owners Equity	3.832.194.525,31	632.705.000,00	4.438.199.624,39	5.022.641,79	9.626.691.000,00
Total Liabilities and Owners Equity	28.725.951.257,04	3.560.371.000,00	32.844.142.373,27	59.085.926,37	67.416.562.000,00

Table 2. Descriptive data for the financial indices of the sample banks.

Indices	Mean	Median	Std. Deviation	Minimum	Maximum
Owners' Equity / Total Assets	11,44	11,39	3,81	6,96	17,77
Owners' Equity / Deposits	0,42	0,22	6,27	-10,96	8,75
Owners' Equity / Loans before Allowances	12,87	15,13	5,98	5,88	23,73
Debit interest / Credit interest	30,28	30,06	9,26	14,17	43,69
Loans before Allowances / Total Assets	25,77	24,41	8,29	9,13	35,05
Loans before Allowances / Deposits	136,86	138,59	12,35	119,66	162,26
Allowances / Total Assets	2,68	2,44	0,47	2,13	3,53

For all banks there is an asymmetric distribution on the right which indicates that there is a large population of banks (given our sample of nine banks), which have a certain price range and a small portion of the sample which is distributed at very high prices.

Profit and loss statement (Table 3), and their total accounts, take either positive or negative values, while the income from interest on loans is positive for almost all banks with a large

enough variation.

Table 3. Descriptive data for profit & loss accounts of the sample banks.

Profit & Loss Statement	Mean	Median	Std. Deviation	Minimum	Maximum
Income from loans' interest (Credit interest) and relevant income	994.130.815	137.302.000	1.142.775.019	2.387.617	2.514.338.000
Interest expenses (Debit interest) and relevant expenses	-242.860.555	-50.310.000	293.169.113	-700.000.000	-972.460
Net Income from Interest	-51.984.888	488.427	158.486.803	-412.000.000	115.000.000
Profit/ Loss before taxes	-109.011.271	1.134.000	423.133.764	-1.208.414.000	181.000.000

Debit interest as expenses and related expenses are basically negative for all banks, while as a distribution it is quite asymmetric, but without much heterogeneity. In terms of net interest income, it is set for all banks at a positive price with a fairly large heterogeneity, while in terms of pre-tax profits or losses on operating results and after-tax profits or losses as prices for most banks are almost in values that are in order of magnitude close to the zero axis with two or three cases of extreme values in each case.

The fact that the same banks are outlier both in terms of profits and losses before taxes and in terms of profits and losses after taxes has to do with the fact that they are two highly correlated variables, and it makes sense for them to behave in the same way.

For all banks, personnel salaries and expenses, i.e., operating expense accounts (Table 4), which include general administrative expenses, are about the same size in terms of variation, while there are banks that have very low general and administrative costs and others with very high costs, which is basically related to the retail network they serve.

Table 4. Descriptive data for the operating expenses accounts of the sample banks.

	Personnel Salary and Expenses (Operational Expenses)	General Administrative Expenses (Operational Expenses)
Mean	-184.327.568,21	-176.883.597,69
Median	-38.554.000,00	-45.976.000,00
Std. Deviation	249.178.481,69	222.464.210,32
Minimum	-562.506.000,00	-554.960.000,00
Maximum	-755.669,88	-784.185,20

The loans of credit accounts (Table 5) consist of many intermediate accounts and with great diversity in the amounts represented. For this reason, those are presented separately the loans with a delay of up to 30 days, loans with a delay of 30 to 90 days and loans with a delay of more than 90 days. In overdue loans for more than 90 days, it appears that all banks have a

homogeneity with the exception of the number 3 bank, which is an extreme price with a large set of loans overdue for more than 90 days.

Table 5. Descriptive data for the loans of credit accounts of the sample banks.

Loans	Mean	Median	Std. Deviation	Minimum	Maximum
Non overdue and non-impaired loans	18.544.110.669,28	2.192.074.000,00	21.225.684.052,50	47.828.981,55	44.719.530.000,00
Overdue loans (1to 30 days) non-impaired	1.080.239.493,44	134.298.000,00	1.278.943.424,00	480.000,00	3.130.000.000,00
Overdue loans (31to 90 days) non-impaired	504.657.986,11	139.249.000,00	581.379.135,81	4.234.785,00	1.615.950.000,00
Overdue loans (more than 90 days) - Non-impaired loans	156.825.215,11	11.337.936,00	354.542.634,31	0,00	1.088.867.000,00
Impaired loans	7.981.309.441,52	986.700.000,00	9.245.232.435,72	36.161.000,00	20.700.000.000,00
Allowances for impairment (unsafe claims)	-5.577.330.253,51	-474.667.000,00	6.578.249.206,03	-15.540.506.000,00	-18.320.383,61
Regulated loans (after impairment)	4.687.604.136,00	517.980.000,00	5.626.671.475,26	14.817.000,00	14.199.639.000,00

The second research goal concerns the correlation of loans with outflow data. At a technical level, this goal is basically served using the Pearson or Spearman correlation factor. Table 6 shows the ROE and net equity ratios, and it appears that there is an absolute correlation between the ROA and ROE indices and potentially this could mean that the results for ROA could be immediately adopted for ROE without performing the relevant checks, but in addition it appears that there is a strong statistically significant correlation between the ROA, ROE and net equity indices.

Table 6. Values of correlation factor Pearson for the assessment of relevance between net equity and ROE and ROA.

	ROA	ROE	Net worth or Owners' equity (Balance sheet)
ROA	**1,000**	**1,000****	**-,233***
ROE	**1,000****	**1,000**	**-,233***
Net worth or Owners' Equity	-,233*	-,233*	1,000**

This correlation is negative, which means that as net equity increases by an absolute value, the equity index and the ROA index tends to decrease. As for the control of the impact that loans have on the ROA, ROE and net equity, Table 7 with Pearson correlation ratios, depicts that there is a strong statistically significant correlation between loans and net equity which is overall positive. With the exception of profits and pre-tax losses with net equity where the correlation is statistically significant and negative but it is very weak.

Table 7. Values of correlation factor Pearson for the assessment of relevance between net equity and ROE and ROA and loans in credit as loans.

