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The effect of Inflation on European banks' profitability, stability and riskiness

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Β Ε Β Α Ι Ω Σ Η

Βεβαιούται ότι η μεταπτυχιακή φοιτήτρια Χρυστάλλα Σωκράτους (Αρ. Ταυτότητας .....) ολοκλήρωσε με επιτυχία την προφορική υποστήριξη της διπλωματικής της μελέτης σε εξέταση που έλαβε χώραν ενώπιον διμελούς εξεταστικής επιτροπής, στις 4 Δεκεμβρίου 2020. Παρέδωσε την διπλωματική της μελέτη στις _____.

Η εξεταστική επιτροπή,

_____ _____

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The effect of Inflation on European banks' profitability, stability and riskiness.

Abstract

This study debates whether the inflation can influence in any way the banks' profitability, stability and riskiness by take into consideration European commercial banks. In order to address this, a dataset of 101 European commercial banks is examined over a 14-years period, namely from 2005 to 2018. The two steps GMM (General Method of Moments) system estimator is used. Not only the whole sample is examined but also it is subdivided into East-West Europe and Eurozone – Not Eurozone countries. Weighting up the results, inflation has negative impact to the banks' stability and riskiness but positive impact to the banks' profitability.

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INTRODUCTION

Inflation is one of the main macroeconomic variables. It is a situation of raising the prices of most goods and services of daily or common use, such as food, clothing, housing, transport. Inflation is measured by the change of the average price in a basket of that goods and services over some specific time. The rare case of fall in the price index of this basket is called deflation. In other words, deflation is the negative inflation. A more exact definition, inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling. So, an increase in the cost of living leads to an increase of the price of goods and services. "Your money will not buy as much today as you could yesterday".

Once inflation is high, the cost of living gets higher and the economic growth is decreasing. In other words, high inflation has significant cost for the consumers, the producers and the economy as a whole. Unanticipated inflation raises uncertainty and impairs (weakness and negative effect) on these economic and business decisions, which lie at the heart of the smooth functioning of the economic system and level. However, a certain level of inflation is required in the economy in order to ensure that expenditure is promoted and hoarding money through savings is demotivated.

On contrast, deflation (negative inflation) is a negative rate of change in the general price level. A deflationary spiral situation where decreases in prices lead to lower production which in turn leads to lower wages and demand. As a result, there are further decreases in price. Since, the prices continuously decline, consumers have the incentive to postpone their purchases whenever they can, because goods are expected to become cheaper in the future. The main or a major objective of central banks is that the inflation should be at low and steady levels. The ideal spot for the inflation is around 2%.

A moderate amount of inflation is generally considered to be a sign of a healthy economy, for the reason that as economy grows, demands for stuff increases. Therefore, the prices push a little higher as suppliers try to create more than consumers and businesses want to buy. Workers benefit because this economic growth drives an increase in demand for labor and consequently wages usually increase. On contrast, too much inflation can cause problems. The economy could

slow down quickly; it can even lead to a recession with increases in unemployment. Getting the balance right is not easy.

Commercial banks play a vital role in the economy due to the fact that they create capital, credit and liquidity in the markets. In other words, commercial banks lending out to others the money that their customers deposit for their savings. So, these banks are the main pillar in the creation of credit. As a result, they lead to an increase in production, employment and consumer spending. As we mention above, today's economy is based on production, trade and consumption.

Taking everything into consideration, inflation has effect on banks. Once the inflation is rising up, the borrowers could not afford the loan repayments since their cash-flow will rise up. As the authors Boyd and Champ (2006) mentioned, the relation between inflation and banks' profitability is negative. Hence, when the inflation increases, the real rate of return on assets is negatively affected. So, there is a trend for more loans and less savings. As a result, the market will have new borrowers who are more likely to default on their loans. A negative relation between inflation and banks' stability is expected (Adusei (2015)). According to Ben Jabra et al. (2017), the macroeconomic variable inflation has negative impact to the banks' risk. This is expected due the fact that the banks will find difficult to differentiate the good and the bad borrowers. The banks may reject some loans in order to make more quality borrowers.

Summarily, this study focuses on the impact of inflation on profitability, stability and riskiness of the commercial banks. The geographical area is Europe, particularly 23 European countries. It is worth to mention that relative researches do not focus on Europe since the European data are very limited.

A sample of 101 European banks is examined during the period of 2005 to 2018. Bank's profitability is measured by the Return on Assets (ROA) and Net Interest Margin (NIM), the bank's riskiness is measured by Tier 1 ratio and Leverage ratio (Leverage). Finally, the bank's stability is calculated by Z score, specifically the natural logarithm of Z score is used.

The study continuous as follows. Section 2 discusses the literature review, motivation and hypotheses; Section 3 describes the data and methodology; Section 4 provides the empirical results and Section 5 concludes.

LITERATURE REVIEW, MOTIVATION AND DEVELOPMENT OF HYPOTHESES

Inflation plays an important role across the literature since is one of the main macroeconomic factors. Firstly, there are a lot of empirical studies that work out the relation between inflation and banks' profitability. Ishfaq and Khan (2015) investigate the Pakistan commercial banks from 2008 to 2012. They indicated that inflation has a significant impact on the banks' profitability in Pakistan. Specifically, there is a positive relationship between inflation and profitability. In the same direction, Tan and Floros (2012) give rise to examine how the inflation affects the banks in China. Banks' lending and profitability is affected by inflation. Furthermore, one of the analyses, of Delis and Staikouras (2006), is that the inflation has a significant impact on the banks' profitability in South Eastern European (SEE) Region, specifically SEE is 6 countries. Our study differs since the geographical area that is investigated includes 23 European countries.

Empirically, not much attention has been given between the relation of inflation and stability. Diaconu and Oanea (2014) conclude that there is not significant relation between these two for commercial banks in Romanian Banking Sector. On the other hand, Adusei (2015) studied the relation of inflation and banks' stability for rural banking industry in Ghana on 2013. He found out that the relationship is not only positive but also statistically significant. In addition from the articles above this study examines bank's riskiness through the Tier 1 ratio and Leverage ratio.