	ROA	ROE	Net worth or Owners' equity (Balance sheet)
Profits/ Losses before taxes	,633	,633	**-,067****
Overdue loans (1 to 30 days) and non-impaired	,017	,017	**,817****
Overdue loans (31 to 90 days) and non-impaired	-,317	-,317	**,950****
Overdue loans (more than 90 days) - Non-impaired loans	-,119	-,119	,509
Impaired loans	-,117	-,117	**,950****

Assessing the statistically significant correlation of loans with net worth, it is found that the resulting rates have values above 0.8, which means that as the loan amounts increase, so does net equity or equity as an element of the balance sheet. The correlation of the ROA and ROE indices with the loans as shown in Table 8 is in no way captured as statistically significant, at least at 95% level. It turns out that for all variables associated with ROE there is a negative slope of the curve. That is, there is a tendency for the ROE factor to decrease as the loans increase. Of course, this may not have been a statistically significant finding in any case, but it is still a visual observation that cannot be ignored. The same is assessed and shown in the case of the correlation of the ROA index with all the variables concerning loans. This means that the higher the value of the variable that captures a particular loan account, it is so likely that the ROA will decrease slightly.

Table 8. Values of correlation factor Pearson for the assessment of relevance between net equity and ROE and ROA and data of balance sheet, profit and loss, operating expenses, loans in credit and financial indices.

	ROA	ROE	Net worth or Owners' equity
Loans and customers claims after allowances	-,302	-,278	**,497****
Total Assets or total value of the Bank	-,176	-,112	**,155****
Liabilities to Customers (Depositsς)	,130	,143	**-,476****
Liabilities to Credit Institutions	-,180	-,187	**,496****
Total liabilities	-,329	-,300	**,489****
Net Worth or Owners Equity	-,223	-,236	**1****
Total Liabilities and Owners Equity	-,325	-,298	**,493****
Net Income from Interest	-,294	-,274	**,501****
Profit/ Loss before taxes	,280	,277	-,263
Personnel Salary and Expenses	,077	,093	**-,439****
General Administrative Expenses	,268	,246	**-,504****
Impaired loans	**1,000****	**,993****	**-,223****
Allowances for impairment (unsafe claims)	,296	,269	**-,482****
Regulated loans (after impairment)	-,220	-,213	**,489****
Non-Performing Loans	-,266	-,248	**,494****
Owners' Equity / Deposits	-,167	-,153	**-,760****,*
Net profit before taxes / Income interest	**,792***	**,769***	-,205
Debit interest / Credit interest	,259	,192	-,247
Loans before allowances / Total assets	,379	,369	**-,862****,*
Loans before allowances / Deposits	,323	,278	,326
Allowances / Total assets	,052	,053	**-,861****,*
Regulated loans / Total loans (after impairment)	,198	,155	-,045

From the correlation between ROA, ROE and net equity or equity with all variables, in addition to the indicators, it appears that net equity is positively or negatively correlated with many of the variables that are elements of the accounts and the data, while the ROE and ROA indices are basically correlated, strongly and positively, only with the results before taxes and interest income. In order to assess the effect on the ROE efficiency of all variables related to loans, a multivariate linear regression analysis was performed using the Enter method.

Both the R-SQUARE index and the Adjusted R-SQUARE result in the fact that all explanatory variables have almost no explanatory effect on the dependent variable. Anova's control also converges on this conclusion. The interpretation of this is that all variables have correlation coefficients whose total does not differ from zero. Both Co-efficients and Excluded Variables coefficients show that all variables are significantly larger than 0.05, which means that all variables introduced in the model are considered incapable of predicting the ROE index value.

The Backward and Forward regression technique was tested, with a total interpretive ability

of the 0% model. Ultimately, the amount of loans in various forms, with overdue loans of a few or many days, loans without delay, etc., leaves the price of the bank's ROE index indifferent.

Multiple linear regression techniques, involving the Enter method and the Backward method as applied in the case of ROE, were applied with dependent variable ROA.

The results show the model's low explanatory ability, as well as the model's inability to predict. To this result converge the variation analysis method, which starts with a statistical significance of 0.943, i.e., P-Value value exactly the same as the Enter method and ends best in the sixth step in statistical significance 0.429. In other words, it shows exactly that it is far from being able for the model, that is, all explanatory variables, to consider the ROA efficiency index as a good predictor. The results after the 7th iteration show that the ROA yield remains stable regardless of the price received by the loans variables. The results after the 7th iteration show that the ROA yield remains stable regardless of the price received by the variables of the loans.

In order to determine whether there is a statistically significant effect of loans on net equity or owners' equity, which is an element of the balance sheet, multivariate linear regression with two versions, the Enter method and the Backward method, was performed as in previous cases (Tables 9 and 10).

Table 9. Statistics of good adjustment and table of variance analysis for multivariable linear regression with net worth as dependent variable and the method Enter.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	1,000[a]	1,000	1,000	28845854,16359	1,682

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	157579263081067450000,000	6	26263210513511244000,000	31563,199	,000[b]
	Residual	1664166604854528,000	2	832083302427264,000		
	Total	157580927247672300000,000	8			

Note. a. Dependent Variable: Net Worth or Owners Equity (Balance sheet); b. Predictors: (Constant), Loans and customers claims after allowances (Balance sheet), Overdue loans (more than 90 days) - Non-impaired Loans, Regulated loans (after impairment), Overdue loans (1to 30 days) non-impaired, Overdue loans (31to 90 days) non-impaired, Overdue loans (more than 90 days).

Table 10. Table of regression rates with net worth as dependent variable, loans as explanatory variables and the Enter method.

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-36330770,760	15580705,741		-2,332	,145		
Overdue loans (1 to 30 days) non-impaired	-,648	,083	-,187	-7,818	,016	,009	107,981
Overdue loans (31 to 90 days) non-impaired	1,486	,428	,195	3,474	,074	,002	594,587
Overdue loans (more than 90 days) - Non-impaired loans	-1,147	,214	-,092	-5,356	,033	,018	55,409
Impaired loans (overdue more than 90 days)	,268	,081	,254	3,298	,081	,001	1121,067
Regulated loans (after impairment)	,014	,042	,018	,343	,764	,002	540,018
Loans and customers claims after allowances	,160	,008	,765	20,389	,002	,004	266,688

Note. a. Dependent Variable: Net Worth or Owners Equity (Balance sheet).

According to the Enter method, the Adjusted R-Square factor takes the value 1, which means that all the variables introduced in the model are absolutely predictable, without any margin of error, while the variation analysis which shows statistical significance from the first run of the model equal to zero, also showing absolute predictability of the variable package on net equity of the bank agrees with that.

Table 11 of the indicators and regression rates shows that of all the variables used, those that have a statistically significant effect are loans and receivables from customer after the allowances, which is an element of the balance sheet, are loans with a delay of more than 90 days and loans with a delay of up to 30 days, while they are estimated as non-statistically significant but with a marginally rejected P-Value, loans with a delay of 30 to 90 days and impairment loans with a delay of more than 90 days. The Backward method shows that it converged in two repetitions.

Table 11. Balance sheet.

	Loans and Customers Receivables after Allowances	Total Assets or total value of the Bank	Liabilities to Customers (Depositsς)	Liabilities to Credit Institutions	Total liabilities	Net Worth or Owners Equity	Total Liabilities and Owners Equity
ALPHA BANK	43.318.193.000,00	60.813.025.000,00	34.890.436.000,00	13.141.531.000,00	51.186.334.000,00	9.626.691.000,00	60.813.025.000,00
EUROBANK	37.108.000.000,00	60.029.000.000,00	33.843.000.000,00	13.991.000.000,00	52.879.000.000,00	7.150.000.000,00	60.029.000.000,00
PIRAEUS BANK	44.719.530.000,00	67.416.562.000,00	42.715.272.000,00	11.435.986.000,00	57.872.364.000,00	9.544.198.000,00	67.416.562.000,00
NATIONAL BANK (NBG)	37.941.000.000,00	64.768.000.000,00	40.265.000.000,00	7.341.000.000,00	57.389.000.000,00	7.379.000.000,00	64.768.000.000,00
ATTICA BANK	2.192.074.000,00	3.560.371.000,00	1.924.131.000,00	943.451.000,00	2.927.666.000,00	632.705.000,00	3.560.371.000,00
Epirus Cooperative Bank	178.145.999,00	218.015.350,00	183.102.382,00	6.021.000,00	199.926.591,00	18.088.759,00	218.015.350,00
Cretan Cooperative Bank	1.225.245.027,00	1.471.774.531,00	1.115.952.103,00	182.259.099,00	1.351.493.199,00	120.281.331,00	1.471.774.530,00
Thessaly Cooperative Bank	166.979.016,00	197.727.507,00	175.260.844,00	1.219.360,00	183.963.511,00	13.763.996,00	197.727.507,00
Serres Cooperative Bank	47.828.981,55	59.085.926,37	52.222.517,49	802.715,13	54.063.284,58	5.022.641,79	59.085.926,37

Table 12. Statistics of good adjustment and table of variance analysis for multivariable linear regression with net worth as dependent variable and the Backward method.

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	1,000[a]	1,000	1,000	28845854,16359	
2	1,000[b]	1,000	1,000	24235897,84189	2,066

Note. c. DependentVariable: Net Worth or Owners Equity (Balance sheet)

ANOVA[a]

Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	1575792630810674500000,000	6	26263210513511244000,000	31563,199	,000[b]
	Residual	1664166604854528,000	2	832083302427264,000		
	Total	1575809272476723000000,000	8			
2	Regression	1575791651114397200000,000	5	315158330222879400000,000	53655,045	,000[c]
	Residual	1762136232607550,200	3	587378744202516,800		
	Total	1575809272476723000000,000	8			

Note. a. Dependent Variable: Net Worth or Owners Equity (Balance sheet); b. Predictors: (Constant), Loans and customers claims after allowances (Balance sheet), Overdue loans (more than 90 days) - Non-impaired Loans, Regulated loans (after impairment), Overdue loans (1to 30 days) non-impaired, Overdue loans (31to 90 days) non-impaired, Overdue loans (more than 90 days); c. Predictors: (Constant), Loans and customers claims after allowances (Balance sheet), Overdue loans (more than 90 days) - Non-impaired Loans, Regulated loans (after impairment), Overdue loans (1to 30 days) non-impaired, Overdue loans (31to 90 days) non-impaired, Overdue impaired loans (more than 90 days).

Table 13. Table of regression rates with net worth as dependent variable, loans as explanatory variables and the Backward method.

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-36330770,760	15580705,741		-2,332	,145		
	Overdue loans (1to 30 days) non-impaired	-,648	,083	-,187	-7,818	,016	,009	107,981
	Overdue loans (31to 90 days) non-impaired	1,486	,428	,195	3,474	,074	,002	594,587
	Overdue loans (more than 90 days) Non-impaired loans	-1,147	,214	-,092	-5,356	,033	,018	55,409
	Impaired loans (overdue more than 90 days)	,268	,081	,254	3,298	,081	,001	1121,067
	Regulated loans (after impairment)	,014	,042	,018	,343	,764	,002	540,018
	Loans and customers claims after allowances	,160	,008	,765	20,389	,002	,004	266,688
2	(Constant)	-35169115,723	12777941,596		-2,752	,071		
	Overdue loans (1to 30 days) non-impaired	-,673	,033	-,194	-20,383	,000	,041	24,275
	Overdue loans (31to 90 days) non-impaired	1,426	,328	,187	4,351	,022	,002	494,409
	Overdue loans (more than 90 days) - Non-impaired loans	-1,145	,180	-,091	-6,366	,008	,018	55,375
	Impaired loans (overdue more than 90 days)	,294	,019	,279	15,252	,001	,011	89,829
	Loans and customers claims after allowances	,161	,005	,772	29,390	,000	,005	185,221

Note. a. Dependent Variable: Net Worth or Owners Equity (Balance sheet).

The Adjusted R-Square factor consistently takes the value 1, the variation analysis of the regression model systematically takes the value of P-Value 0 in both iterations, while the second model used has excluded the following variables which obviously optimize the performance of the model at the level of total error and appear as statistically significant and influential in the clear position of the bank:

Debts up to 30 days overdue, loans up to 90 days overdue, loans over 90 days overdue and loans over 90 days overdue, as well as loans and receivables after allowances against customers.

Assessing the overall application of regression methods on the three elements that were considered dependent variables, we can summarize that the variables that relate to loans of various forms with or without delay, impaired or non-impaired, demonstrate and show an intense and statistically significant effect on net equity, but not an effect on the two ROE and ROA coefficients, at least at a statistical significance level of 95%.

However, the regression coefficients factors in ROE and ROA cases have a negative value. In other words, they may not be evaluated as statistically significant, but as a whole they have a negative value which shows that there is a weak trend, the increase in loans leads to a decrease in efficiency in the sense of ROE and ROA rates of the bank. Both the nature and the texture and the distribution of the data, and most importantly, the very small sample, make it impossible to estimate such an effect at a 95% level as statistically significant.

5.1 Effect of Loans on Net Profits before Taxes

As in the previous cases of linear regression, the multivariable linear regression was performed with its two versions, the Enter method and the Backward method, where the results are sufficiently satisfactory in terms of predictability of the model in contrast to the previous three cases. In particular, the application of the Enter method shows that the value of the Adjusted R-Square factor is 0.998, which essentially means almost absolute prediction (Table 14).