Ben Jabra et al., (2017) support that the macroeconomic variable inflation has a strong effect on the banks' risk. The bank's risk is calculated by the natural logarithm of Z-score. Moreover, the authors found out that inflation is fairly stable across different regions by subdividing the whole sample into two sub-samples. Our study differs since we examine not only the whole sample, East and West Europe but also the Eurozone and non-Eurozone countries.

The main motivation of this study is to examine whether the inflation can affect negatively or positively the banks' profitability, stability and riskiness. In addition, this study is a limited research in the geographical area of Europe due to the fact that the number of our observations is limited.

Overall, the purpose of this study is to examine the relation between the inflation and the bank's profitability, riskiness and stability, respectively.

METHODOLOGY

a) Dataset and measurement of variables

A database is created for commercial banks across 23 European countries over a 14-years period, namely from 2005 to 2018. Our data is collected from several sources. S&P Market Intelligent is used to obtain the banks variables, which provides information about worldwide listed banks. We focus on European listed banks since the unlisted banks were unavailable. Therefore, the numbers of banks is significantly reduced. World Bank database is used to collect information about inflation, GDP, Banking Sector Development and Stock Market Development. The initial sample is consisted by 133 European banks.

The instruction of the final sample is demonstrated in table 1. First, we exclude the banks that have missed information for the independent variables (ROA, NIM, Tier1, Leverage and LogZscore). It is worth to mention that the source of these variables is the S&P Market Intelligent. Once being collected, banks without Asset Quality, Bank Capitalization and Liquidity ratio information are dropped from our sample. At the end, the final sample is composed by 101 European banks.

In this study, we are interested to investigate the impact of macroeconomic variable on banks' profitability, stability and riskiness. Specifically, the project focuses on inflation. Inflation is collected yearly from the source World Bank Database.

The bank's profitability is measured by Return on Assets (ROA) and Net Interest Margin (NIM). Return on assets (ROA) is an indicator of how well a bank utilizes its assets, by determining how profitable a bank is relative to its total assets. It is worth to mention that ROA takes into account the debt. It is calculated by dividing bank's net income by total assets. ROA is displayed as a percentage. Furthermore, NIM is a measure of profitability which is focused on the profit earned on lending, investing and funding activities. It is calculated by dividing net interest income by earning assets. NIM is displayed as a percentage. ROA and NIM are collected yearly from the source S&P Market Intelligent.

Tier 1 ratio and Leverage ratio are used to evaluate the bank's stability. Tier 1 capital ratio is collected by S&P Market Intelligent as defined by the latest regulatory and supervisory guidelines. Tier 1 capital ratio is the core measure of a bank's financial stability from a regulator's point of view. It is composed of core capital, which consists of common stock and disclosed reserves (or retained earnings), but may also include non-redeemable non-cumulative preferred stock. It is notable that Basel III, after the financial crisis in 2010, tightens the tier 1 ratio. It has to be at least 6%, in order to force banks to increase capital buffers, and to ensure that they can withstand financial distress before they become insolvent. Leverage is the division of Tier1 capital ratio by the tangible assets less derivative liabilities. Leverage ratio indicates whether the banks have enough liquidity to meet certain stress tests (which are set by bank regulators). It is worth to mention that a ratio bigger than 5% is considered a 'strong financial footing' for a bank.

The riskiness of a bank is measured by LogZscore. LogZscore is the inverse of the probability of insolvency. In other words, this variable reflects that the risk of failure dependents on the interaction of the income generating capacity, the potential size of return shock, and the level of capital (that reserves available to absorb sudden shocks). Z-score will be computed based on the formula presented in the paper of Diaconu and Oanea (2014). So the Zscore is expressed as follows:

$$Zscore = \frac{ROA + \frac{E}{A}}{\sigma(ROA)}$$

where ROA is the return on assets of bank, Equity/Assets ratio and the standard deviation of ROA. A natural logarithm is used to calculate this variable in order to be less skewed and to follow the normal distribution.

Both independent and dependent variables are illustrated in table 2. The dependent variables are represented by the Return on Asset (ROA), Net Interest Income (NIM), Tier 1 ratio, Leverage ratio (Leverage) and the natural logarithm of the Zscore (LogZscore). To analyze the effect of bank specific variable, the following variables are included: The Total Assets (LTA), Bank Capitalization ratio (BC), Liquidity ratio (LA), Efficiency (Ef) and Asset Quality ratio (AQ). All above are collected by S&P Market Intelligent. The variable LTA is the natural logarithm of the Total Assets. This variable is used to capture the possible relationship between bank size and profitability, stability and riskiness. Bank Capitalization ratio (BC) is displayed as a percentage. It is the division of total equity by total assets, usually used as the key capital ratio. Liquidity ratio (LA) is the percentage of the Net Loans by the assets.

Efficiency (Ef) is the noninterest expense before foreclosed property expense, amortisation of intangibles, and goodwill impairments as a percent of net interest income (fully taxable equivalent, if available) and noninterest revenues, excluding only gains from securities transactions and nonrecurring items. For European banks, expenses include foreclosed property and amortisation of intangibles and income includes security transactions. Asset Quality (AQ) is the percentage of the non-performing loans (NPLs) by total loans. This ratio could reflect changes in the health of a bank's portofolio.

Except from S&P Market Intelligent, we used World Bank database to collect information about the Banking Sector Development and Stock Market Development. Banking Sector Development (BSD) is displayed as a percentage. Specifically, BSD is the division of Market capitalization of listed banks by the GDP of each country. Stock Market Development (SMD) is also displayed as a percentage. It is the division of Bank Assets by GDP. SMD becomes larger, more activate and more efficient as countries become richer.

As an additional macroeconomic variable, we use the growth rate (GDP) in order to measure the level of economic development. GDP is an annual percentage growth rate at market prices based on constant local currency. In other words, GDP is the sum of gross value added by all resident

producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. As we mention before, we used the inflation rate (INF) as major macroeconomic determinant.

b) Empirical Models

With the objective to investigate the effect of inflation on European commercial banks on profitability, stability and riskiness the GMM (Generalize Method of Moments) system is used. It is worth to mention that Arellano and Bond originally introduced this system in 1991. Specifically, the two-steps GMM system is applied since it is more efficient and robust to heteroscedasticity and autocorrelation than GMM one-step system. Several studies, about banks performance, adopt this method such as Ben Jabra et al. (2017) and Tan, Floros (2012).

GMM system is used due to the following criteria. Initially, lets take a look at the sample. The data is collected from different banks across the Europe (cross-sectional characteristic) over a 14-years period (longitudinal characteristic). With respect to characteristics, the type of data is panel data. Therefore, GMM system is a dynamic panel data estimator and controls for unobserved panel heterogeneity, omitted variable bias and endogeneity of the lagged dependent variable in a panel data. GMM system is designed for situations where the time-span (in this case is 14 years) is smaller than the number of cross-sections or groups (in this case is 23 countries). In addition, it is used for specific characteristics of countries or regions that can affect the results (East versus West Europe and countries with euro as a currency and not).

The overall validity of the results is tested by implementing Sargan and Hansen test (Sargan 1958, Hansen 1982) and Arellano – Bond tests. Firstly, the null hypothesis of the Sargan test is that the instruments used are not correlated with residuals (over-identifying restriction) and the null hypothesis of Arellano – Bond serial correlation test is that the errors exhibit no second-order serial correlation. In detail, Arellano-Bond test for first order serial correlation (AR1) and for second order serial correlation (AR2). In addition, AR2 is considered more important than AR1 due to the fact that it can detect autocorrelation in levels.

This paper focuses on estimation methods for the simple model:

$$ROA_{i,t} = a_0 + a_1 ROA_{i,t-1} + a_2 INF_{j,t} + a_3 LTA_{i,t} + a_4 BC_{i,t} + a_5 LA_{i,t} + a_6 Ef_{i,t} + a_7 BSD_{j,t} + a_8 SMD_{j,t} + a_9 AQ_{i,t} + a_{10} GDP_{j,t}$$

$$NIM_{i,t} = a_0 + a_1 NIM_{i,t-1} + a_2 INF_{j,t} + a_3 LTA_{i,t} + a_4 BC_{i,t} + a_5 LA_{i,t} + a_6 Ef_{i,t} + a_7 BSD_{j,t} + a_8 SMD_{j,t} + a_9 AQ_{i,t} + a_{10} GDP_{j,t}$$

$$Tier1_{i,t} = a_0 + a_1 Tier1_{i,t-1} + a_2 INF_{j,t} + a_3 LTA_{i,t} + a_4 BC_{i,t} + a_5 LA_{i,t} + a_6 Ef_{i,t} + a_7 BSD_{j,t} + a_8 SMD_{j,t} + a_9 AQ_{i,t} + a_{10} GDP_{j,t}$$

$$Tier1_{i,t} = a_0 + a_1 Tier1_{i,t-1} + a_2 INF_{j,t} + a_3 INF_{j,t-1} + a_4 INF_{j,t-2} + a_5 LTA_{i,t} + a_6 BC_{i,t} + a_7 LA_{i,t} + a_8 Ef_{i,t} + a_9 BSD_{j,t} + a_{10} SMD_{j,t} + a_{11} AQ_{i,t} + a_{12} GDP_{j,t}$$

$$Leverage_{i,t} = a_0 + a_1 Leverage_{i,t-1} + a_2 INF_{j,t} + a_3 LTA_{i,t} + a_4 BC_{i,t} + a_5 LA_{i,t} + a_6 Ef_{i,t} + a_7 BSD_{j,t} + a_8 SMD_{j,t} + a_9 AQ_{i,t} + a_{10} GDP_{j,t}$$

$$Leverage_{i,t} = a_0 + a_1 Leverage_{i,t-1} + a_2 INF_{j,t} + a_3 INF_{j,t-1} + a_4 INF_{j,t-2} + a_5 LTA_{i,t} + a_6 BC_{i,t} + a_7 LA_{i,t} + a_8 Ef_{i,t} + a_9 BSD_{j,t} + a_{10} SMD_{j,t} + a_{11} AQ_{i,t} + a_{12} GDP_{j,t}$$

$$Logzscore_{i,t} = a_0 + a_1 Logzscore_{i,t-1} + a_2 INF_{j,t} + a_3 LTA_{i,t} + a_4 BC_{i,t} + a_5 LA_{i,t} + a_6 Ef_{i,t} + a_7 BSD_{j,t} + a_8 SMD_{j,t} + a_9 AQ_{i,t} + a_{10} GDP_{j,t}$$

where, ROA and NIM are proxies for profitability, Tier1and Leverage are proxies for stability and LogZscore (the natural logarithm of Z score) for riskiness; a_0 is constant; i represents the individual bank, t refers to time (years) and j refers to the country in which bank i operates; $ROA_{i,t-1}$, $NIM_{i,t-1}$, $Tier1_{i,t-1}$, $Leverage_{i,t-1}$, $Logzscore_{i,t-1}$, $INF_{i,t-1}$ denote the one period lagged (one year) and $INF_{i,t-2}$ denote the two periods lagged (two years). In detail, the historical information of banks' profitability ($ROA_{i,t-1}$, $NIM_{i,t-1}$), stability ($Tier1_{i,t-1}$, $Leverage_{i,t-1}$) and riskiness ($Logzscore_{i,t-1}$) is taking into consideration in order to allow the model to capture the dynamic trend of its performance and for more accurate results (Ben Jabra et al. (2017). Furthermore, the historical information of inflation ($INF_{i,t-1}$ and $INF_{j,t-2}$) is used, for bank's

stability (Tier 1 and Leverage ratio), since the dependent variables for stability is balance sheet items.

Firstly, we will perform the system with all three dependent variables for the whole database. Then, we will examine the results.

"Europe has a rich texture of social, political, economic and cultural entities." As a result, there are dividing lines all over the continent. In this study, we will examine the East and West division. Since the nature of East and West differences suggests that they should be more consequential than other EU divides. The greatest gap between East and West exist in the socio-economic sphere. The differences in capitalization, savings, and integration are still huge. As we mention above as SMD becomes larger, more activate and more efficient countries become richer. According to the table 3, the mean of Stock Market Development in East Europe over 14-years period is half (35.185%) in relation with the mean in West Europe (61.902%). It is notable that the asset quality ratio (non-performing loans divided by total loans) of East (13.86%) is twice the one of the West Europe (6.216%), that means East Europe has much more or bigger non-performing loans than West Europe. In addition, the bank size in West is bigger than in East Europe. Hence, by subdividing the database into East and West Europe, we are examining how the inflation and the bank specific factors affect the bank's profitability, stability and riskiness under different size of economy and institutional environment.