Table 14. Statistics of good adjustment and table of variance analysis for multivariable linear regression with net profit before taxes as dependent variable and the method Enter

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1,000[a]	1,000	,998	17237937,73732

Note. a. Predictors: (Constant), Regulated loans (after impairment), Overdue loans (more than 90 days) - Non-impaired loans, Overdue loans (1to 30 days) non-impaired, Non-overdue and non-impaired loans, Overdue loans (31to 90 days) non-impaired, Impaired loans (overdue more than 90 days)

ANOVA[a]

Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	1431743165130483200,000	6	238623860855080544,000	803,051	,001[b]
	Residual	594292994871272,200	2	297146497435636,100		
	Total	1432337458125354500,000	8			

Note. a. Dependent Variable: Profit/ Loss before taxes (Profit/ Loss statement); b. Predictors: (Constant), Regulated loans (after impairment), Overdue loans (more than 90 days) - Non-impaired loans, Overdue loans (1to 30 days) non-impaired, Non overdue and non-impaired loans, Overdue loans (31to 90 days) non-impaired, Impaired loans (overdue more than 90 days).

The price of the Anova model gives a statistical significance of 0.01, so from this statistic of good adjustment it appears that all the explanatory variables are also able to predict with sufficient efficiency the dependent variable which is the pre-tax profits, while from the linear

regression rates and in particular by evaluating the SIG column which is the well-known P-Value, it appears that the following variables have a statistically significant effect on net profit before taxes (Table 15): non-overdue and unsecured loans, loans overdue for one to 30 days, overdue loans over 90 days and loans settled after a reduction in Loans. It is not assessed as statistically significant in loans over a period of 30 to 90 days and not impaired. Regarding the rates, it turns out that the loans without delay and not impaired have a negative coefficient of determination. That is, these loans negatively affect net earnings before taxes.

Table 15. Table of regression rates with net profit before taxes as dependent variable, loans as explanatory variables and the Enter method

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	29437032,337	9244171,146		3,184	,086		
Non overdue and non-impaired loans	-,436	,051	-4,338	-8,558	,013	,001	1238,568
Overdue loans (1to 30 days) non-impaired	,513	,047	1,550	10,979	,008	,010	96,112
Overdue loans (31to 90 days) non-impaired	,596	,249	,819	2,397	,139	,002	562,398
Overdue loans (more than 90 days) - Non-impaired loans	-,922	,129	-,773	-7,134	,019	,018	56,540
Regulated loans (after impairment)	,236	,024	3,135	10,027	,010	,002	471,147

All other loan cases, whether assessed as statistically significant in their effect or not, have positive determinants, which means that it is expected that as the loans amount increases, profits will increase. The results of the Backword method show that the Adjusted R-Square factor that shows the model adjustment has a value of 0.94 (Table 16).

Table 16. Statistics of good adjustment and table of variance analysis for multivariable linear regression with net profit before taxes as dependent variable and the method Backward

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,973[a]	,947	,940	103786992,92743

Note. a. Predictors: (Constant), Overdue loans (more than 90 days) - Non-impaired loans

ANOVA[a]

Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	1356935278818921730,000	1	1356935278818921730,000	125,972	,000[b]
	Residual	75402179306432768,000	7	10771739900918966,000		
	Total	1432337458125354500,000	8			

Note. a. Dependent Variable: Net profit before taxes (Profit & loss statement); b. Predictors: (Constant), Overdue loans (more than 90 days) - Non-impaired loans.

That is, 94% of the variable behavior profit before taxes is interpreted by all the variables extracted by the Backward methodology. This is the conclusion that the Anova method, the P-Value factor of which takes the value of zero, also leads to the interpretive suitability of the model. It is thus less than 0.05 and the model is evaluated as statistically significant. From the co-efficiency table which presents the factors of the models, it appears that in the end the only variable that affects net profit before taxes is the loans with a delay of more than 90 days, the not impaired loans.

In particular, it is found with zero statistical significance, i.e., it is absolutely certain as a result, while the determination factor is negative and in fact the standardized coefficient Beta has a relatively high value of -0.973 (Table 17). This essentially means that as long as overdue loans tend to grow, there is a tendency to reduce net profits before taxes. In addition, it is found that as loan prices increase on various loan accounts, there is a tendency to reduce net profit before taxes.

Table 17. Table of regression rates with net profit before taxes as dependent variable, loans as explanatory variables and the Backward method

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	73160885,156	38213943,137		1,915	,097		
Overdue loans (more than 90 days) - Non-impaired loans	-1,162	,103	-,973	-11,224	,000	1,000	1,000

5.2 Effect of Loans on Efficiency

This section explores whether borrowing has an effect on the sign of efficiency. We take the ROE and ROA coefficients as efficiency ratios. To investigate this question, a double-value variable was constructed, the variable efficiency sign, which has two values, the negative value and the positive value which, as the name suggests, represent the sign of the ROE and ROA coefficients.

The variable takes the negative value when the ROE and ROA indicators have a negative sign and takes the positive value when the ROE and ROA indicators have a positive sign. In order to control the effect of loans on the sign of efficiency, the control of average values for independent t-test samples was performed (Table 18).

Table 18. Results from t-test for the control of the effect of the loans amount to the sign of efficiency

	Efficiency sign	Mean	Std. Deviation	t	p
Loans and customers claims after allowances	Negative	27.569.452.993,85	24.074.196.942,91	0,89	0,40
	Positive	14.031.439.507,00	20.388.956.681,20	0,84	0,46
Non overdue and non-impaired loans	Negative	27.569.452.993,85	24.074.196.942,91	0,89	0,40
	Positive	14.031.439.507,00	20.388.956.681,20	0,84	0,46
Overdue loans (1to 30 days) non-impaired	Negative	1.297.229.000,00	1.123.673.781,83	0,34	0,74
	Positive	971.744.740,17	1.438.638.572,52	0,37	0,73
Overdue loans (31to 90 days) non-impaired	Negative	809.428.666,67	805.309.746,66	1,13	0,30
	Positive	352.272.645,83	444.743.244,03	0,92	0,44
Overdue loans (more than 90 days) - Non-impaired loans	Negative	398.584.000,00	599.936.684,89	1,58	0,16
	Positive	35.945.822,67	67.443.145,32	1,04	0,41
Impaired loans	Negative	4.739.074.333,33	4.411.083.540,61	0,55	0,60
	Positive	3.029.253.215,00	4.399.803.501,25	0,55	0,61
Regulated loans (after impairment)	Negative	6.055.341.333,33	5.544.944.859,64	0,49	0,64
	Positive	4.003.735.537,33	6.055.814.651,17	0,51	0,64

The results of the audit show that loans that have a statistically significant effect on the sign of efficiency and can make the bank's efficiency negative, according to the sample, are loans and claims against customers after allowances, which is an element of balance sheet, not overdue and not impaired loans, as well as overdue and not impaired loans, and overdue loans over 90 days not impaired, while impaired loans, regulated loans and loans with a short delay of one to 30 days do not have a statistically significant effect on banks' efficiency when this efficiency is measured by the ROE or ROA index.

This fact, in addition to its value as a finding, reflects the need or indicates the policy that banks should have in order to enter into procedures either to reduce, or to regulate loans, or to

deal with the phenomena of delay, if it seems that overdue or outstanding loans are those that create or exacerbate the problem of efficiency. It seems, therefore, that for the various balance sheet items or the various data relating to loans, the sign of profitability, which is positive, in any case concerns smaller loan cases.

6. Conclusions

The purpose of this paper is to investigate whether loans from the Greek banks affect the data related to efficiency of banks. The research objectives set out to determine the above aim are as follows:

1) recording the financial size of the banks that make up the research sample,

2) the correlation using simple loan correlation coefficients with the outflow or efficiency data in the banks,

3) multivariate analysis of linear regression for detail control of the effects of loans in the form of loans on outflows or efficiency indicators in banks, and 4) controlling the impact of loans on the efficiency rating, i.e., investigating whether the increase in loans has a positive or negative effect on profitability.

Profit & loss statement as a set of accounts take either positive or negative values. In terms of interest income from loans, it is positive for almost all banks with a large enough variation that it is interpreted that there is a great deal of inequality and heterogeneity in banks in terms of these revenues. Debit interest and related expenses are basically a negative price for all banks, while as a distribution it is quite asymmetric, but without much heterogeneity.

Table 19. Profit & loss statement

	Income from loans' interest (Credit interest) and relevant income	Interest expenses (Debit interest) and relevant expenses	Net Income from Interest	Losses Impairments and Allowances	Profit/ Loss before taxes	Net profit /loss after taxes/	Personnel Salary and Expenses	General Administrative Expenses
ALPHA BANK	2.514.338.000,00	-571.746.000,00	1.942.592.000,00	-1.005.415.000,00	165.120.000,00	21.052.000,00	-474.378.000,00	-554.960.000,00
EUROBANK	2.164.000.000,00	-700.000.000,00	1.464.000.000,00	-750.000.000,00	181.000.000,00	115.000.000,00	-506.000.000,00	-206.000.000,00
PIRAEUS BANK	2.247.209.000,00	-576.928.000,00	1.670.281.000,00	-1.208.414.000,00	-1.208.414.000,00	-204.305.000,00	-562.506.000,00	-499.864.000,00
NATIONAL BANK (NBG)	1.807.000.000,00	-256.000.000,00	1.551.000.000,00	-811.000.000,00	-137.000.000,00	-412.000.000,00	-57.900.000,00	-274.000.000,00
ATTICA BANK	137.302.000,00	-50.310.000,00	86.992.000,00	-73.500.000,00	1.134.000,00	430.000,00	-38.554.000,00	-45.976.000,00
Epirus Cooperative Bank	9.648.840,00	-2.900.356,00	6.748.484,00	-252.491,00	2.125.894,00	1.499.656,00	-2.797.274,00	-3.488.615,00
Cretan Cooperative Bank	55.793.714,00	-24.374.103,00	31.419.611,00	-10.000.000,00	14.911.079,00	10.521.212,00	-13.007.418,00	-5.171.960,00
Thessaly Cooperative Bank	9.498.170,00	-2.514.080,00	6.984.090,00	-2.310.170,00	852.476,00	488.427,00	-3.049.752,00	-1.707.619,00
Serres Cooperative Bank	2.387.617,48	-972.460,06	1.415.157,42	-600.000,00	-830.886,03	-550.286,13	-755.669,88	-784.185,20

Table 20. Loans

Non overdue and non-impaired loans	Overdue loans (1to 30 days) non-impaired	Overdue loans (31to 90 days) non-impaired	Overdue loans (more than 90 days) - Non-impaired loans	Impaired loans	Impaired loans and overdue loans (more than 90 days)	Loans and customers claims before allowances	Allowances for impairment (unsafe claims)	Loans and customers claims after allowances	Regulated loans (after impairment)	Non-Performing Loans
23.924.641.000,00	2.489.069.000,00	1.040.176.000,00	33.284.000,00	29.125.050.000,00	9.832.183.000,00	56.612.220.000,00	-13.294.027.000,00	43.318.193.000,00	14.199.639.000,00	19.757.664.780,00
23.223.000.000,00	3.130.000.000,00	785.000.000,00	0,00	20.104.000.000,00	7.406.000.000,00	47.242.000.000,00	-10.134.000.000,00	37.108.000.000,00	8.801.000.000,00	15.778.828.000,00
27.835.718.000,00	1.907.207.000,00	1.615.950.000,00	1.088.867.000,00	27.812.293.000,00	8.779.947.000,00	60.260.036.000,00	-15.540.506.000,00	44.719.530.000,00	10.914.207.000,00	20.700.000.000,00
27.872.000.000,00	1.984.000.000,00	807.000.000,00	104.000.000,00	17.413.000.000,00	5.404.000.000,00	48.180.000.000,00	-10.239.000.000,00	37.941.000.000,00	7.237.000.000,00	13.706.827.309,24
1.278.531.000,00	59.775.000,00	139.249.000,00	0,00	1.189.185.000,00	512.084.000,00	2.666.741.000,00	-474.667.000,00	2.192.074.000,00	517.980.000,00	986.700.000,00
67.768.894,00	10.682.995,00	20.284.090,00	0,00	133.974.741,00	131.831.502,00	232.710.721,00	-54.564.722,00	178.145.999,00	59.051.147,00	120.846.677,42
454.486.000,00	134.298.000,00	124.692.000,00	171.053.000,00	714.531.000,00	202.784.000,00	1.599.060.179,00	-373.815.152,00	1.225.245.027,00	429.504.000,00	632.782.483,00
85.770.767,00	6.643.446,00	4.234.785,00	11.337.936,00	126.064.106,00	90.636.788,00	234.051.040,00	-67.072.024,00	166.979.016,00	15.239.077,00	111.974.724,00
24.172.000,00	480.000,00	5.336.000,00	2.885.000,00	34.629.000,00	33.276.000,00	66.149.365,16	-18.320.383,61	47.828.981,55	14.817.000,00	36.161.000,00