The differences on factors that may explain bank's profitability, stability and riskiness between each region will be compared. The banks are split into two sub-samples, namely East Europe and West Europe (Ben Jabra et al. (2017)). In details, East Europe includes Romania, Lithuania, Bulgaria, Croatia, Estonia, Hungary, Poland, Czech Republic, Slovenia, Malta and Cyprus. West Europe includes Greece, Spain, Italy, Portugal, France, Germany, United Kingdom, Belgium, Ireland, Finland, Netherlands, Austria, Denmark and Sweden. We will perform the system with all three dependent variables for both sub-samples, we will compare and we will examine the results.

Once being examined, we will illustrate the effects of inflation to the profitability, stability and riskiness of European countries who adopted euro and European countries with different currency. The common currency, euro, imposes a system of central monetary policy which is

applied across them. Central Monetary policy includes modulation inflation, handling nation debts, price transparency. Despite the fact that this policy could help and get strong for one country in Eurozone, it is not helpful for others.

The European nations that have avoided the Eurozone do so as a way to maintain financial independence on these key issues. This study focuses in inflation. When inflation rises in an economy, the interest rates will increase. Eurozone countries do not have the opportunity to change the interest rate in order to reduce the inflation. In other words, non-euro countries can do this through their monetary policy since they have independent regulators. Eurozone countries don't always have that option. Thus, we will compare differences on factors that may explain bank's profitability, stability and riskiness between each sub-sample.

Therefore, we will run again with all three dependent variables the system for both sub-samples, we will compare and we will examine the results. The sub –samples is split by countries with euro (Eurozone area) and with a different currency. Specifically, Eurozone area is Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Malta, Netherlands, Portugal, Slovenia and Spain. The countries of the other sub-sample are Romania, Bulgaria, Hungary, Poland, Czech Republic, United Kingdom, Finland, Denmark and Sweden.

EMPIRICAL RESULTS

Prior to analyze the results, descriptive statistics on the different variables are illustrated in the tables 3 to 5. Analytically, the table 3 presents information about min, max, mean, standard deviation and t-test (mean difference). It is notable that the mean of inflation is 1.725(whole sample), 2.228(East Europe), 1.573(West Europe), 1.564(Eurozone), 1.941(Non-Eurozone) and the standard deviation is 1.486(whole sample), 2.241(East Europe), 1.184(West Europe), 1.356(Eurozone), 1.621(Non-Eurozone), respectively. Therefore, both crisis and normal periods are reflected to the inflation rate due to the fact that their minimum and maximum values suggest the volatility of the country's economy over 14 years period. The same conclusion is observed for

the macroeconomic variable growth rate (GDP). These results are similar to those reported by Wiem Ben Jabra, Zouheir Mighri and Faysal Mansouri (2017).

Another point worth noting is that the mean differences of inflation, ROA (Return on Assets) and Tier1 between West and East Europe are not statistically significant. The mean of inflation in East Europe (2.338) is much bigger than West Europe (1.573). On contrast, these differences are statistically significant between Eurozone and non-Eurozone countries. Here, the mean of inflation in non-Eurozone countries (1.621) is slightly bigger than Eurozone countries. The same conclusion is observed for the macroeconomic variable growth rate (GDP). The mean difference of the natural logarithm of Z score between East and West Europe is statistically significant but between Eurozone and non-Eurozone countries is not. Despite the fact that the mean of ROA between East and West Europe is slightly different, the mean (of ROA) between Eurozone and non-Eurozone countries is huge. In detail, the mean of Eurozone countries is half of Non-Eurozone countries. The same behavior is observed by the Net Interest margin (NIM).

The mean of SMD (Stock Market Development) in the East Europe is much lower than in the West Europe, as we expected, and the mean difference is statistically significant. Stock market becomes larger, more active and more efficient as countries become richer (Young Aaron Tan, Christos Floros 2012). So, developing countries (East Europe) generally have less developed stock market. The same conclusion is observed between Eurozone and Non-Eurozone countries.

Tables 6 to 15 demonstrate the empirical results of the GMM 2-steps system in order to investigate the impact of inflation on bank's profitability, stability and riskiness. In detail, tables 6 and 7 presents the results for 23 European countries (whole sample). Tables 8 to 11 illustrate the results for East and West Europe, respectively. Finally, tables 12 and 15 give us the results for Eurozone and Non-Eurozone region, respectively.

As it is mentioned, the tables 6 and 7 demonstrate the results in the 23 mentioned European countries (whole sample). As is observed from these tables, not only the Sargan test is statistically significant for all the dependent variables, but also the Arellano-Bond(1). On contrast, the Arellano-Bond(2) is not statistically significant (at the 5% level), as we expected. Since, the null hypothesis of the Sargan test is that the instruments used are not correlated with

residuals and the null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation.

A prominent feature is that inflation has negative impact to the bank's stability (Tier 1, Leverage) and riskiness (natural logarithm of Z score) but positive impact to the bank's profitability (ROA, NIM). It is noticeable that inflation is strong statistically significant for almost all the cases. In detail, inflation and bank's profitability has a positive relation that means that the inflation gives banks the capability to adjust the interest rates, so the revenues increase faster than costs. Hence, there is a positive impact on bank's profitability. This result is consistent with finding by Tan, Floros (2012).

In contrast, the inflation has a strong negative relation with the bank's stability, Tier 1 ratio and Leverage ratio, as it is observed from the table 6. Furthermore, almost all the lags (for the dependent macroeconomic variable inflation) still have negative impact on bank's stability (table 7). In that case, almost they are all statistically significant.

The inflation has a strong negative impact to bank's riskiness as Ben Jabra et al., (2017) support. In other words, when the inflation increases, the bank savings will reduce (their expenses will increase) and the number for application for loans will increase. The market would have new borrowers who are more likely to default on their loans. Hence, the banks will have stricter loan terms and conditions. Consequently, the bank's riskiness will affect due to the fact that the banks will have to decide who will be their borrowers.