Table 21. Financial indices

Owners' Equity/ Total Assets	Owners' Equity/ Deposits	Owners' Equity/ Loans before Allowances	Personnel Salary and Expenses/ Credit interest	Profit/ Loss before taxes / Debit interest	Debit interest / Credit interest	Loans before Allowances / Total Assets	Loans before Allowances / Deposits	Loans after Allowances / Deposits	Allowances / Total Assets	Profits after taxes/Owners' equity	Profits after taxes/Total assets	Net Income from Interest / Total assets	Allowances / Overdue loans	Overdue loans/ total loans	Loans after Allowances / Total Assets	Allowances / Loans	Regulated loans (after impairment) / total loans	ROA	ROE
15,83%	27,59%	17,00%	40,94%	6,57%	22,74%	93,09%	162,26%	124,15%	21,86%	0,22%	0,03%	3,19%	67,29%	34,90%	71,23%	23,48%	32,78%	0,03%	0,22%
11,91%	21,13%	15,13%	32,90%	8,36%	32,35%	78,70%	139,59%	109,65%	16,88%	1,61%	0,19%	2,44%	64,23%	33,40%	61,82%	21,45%	23,72%	0,19%	1,61%
14,16%	22,34%	15,84%	47,28%	-53,77%	25,67%	89,38%	141,07%	104,69%	23,05%	-2,14%	-0,30%	2,48%	75,07%	34,35%	66,33%	25,79%	24,41%	-0,30%	-2,14%
11,39%	18,33%	15,32%	18,37%	-7,58%	14,17%	74,39%	119,66%	94,23%	15,81%	-5,58%	-0,64%	2,39%	74,70%	28,45%	58,58%	21,25%	19,07%	-0,64%	-5,58%
17,77%	32,88%	23,73%	61,57%	0,83%	36,64%	74,90%	138,59%	113,93%	13,33%	0,07%	0,01%	2,44%	48,11%	37,00%	61,57%	17,80%	23,63%	0,01%	0,07%
8,30%	9,88%	7,77%	65,15%	22,03%	30,06%	106,74%	127,09%	97,29%	25,03%	8,29%	0,69%	3,10%	45,15%	51,93%	81,71%	23,45%	33,15%	0,69%	8,29%
8,17%	10,78%	7,52%	32,58%	26,73%	43,69%	108,65%	143,29%	109,79%	25,40%	8,75%	0,71%	2,13%	59,07%	39,57%	83,25%	23,38%	35,05%	0,71%	8,75%
6,96%	7,85%	5,88%	50,09%	8,98%	26,47%	118,37%	133,54%	95,27%	33,92%	3,55%	0,25%	3,53%	59,90%	47,84%	84,45%	28,66%	9,13%	0,25%	3,55%
8,50%	9,62%	7,59%	64,49%	-34,80%	40,73%	111,95%	126,67%	91,59%	31,01%	-10,96%	-0,93%	2,40%	50,66%	54,67%	80,95%	27,70%	30,98%	-0,93%	-10,96%

Table 22. Unified table of correlation rates.

	Loans and Customers Receivables after Allowances	Total Assets or total value of the Bank	Liabilities to Customers (Deposits)	Liabilities to Credit Institutions	Total liabilities	Net Worth or Owners Equity	Total Liabilities and Owners Equity	Net Income from Interest	Profit/ Loss before taxes	Personnel Salary and Expenses	General Administrative Expenses	Impaired loans	Allowances for impairment (unsafe claims)	Regulated loans (after impairment)	Non-Performing Loans	Owners' Equity / Deposits	Net profit before taxes / Income interest	Debit interest / Credit interest	Loans before allowances / Total assets	Loans before allowances / Deposits	Allowances / Total assets
ROA	-,302	-,176	,130	-,180	-,329	-,223	-,325	-,294	,280	,077	,268	1,000**	,296	-,220	-,266	-,167	,792*	,259	,379	,323	,052
ROE	-,278	-,112	,143	-,187	-,300	-,236	-,298	-,274	,277	,093	,246	,993**	,269	-,213	-,248	-,153	,769*	,192	,369	,278	,053
Loans and Customers Receivables after Allowances	1	,467**	-,921**	,957**	,992**	,497**	,995**	,995**	-,091	-,851**	-,927**	-,302**	-,990**	,967**	,992**	-,172**,*	-,368	-,659	-,681*	,355	-,471
Total Assets or total value of the Bank	,467**	1**,*	-,403**	,358**	,443**	,155**	,450**	,402**	-,236**	-,533**	-,543**,*	-,176**	-,569**	,411**	,514**	,217**,*	-,686*	-,177*	-,195*	,133	-,003
Liabilities to Customers (Deposits)	-,921**	-,403**	1**	-,990**	-,900**	-,476**	-,905**	-,912**	,075	,965**	,835**	,130**	,915**	-,926**	-,941**	,167**,*	,278	,414*	,606*	-,506	,432
Liabilities to Credit Institutions	,957**	,358**	-,990**	1	,939**	,496**	,943**	,956**	-,054	-,933**	-,872**	-,180**	-,942**	,958**	,966**	-,192**,*	-,264	-,506	-,640	,483	-,463
Total liabilities	,992**	,443**	-,900**	,939**	1	,489**	1,000**	,982**	-,143	-,806**	-,877**	-,329**	-,971**	,929**	,971**	-,205**	-,362	-,678*	-,725*	,253	-,509
Net Worth or Owners Equity	,497**	,155**	-,476**	,496**	,489**	1**	,493**	,501**	-,263	-,439**	-,504**	-,223**	-,482**	,489**	,494**	-,760**,*	-,205	-,247	-,862**,*	,326	-,861**,*
Total Liabilities and Owners Equity	,995**	,450**	-,905**	,943**	1,000**	,493**	1	,986**	-,132	-,816**	-,890**	-,325**	-,977**	,938**	,977**	-,199**,*	-,365	-,677*	-,718*	,274	-,502
Net Income from Interest	,995**	,402**	-,912**	,956**	,982**	,501**	,986**	1	-,047	-,837**	-,936**	-,294**	-,981**	,979**	,987**	-,181**,*	-,321	-,673*	-,665	,395	-,469
Profit/ Loss before taxes	-,091	-,236**	,075	-,054	-,143	-,263	-,132	-,047	1	,020	-,057	,280	,074	,031	-,060	,413	,266*	-,400	,391	,184	,455
Personnel Salary and Expenses	-,851**	-,533**	,965**	-,933**	-,806**	-,439**	-,816**	-,837**	,020	1	,841**	,077**	,880**	-,891**	-,901**	,053**,*	,358	,305	,479	-,605	,306
General Administrative Expenses	-,927**	-,543**,*	,835**	-,872**	-,877**	-,504**	-,890**	-,936**	-,057	,841**	1	,268**	,955**	-,968**	-,952**	,068**,*	,415	,614	,521	-,551	,337
Impaired loans	-,302**	-,176**	,130**	-,180**	-,329**	-,223**	-,325**	-,294**	,280	,077**	,268**	1**	,296**	-,220**	-,266**	-,167**,*	,792*	,259	,379	,323	,052
Allowances for impairment (unsafe claims)	-,990**	-,569**	,915**	-,942**	-,971**	-,482**	-,977**	-,981**	,074	,880**	,955**	,296**	1	-,969**	-,996**	,106**,*	,437	,632	,631	-,395	,412
Regulated loans (after impairment)	,967**	,411**	-,926**	,958**	,929**	,489**	,938**	,979**	,031	-,891**	-,968**	-,220**	-,969**	1	,982**	-,127**,*	-,302	-,592	-,567	,556	-,394
Non-Performing Loans	,992**	,514**	-,941**	,966**	,971**	,494**	,977**	,987**	-,060	-,901**	-,952**	-,266**	-,996**	,982**	1	-,131**,*	-,389	-,610	-,635	,438	-,428
Owners' Equity / Deposits	-,172**,*	,217**,*	,167**,*	-,192**,*	-,205**	-,760**,*	-,199**,*	-,181**,*	,413	,053**,*	,068**,*	-,167**,*	,106**,*	-,127**,*	-,131**,*	1**,*	-,323	,031*	,696**,*	-,083	,937**,*
Net profit before taxes / Income interest	-,368	-,686*	,278	-,264	-,362	-,205	-,365	-,321	,266*	,358	,415	,792*	,437	-,302	-,389	-,323	1	,154	,285	,145	-,061
Debit interest / Credit interest	-,659	-,177*	,414*	-,506	-,678*	-,247	-,677*	-,673*	-,400	,305	,614	,259	,632	-,592	-,610	,031*	,154	1	,457	,085	,243
Loans before allowances / Total assets	-,681*	-,195*	,606*	-,640	-,725*	-,862**,*	-,718*	-,665	,391	,479	,521	,379	,631	-,567	-,635	,696**,*	,285	,457	1**	-,013**	,893**
Loans before allowances / Deposits	,355	,133	-,506	,483	,253	,326	,274	,395	,184	-,605	-,551	,323	-,395	,556	,438	-,083	,145	,085	-,013**	1	-,089
Allowances / Total assets	-,471	-,003	,432	-,463	-,509	-,861**,*	-,502	-,469	,455	,306	,337	,052	,412	-,394	-,428	,937**,*	-,061	,243	,893**	-,089	1
Regulated loans (after impairment) / total loans	-,058	-,023	-,009	-,004	-,110	-,045	-,100	-,035	-,348	-,069	-,061	,198	,035	,057	-,018	-,167	,133	,463	,217	,327	-,065

In terms of net interest income, it is set for all banks at a positive price with a fairly-large heterogeneity, while in terms of earnings or pre-tax losses on profit and loss statement or post-tax profits or losses for most banks are almost at prices that are in order of magnitude

close to the zero axis with two or three cases of extreme values in each case. In terms of personnel salaries and expenses, it seems that for all banks they have about the same order of magnitude in terms of variation, while their differences are basically related to the retail network they serve.

Loan accounts vary widely on their amounts. In loans overdue for more than 90 days, it appears that all banks have a homogeneity with the exception of one bank which is an extreme value with a large sum of loans overdue for more than 90 days.

Assessing the statistically significant correlation of loans with net equity, means that as loan amounts increase, so does net equity. The correlation of ROA and ROE indices with loans is by no means statistically significant. However, where these correlations are graphically plotted, there are scattered lines of adjusted linear regression that have a slope different from zero, demonstrating even a faint effect.

That is, there is a tendency for the ROE factor to decrease as the loans increase. Of course, this may not have been a statistically significant finding under any circumstances, but it is still a visual observation that cannot be ignored. The same is assessed and shown in the case of the correlation of the ROA index with all the variables concerning loans. Thus, it seems that net equity is positively or negatively correlated with many of the variables that are elements of the accounts and data, while the ROE and ROA indices are basically correlated, strongly and positively, only with the results before taxes and interest income.

In order to assess its effect on the ROE efficiency of all variables related to loans, a multivariate analysis of linear regression was performed. The ROE indicator was selected as the dependent variable, while the variables related to loans in the form of loans were selected as predictive variables. All variables introduced in the model are considered incapable of predicting the ROE index value. That is, the amount of loans in various forms, with overdue loans a few or many days, loans without delay, leaves the price of the bank's ROE index indifferent.

Two multiple linear regression techniques were also performed, like in the case of ROE, with the ROA index as a dependent variable. It was found that none of the variables had the ability to function predictively for the ROA index value and the best prediction which can be done using the constant yield of the ROA, regardless of the price received by the loans' variables. This was almost expected given the high correlation between ROE and ROA and it is normal for any dependence on ROE to appear on ROA as well.

In order to determine whether there is a statistically significant effect of loans on net worth or owners' equity, a multivariable linear regression has been performed, which shows that of all the variables used, those that have a statistically significant effect are loans and claims against customers after allowances, loans overdue more than 90 days and loans overdue up to 30 days.

Assessing the overall application of regression methods on the three elements that were considered dependent variables, we can summarize that the variables that relate to loans of various forms with or without delay, impaired or non-impaired, demonstrate and show a

significant and statistically significant effect on net equity, but does not show statistically significant effect on the two ROE and ROA coefficients at least at 95% level.

However, it is noted that the correlation coefficients, that is the coefficients of determination in the regression of the ROE and ROA cases, have a negative value. In other words, they may not be considered statistically significant, but on the whole they have a negative value which shows that there is a faint trend that the increase in loans leads to a decrease in efficiency in the sense of the bank's ROE and ROA rates. However, both the nature and the texture and the distribution of the data make it impossible to estimate at 95% level as statistically significant such an effect.

In order to assess the effect on pre-tax profits, multivariate linear regression was performed, where the results are sufficiently satisfactory in terms of predictability of the model in contrast to the previous three cases. It turns out that all explanatory variables are also capable of predicting with great adequacy the dependent variable which is pre-tax profits.