The bank size is not statistically significant for any cases. However, there is a positive relation to the banks' profitability and riskiness. According to the "too big to fail", large banks are more likely to take more risk (also profit) than smaller banks. It is also notable that there is a positive impact on banks' stability since the larger banks used to build up high "capital buffers" in order to prevent failure.

Bank capitalization ratio (BC) has positive relation for all the cases and is statistically significant. When the bank capitalization ratio is high, then the insolvency risk is lower (Ben Jabra et al., (2017)). So, BC ratio has positive impact on bank's stability and profitability, as we expect. On the other hand, there is a positive relation between bank capitalization and bank's riskiness, as we

did not expect. Owing to the fact that once the capital level increases, the probability of bank risk decreases. In addition, the only relation of liquidity ratio that is statistically significant is with bank's stability. Specifically, that relation is negative. The lacks of the resources to meet the liquidity standards, not only could not prevent but also could speed up the failure. So, the relation between liquidity ratio and bank's profitability, stability and riskiness should be positive.

In addition, there is a strong negative relation between efficiency and bank's profitability and stability. Efficiency is the ability to pass the expenses through the increase in lending rate and decrease to deposit rate. So, a positive relation is expected between efficiency and bank's profitability and stability. On the other hand, a negative relation is expected between efficiency and bank's riskiness, as we observe from the results. Asset Quality (AQ) is the percentage of the non-performing loans (NPLs) by total loans. Once the banks will have more risky loans, the number of non-performing loans will increase. A strong negative impact is observed between AQ and bank's profitability, stability and riskiness, as we expect.

Once the inflation increases, the need for banks services goes up (more borrowers). As a result, governments are pressed to create new banks. Notwithstanding the need, the governments are stricter in order to prevent any failure. So, the existing banks get profit. Furthermore, stock market development (SMD) has positive and statistically significant impact on bank's profitability, as we expected. Tan, Floros (2012) mention that as the SMD enlarges, then more information is released. As a consequence, the banks will have more customers and so higher profitability.

In order to check the robustness of the results, Net Interest Margin (NIM) is used as an alternative dependent variable for Return on Assets (ROA). As it is observed, the most of the results are similar with the results of the dependent variable ROA. It is notable that the inflation is negative and strong statistically significant for both dependent variables.

On the other hand, there is a negative relation between bank size and banks' profitability (NIM) while this relation was positive with dependent variable ROA. According to Tan, Floros (2012), it is probably due to bureaucratic reasons when banks become extremely large. In addition, Stock Market Development has a negatively but not statistically significant impact on banks' profitably,

while this relation was positive and statistically significant with dependent variable ROA. It is worth to mention that the relation between asset quality and net interest ratio (banks' profitability) is positive and not statistically significant, while this relation was negative and statistically significant with dependent variable ROA.

Not only Net Interest Margin (NIM) is used as an alternative dependent variable for Return on Assets (ROA) but also Leverage ratio (Leverage) is used for Tier1, in order to check for robustness of results. Once again, the most of the results are similar with the results of the dependent variable Tier1. It is notable that the inflation has a negative impact in bank's stability for both dependent variables. It is worth to mention that all lags (of inflation) variables similarly behave as Tier 1 and that means they still have negative impact on bank's stability. On contrast with the results of dependent variable Tier1, the Liquidity ratio has a positive impact on bank's stability, as we expected. In other words, while the liquidity ratio increases, the probability to prevent the failure increases.

Tables 8 to 11 present the results of East and West Europe, respectively, for all the cases. Once again, for both region, the Sargan and the Arellano-Bond(1) test is statistically significant, while the Arellano-Bond(2) is not for all the cases, as we expected. Since, the null hypothesis of the Sargan test is that the instruments used are not correlated with residuals and the null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation.

By separating the sample into East and West Europe, we expect to notice changes across the behavior of determinants that are affected by the regional differences. In detail, regional differences are levels of size of economies, savings, and capitalization. Firstly, it is important to mention the relation between inflation and bank's profitability, stability and riskiness. What stands out from the results is the fact that the relation between inflation and bank's profitability similarly behaves for both region. In detail, it is a positive relation but not statistically significant. In addition, the inflation has the same behavior in bank's riskiness for both regions. The inflation has a negative impact on bank's riskiness.

Furthermore, the inflation has negative relation with bank's stability (Tier 1) for East and West Europe. All the lags variables of inflation, in East Europe, have statistically significant negative impact on bank's stability (Tier 1 ratio) as it is observed in table 9. On contrast, all the lags

variables of inflation, in West Europe, have a positive but not statistically significant impact on bank's stability (table 11).

As observed from the results, the bank capitalization is strong statistically significant for the West Europe where in East Europe is not. In addition, the Stock Market Development has the same behavior as the Bank capitalization ratio. In other words, there is a strong positive impact in bank's profitability and riskiness in West Europe but it is not statistically significant for the East Europe. Weighting up all, we can conclude that stronger macroeconomic and institutional environment encourage the bank's profitability, stability and discourage bank's riskiness.

As we mention above, in order to check the robustness of the results, not only the Net Interest Margin (NIM) is used as an alternative dependent variable for Return on Assets (ROA) but also Leverage ratio (Leverage) is used for Tier1. As it is observed, the most of the results are similar to what we get from NIM and Tier1, respectively.

Tables 12 to 15 indicate the results for Eurozone and Non-Eurozone region, respectively, for all the cases. The Sargan and the Arellano-Bond(1) test, in Eurozone area, is statistically significant, while the Arellano-Bond(2) is not for all the cases, as we expected. Since, the null hypothesis of the Sargan test is that the instruments used are not correlated with residuals and the null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. For Non-Eurozone region, the Sargan test, is statistically significant, except the bank's stability (Tier 1), while Arellano-Bond(1) and Arellano-Bond(2) is not statistically significant. It is worth to mention that the Arellano-Bond(2) test is more substantial than the Arellano-Bond(1) test.

By separating the sample into Eurozone countries and not, we expect to notice changes across the behavior of determinants that is affected by their region's policy. Specifically, the countries that obtain the euro currency, imposes a system of central monetary policy. The countries who avoid the euro, they have financial independence on certain key issues (modulation inflation, handling nation debts, price transparency). One of these is the modulation inflation. When inflation rises, non-euro countries have the opportunity to increase interest rates in order to reduce the inflation. Eurozone countries do not have this opportunity.

According to the results, once again, the relation between inflation and bank's profitability similarly behaves for both regions. In other words, the inflation has a positive but not statistically significant impact on bank's profitability for both Eurozone and Non-Eurozone region. Despite the fact that the inflation has strong (statistically significant at 1% level) impact on bank's riskiness (natural logarithm of Z score) in Eurozone region, that relation is positive and not statistically significant for Non-Eurozone region.

Furthermore, the inflation has a strong (statistically significant) negative relation with bank's stability (Tier 1) for both regions. On top of that, almost all the lags variables of inflation, in Eurozone and Non-Eurozone region, have statistically significant negative impact on bank's stability (Tier 1 ratio) as it is observed on the tables 13 and 15.

There is a strong negative relation between efficiency and bank's profitability and stability. It is notable that the relation between efficiency and bank's profitability is negative and strong statistically significant, as we expect in Eurozone, where in Non-Eurozone area is also negative but not statistically significant. It is the same case with the bank's stability. Once again, results provide that there is an insignificant impact of the most variables on bank's profitability, riskiness and stability.

Once more, in order to check the robustness of the results, not only the Net Interest Margin (NIM) is used as an alternative dependent variable for Return on Assets (ROA) but also Leverage ratio (Leverage) is used for Tier1. As it is observed, the most of the results are similar to what we get from NIM and Tier1, respectively. It is notable, once again, that the inflation has a positive impact in bank's profitability for both regions. The only difference is the fact that this relation is statistically significant at the 5% level for Non-Eurozone whereas it is not statistically significant for the Eurozone area.

On the one hand, the inflation has a strong (statistically significant at 5% level) negative impact on bank's stability (Leverage) for the Eurozone area. On the other hand, in Non-Eurozone region, this relation is positive and not statistically significant. In addition, all the lags variables of inflation behave similarly for both independent variables (Tier 1 ratio and Leverage ratio) in Eurozone area. All the lags variables of inflation of Non-Eurozone region have positive but not

statistically significant impact on bank's stability (Leverage). It is worth to remind that this relation between inflation and bank's stability, with independent variable Tier 1, is positive.

CONCLUSION

The aim of this study is to examine whether the inflation has impact on commercial banks. Our analysis focuses on the relation between the inflation and the bank's profitability, stability and riskiness, respectively. The dynamic panel data estimator GMM (General Method of Moments) system is used. So, unobserved panel heterogeneity, omitted variable bias and endogeneity of the lagged dependent variable in a panel data are controlled. The sample is consisted of 101 commercial banks across 23 European countries over a 14-year period, namely from 2005 to 2018.

Weighting up the empirical findings, inflation has negative impact to the bank's stability (Tier 1) and riskiness (natural logarithm of Z score) but positive impact to the bank's profitability (ROA). Bank Capitalization and stock market development has positive and statistically significant impact on bank's profitability, as we expected. On contrast, efficiency and bank's profitability has a strong negative relation. In addition, a strong negative impact is observed between assets quality and bank's profitability, stability and riskiness, as we expect due to the fact that once the banks will have more risky loans, the number of non-performing loans will increase.

The sample is not only examined as a whole sample but it is subdivided into East-West Europe and Eurozone – Not Eurozone countries. Overall, what we get from the results is the fact that the relation between inflation and bank's profitability behaves similarly for all the cases. In addition, the relation between inflation and bank's riskiness, between East and West Europe behaves similarly. On contrast, that relation is positive for Eurozone area and negative for Non-Eurozone area.

It is important to mention that the inflation does not behave similarly to bank's stability for all the cases. In other words, the inflation has negative relation with bank's stability (Tier 1) for East - West Europe and Eurozone – not Eurozone area. Despite the fact that the inflation has a strong negative impact on bank's stability (Leverage) for East Europe and Eurozone area, for West Europe and Non-Eurozone region, this relation is positive.

All the lags variables of inflation, in East Europe, have statistically significant negative impact on bank's stability whereas these variables, in West Europe, have a positive. In addition, all the lags variables of inflation behave similarly for both independent variables (Tier 1 ratio and Leverage ratio) in Eurozone area. On contrast, almost all lagged variables of Non-Eurozone region have positive impact on bank's stability (Leverage) whereas when the independent variable is Tier 1, this relation is positive.

APENTIX AND TABLES

Table 1 Sample Construction

The following table demonstrates the process to end up the final sample.

European Commercial Banks Sample Selection from 2005-2018	Banks
European Commercial Banks (Initial Sample)*	133
Drop Missing ROA information from S&P Market Intelligent	10
	123
Drop Missing Tier 1 information from S&P Market Intelligent	5
	118
Drop Missing data to calculate Zscore	7
	111
Drop Missing Asset Quality information from S&P Market Intelligent	5
	106
Drop Missing Bank Capitalization and Liquidity ratio information from S&P Market Intelligent	5
Total	101

*Note: Overall, it may be observed that there are some steps needed in order to have the initial sample. Firstly, from all the banks across world, only the European banks are collected. Then, we kept the banks that are commercial. After that, we drop the banks that are not listed. Weighing up all, the initial sample is consisted by 133 banks

Table 2: Variables considered in this study

Variable	Notation	Measurement	Source	Expected sign of coefficient (for all independent variables)
Inflation	INF	Annual inflation rate	World Bank Database	?
Return on Assets	ROA	Net income/Total assets	S&P	
Net Interest Margin	NIM	Net income/Average earning assets	S&P	
Tier 1 ratio	Tier 1	Tier 1 capital ratio	S&P	
Leverage ratio	Leverage	Tier 1 capital ratio/(tangible assets less derivative liabilities)	S&P	
The natural logarithm of Zscore	Logzscore	Natural logarithm of Zscore	Calculated	
The natural logarithm of the total assets	LTA	Natural logarithm of Total Assets	Calculated	?
Bank Capitalization ratio	BC	Total equity / Total assets	S&P	?
Liquidity ratio	LA	Net Loans/Assets	S&P	?
Efficiency	CE	Efficiency ratio	World Bank Database	?
Bank Sector development	BSD	Bank Assets / GDP	World Bank Database	Negative
Stock Market Development	SMD	Market Capitalization of the listed banks/GDP	Calculated	Positive
Asset Quality ratio	AQ	Non-performing loans / total loans	S&P	Negative
GDP	GDP	The growth rate of GDP	World Bank Database	Negative

Notes: S&P is the S&P Market Intelligent

The following table demonstrates the summary statistics for the whole sample, 101 commerical banks across 23 European countries during period 2005 to 2018. Min: Minimum; Max: maximum; Std.Dev.: Standard deviation.