Specifically, on net profits before taxes have a statistically significant effect the following variables:

Not overdue loans and non-impaired, overdue loans of one to 30 days, overdue loans of more than 90 days and loans regulated after a reduction. Regarding the rates, it turns out that the not overdue and not impaired loans have a negative coefficient of determination. That is, these loans affect negatively net earnings before taxes.

Other loan cases, whether assessed as statistically significant in their effect or not, have positive determinants, which means that as the amount of those loans increases, profits are expected to increase. The Backward method shows that ultimately the only variable that affects net profit before taxes is loans overdue for more than 90 days, not impaired loans. This essentially means that as long as overdue loans tend to grow, there is a tendency to reduce net profits before taxes. As loan prices rise in various lending accounts, there is a tendency to reduce net profit before taxes.

Finally, in order to control the effect of loans on the sign of efficiency, the control of average prices for independent samples of t-test was performed, which shows that loans that have a statistically significant effect on the sign of efficiency and can make the bank's efficiency negative, according to the sample data, are loans and receivables against customers after allowances, non-overdue and non-impaired loans, overdue and non-impaired loans and overdue and non-impaired loans over 90 days.

Summarizing the results obtained from the survey, we end up to the following conclusion:

- Interest income on loans is positive for all Banks but fluctuates widely.
- Interest-Expenses have an asymmetric distribution but without much heterogeneity.
- Loans over 90 days past due are uniform except Piraeus Bank which has an extreme price.
- The correlation between ROA and ROE with the loans, is not statistically significant.

- The impact on the Equity of all form loans, except the regulated, is considered statistically significant.

- The negative impact of loans over 90 days is considered statistically significant on Net Profit before Tax.

References

Athanasoglou, P., Brissimis, S., & Delis, M. (2008). Bank-Specific, Industry-Specific and Macroeconomic Determinants of Bank Profitability. *Journal of International Financial Markets, Institutions and Money*, *18*(2), 121–136. https://doi.org/10.1016/j.intfin.2006.07.001

Bolt, W., & Tieman, A. (2004). *Banking Competition, Risk and Regulation*. International Monetary Fund Working Paper WP/04/11. https://doi.org/10.1111/j.0347-0520.2004.00388.x

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North American and Australia. *Journal of Banking and Finance*, *13*, 65–79. https://doi.org/10.1016/0378-4266(89)90020-4

Cifter, A., Yilmazer, S., & Cifter E. (2009). Analysis of Sectoral Credit Default Cycle Dependency with Wavelet Networks: Evidence from Turkey. *Economic Modelling*, *26*, 1382–1388.

Cingolani, M. (2013). Finance Capitalism: A Look at the European Financial Accounts. *Panoeconomicus*, *60*(3), 249–290. https://doi.org/10.2298/PAN1303249C

Diakomihalis, M., Sagka, I., & Chatzi, I. (2016). Financial crisis and Greek banks' performance variation. *Int. J. Financial Services Management*, *8*(4), 317–332. https://doi.org/10.1504/IJFSM.2016.081894

European Banking Authority. (2017). *Risk Dashboard*. Retrieved April 20, 2020, from http://www.eba.europa.eu/risk-analysis-and-data/risk-dashboard

Jeong, S., & Jung, H. (2013). Bank Wholesale Funding and Credit Procyclicality: Evidence from Korea. *Panoeconomicus*, *60*(5), 615–631. https://doi.org/10.2298/PAN1305615J

Kalfaoglou, F. (2006). *Stress Testing of the Greek Banking System*. Bank of Greece: Economic Bulletin 27. Athens.

Kalfaoglou, F. (2015). Alternative approaches to consolidating non-performing bank loan portfolios. Case analysis. *Financial Bulletin*, *41*, 49–78. Athens. Bank of Greece. Retrieved April 22, 2020, from https://www.bankofgreece.gr/BogEkdoseis/oikodelt201507.pdf

Kingu, P., Macha, S., & Gwahula, R. (2018). Impact of Non-Performing Loans on Bank's Profitability: Empirical Evidence from Commercial Banks in Tanzania. *International Journal of Scientific Research and Management* (IJSRM), *6*(01), 71–79.

Klein, N. (2013). *Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance*. IMF Working Paper. https://doi.org/10.5089/9781484318522.001

Louzis, D., Vouldis, A., & Metaxas, V. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*, *36*(4), 1012–1027 https://doi.org/10.1016/j.jbankfin.2011.10.012

Makri, V., Tsagkanos, A., & Bellas, A. (2014). Determinants of non-performing loans: The case of Eurozone. *Panoeconomicus*, *61*(2), 193–206 https://doi.org/10.2298/PAN1402193M

Manove, M., Padilla, J., & Pagano, M. (2001). Collateral versus Project Screening: A Model of Lazy Banks. *RAND Journal of Economics*, *32*(4), 726–744. https://doi.org/10.2307/2696390

Miller, S., & Noulas, A. (1997). Portfolio Mix and Large-Bank Profitability in the USA. *Applied Economics*, *29*, 505–512. https://doi.org/10.1080/000368497326994

Molyneux, P., & Thornton, J. (1992). North-Holland Determinants of European bank profitability: A note. *Journal of Banking and Finance*, *16*, 1173–1178. https://doi.org/10.1016/0378-4266(92)90065-8

Panopoulou, M., (2005). *Technological Change and Corporate Strategy in the Greek Banking Industry*. Athens: KEPE.

Patwary, S. H., & Tasneem, N. (2019). Impact of Non-Performing Loan on Profitability of Banks in Bangladesh: A Study from 1997 to 2017. *Global Journal of Management and Business Research: C Finance*, *19*(1), Version 1.0.

Quagliarello, M. (2007). Banks' Riskiness Over the Business Cycle: A Panel Analysis on Italian Intermediaries. *Applied Financial Economics*, *17*, 119–138. https://doi.org/10.1080/09603100500486501

Rinaldi, L., & Sanchis-Arellano, A. (2006). *Household Debt Sustainability, what Explains Household Non-Performing Loans?* An Empirical Analysis. European Central Bank Working Paper Series 570.

Salas, V., & Saurina, J. (2003). Deregulation, Market Power and Risk Behaviour in Spanish Banks. *European Economic Review*, *47*(6), 1061–1075. https://doi.org/10.1016/S0014-2921(02)00230-1

Spathis, C., Kosmidou, K., & Doumpos, M. (2002). Assessing profitability factors in the Greek banking system: A multicriteria methodology. *International Transactions in Operation Research*, *9*(5), 517–530, https://doi.org/10.1111/1475-3995.00371

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