Variable	Min	Max	Mean	Std. Dev.
INF	-4.478	12.349	1.725	1.486
ROA	-9.752	8.959	0.601	1.128
NIM	0.030	13.700	2.447	1.371
Tier1	0.600	41.800	13.324	4.383
Leverage	-4.546	22.009	7.756	3.400
Logzscore	-1.690	4.349	1.579	0.705
LTA	5.290	9.554	7.540	0.957
BC	0.907	36.796	9.244	4.233
LA	3.027	91.587	62.104	13.846
Ef	13.972	180.301	61.731	15.689
BSD	18.010	222.200	125.045	44.491
SMD	7.069	139.341	54.599	29.687
AQ	0.066	64.629	7.730	9.830
GDP	-14.814	25.163	1.401	2.926

The following table illustrates the summary statistics for the two sub-samples East and West Europe regions. Min: Minimum; Max: Maximum; Std.Dev.: Standard deviation. East Europe includes Romania(1), Lithuania(1), Bulgaria(2), Croatia(6), Hungary(1), Poland(4), Slovenia(1), Malta(2) and Cyprus(2). West Europe includes Greece(5), Spain(5), Italy(10), Portugal(1), France(14), Germany(3), United Kingdom(8), Belgium(1), Ireland(3), Finland(2), Netherlands(2), Austria(6), Denmark(18) and Sweden(3).

Table 4: Summary statistics (East and West Europe regions)

	East Europe (n=9)				West Europe (n=16)				
Variable	Min	Max	Mean	St. Dev	Min	Max	Mean	St. Dev	t-test
INF	-1.634	12.349	2.338	2.241	-4.478	4.897	1.573	1.184	-7.8738
ROA	-9.752	8.959	0.758	1.671	-9.096	5.561	0.562	0.944	-2.6028
NIM	0.215	11.773	3.234	1.513	0.030	13.700	2.254	1.260	-11.1698
Tier1	0.6	28.039	13.2	3.696	0.65	41.8	13.378	4.538	0.6074
Leverage	-0.734	22.009	9.024	3.018	-4.546	19.117	7.442	3.380	-7.0946
Logzscore	-1.587	3.766	1.446	0.714	-1.69	4.349	1.612	0.699	3.5522
LTA	5.29	9.347	7.124	0.862	5.665	9.554	7.643	0.952	8.3028
BC	3.09	26.433	10.587	3.864	0.907	36.796	8.913	4.257	-5.9984
LA	4.996	84.34	58.227	9.939	3.027	91.587	63.061	14.496	5.2809
Ef	13.972	180.301	62.163	19.983	24.866	178.478	61.624	14.443	-0.5145
BSD	18.01	187.38	74.233	31.282	50.8	222.2	137.591	37.843	24.9696
SMD	7.069	116.682	35.185	19.319	11.737	139.341	61.902	29.63	12.868
AQ	0.617	64.629	13.86	13.198	0.066	60.399	6.216	8.126	-12.2538
GDP	-14.814	11.087	2.572	3.43	-9.132	25.163	1.112	2.713	-7.6257

The following table illustrates the summary statistics for the two sub-samples Eurozone and Non-Eurozone countries. Min: Minimum; Max: Maximum; Std.Dev.: Standard deviation. Eurozone countries are Austria(6), Belgium(1), Cyprus(2), France(14), Finland, Germany(3), Greece(5), Ireland(3), Italy(10), Lithuania(1), Malta(2), Netherlands(2), Portugal(1), Slovenia(1) and Spain(5). The sub-sample of Non-Eurozone countries is Romania(1), Croatia(6), Bulgaria(2), Hungary(1), Poland(4), United Kingdom(8), Denmark(18) and Sweden(3).

Table 5: Summary statistics (Eurozone countries and not)

	Eurozone Countries (n=15)				Non Eurozone Countries (n=8)				
Variable	Min	Max	Mean	St. Dev	Min	Max	Mean	St. Dev	t-test
INF	-4.478	10.926	1.564	1.356	-1.545	12.349	1.941	1.621	4.7516
ROA	-9.752	5.561	0.42	1.038	-5.136	8.959	0.845	1.198	7.1252
NIM	0.264	4.116	1.895	0.722	0.030	13.700	3.194	1.655	-7.0946
Tier1	0.6	29.575	12.534	4.355	0.67	41.8	14.433	4.182	8.245
Leverage	-4.546	15.851	6.886	2.766	-0.734	22.009	8.929	3.801	19.9594
Logzscore	-1.69	4.311	1.603	0.773	-1.503	4.349	1.547	0.601	0.9312
LTA	5.799	9.347	7.641	0.768	5.29	9.554	7.403	1.152	-4.6537
BC	0.907	36.796	8.516	3.882	2.224	26.433	10.227	4.485	7.6639
LA	3.027	91.587	64.701	15.113	4.996	84.34	58.602	11.006	-8.3886
Ef	24.866	178.478	60.597	14.337	13.972	180.301	63.261	17.242	3.1672
BSD	18.01	194.34	113.815	30.18	18.6	222.2	140.192	54.999	11.1063
SMD	7.99	132.254	56.577	27.709	7.069	139.341	48.044	34.742	-3.5962
AQ	0.131	64.629	8.164	10.803	0.066	52.404	7.143	8.312	-1.9336
GDP	-14.814	25.163	1.178	3.187	-7.291	9.307	1.703	2.503	3.3512

Our sample consists of 101 European commercial banks. Dependent variables are bank's profitability, stability and riskiness: Return on Assets (ROA), Net Interest Margin (NIM), Tier 1 ratio (Tier1), Leverage ratio (Leverage) and the natural logarithm for Z score (LogZscore). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP).

Table 6: GMM system estimation results (Whole Sample)

	ROA		NIM		Tier1		Leverage		LogZscore	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
ROA_{t-1}	0.210*	0.086								
NIM_{t-1}			0.805	0.000						
$Tier\ 1_{t-1}$					0.650***	0.000				
$Leverage_{t-1}$							0.395***	0.000		
$Logzscore_{t-1}$									0.211***	0.002
INF	0.059***	0.005	0.027**	0.019	-0.370***	0.000	-0.068	0.241	-0.041**	0.021
LTA	0.034	0.608	-0.454	0.307	0.039	0.789	-0.216	0.267	0.012	0.763
BC	0.045**	0.014	0.007	0.583	0.208**	0.031	0.281**	0.018	0.041***	0.001
LA	-0.005	0.184	-0.003	0.331	-0.025***	0.007	0.003	0.772	0.000	0.867
Ef	-0.018***	0.000	-0.005***	0.002	0.004	0.567	-0.012	0.131	-0.006***	0.001
BSD	-0.003**	0.050	-0.001	0.219	0.001	0.859	-0.001	0.560	-0.001	0.555
SMD	0.004***	0.002	-0.001	0.184	0.004	0.373	-0.005	0.105	0.003**	0.010
AQ	-0.027***	0.000	0.002	0.494	0.009	0.360	0.015	0.190	-0.018***	0.000
GDP	0.060***	0.000	0.001	0.899	-0.019	0.630	-0.024	0.213	0.020**	0.021
Constant	1.283**	0.034	1.369**	0.043	4.095**	0.036	4.830*	0.079	1.254**	0.012
Sargan test	461.490	0.000	444.93	0.000	284.84	0.000	321.83	0.000	317.350	0.000
AR(1) test	-2.000	0.046	-2.870	0.004	-3.910	0.000	-2.040	0.042	-4.020	0.000
AR(2) test	-1.180	.239	-1.100	0.271	-1.950	0.051	0.590	0.555	0.730	0.468

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's stabilty: Tier 1 ratio (Tier1) and Leverage ratio (Leverage). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP).

Table 7: GMM system estimation results (Whole Sample)

	Tier1		Leverage	
	Estimate	p-value	Estimate	p-value
$Tier\ 1_{t-1}$	0.602	0.000		
$Leverage_{t-1}$			0.417	0.000
INF	-0.313***	0.000	-0.108**	0.028
INF_{t-1}	-0.129	0.847	0.108*	0.055
INF_{t-2}	-0.183**	0.027	-0.032	0.621
LTA	0.030	0.857	-0.161	0.400
BC	0.208**	0.038	0.274**	0.011
LA	-0.029***	0.007	0.004	0.725
Ef	-0.001	0.881	-0.010	0.199
BSD	-0.002	0.628	-0.003	0.402
SMD	0.006	0.274	-0.006	0.093
AQ	0.004	0.701	0.019*	0.072
GDP	-0.038	0.403	-0.001	0.985
Constant	6.022***	0.002	4.072	0.127
Sargan test	323.11	0.000	296.99	0.000
AR(1) test	-3.580	0.000	-1.960	0.050
AR(2) test	-1.760	0.078	0.670	0.505

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's profitability, stability and riskiness: Return on Assets (ROA), Net Interest Margin (NIM), Tier 1 ratio (Tier1), Leverage ratio (Leverage) and the natural logarithm for Z score (LogZscore). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). The West European countries includes Greece(5), Spain(5), Italy(10), Portugal(1), France(14), Germany(3), United Kingdom(8), Belgium(1), Ireland(3), Finland(2), Netherlands(2), Austria(6), Denmark(18) and Sweden(3).

Table 8: GMM system estimation results (West Europe)

	ROA		NIM		Tier1		Leverage		LogZscore	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
ROA_{t-1}	0.129	0.283								
NIM_{t-1}			0.837***	0.000						
$Tier\ 1_{t-1}$					0.750***	0.000				
$Leverage_{t-1}$							0.443***	0.003		
$Logzscore_{t-1}$									0.201**	0.044
INF	0.029	0.110	0.020*	0.076	-0.353***	0.001	-0.131**	0.040	-0.080***	0.001
LTA	-0.025	0.797	0.006	0.829	-0.067	0.805	-0.394	0.106	-0.006	0.915
BC	0.032***	0.001	0.002	0.623	0.144	0.185	0.212	0.100	0.043***	0.001
LA	-0.007	0.105	0.001	0.931	-0.024**	0.084	-0.005	0.635	-0.001	0.836
Ef	-0.020***	0.000	-0.003***	0.005	0.005	0.500	-0.008	0.348	-0.007***	0.001
BSD	-0.003*	0.087	0.001	0.508	-0.003	0.630	-0.001	0.776	-0.002	0.133
SMD	0.004***	0.002	-0.001**	0.030	0.003	0.678	-0.001	0.708	0.003**	0.018
AQ	-0.027**	0.025	0.006***	0.000	0.004	0.782	0.038***	0.000	-0.021***	0.000
GDP	0.052***	0.000	0.009***	0.004	-0.027	0.531	-0.001	0.965	0.018	0.111
Constant	2.184***	0.004	0.346	0.306	4.756	0.120	6.218*	0.063	1.756**	0.013
Sargan test	396.680	0.000	372.52	0.000	265.620	0.000	286.90	0.000	289.210	0.000
AR(1) test	-1.640	0.100	-2.870	0.004	-3.380	0.001	-1.710	0.088	-3.220	0.001
AR(2) test	-1.390	0.165	-3.040	0.002	-1.130	0.258	1.040	0.299	-0.340	0.735

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's stability: Tier 1 ratio (Tier1) and Leverage ratio (Leverage). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). The West European countries includes Greece(5), Spain(5), Italy(10), Portugal(1), France(14), Germany(3), United Kingdom(8), Belgium(1), Ireland(3), Finland(2), Netherlands(2), Austria(6), Denmark(18) and Sweden(3).

Table 9: GMM system estimation results (West Europe)

	Tier1		Leverage	
	Estimate	p-value	Estimate	p-value
$Tier\ 1_{t-1}$	0.700	0.000		
$Leverage_{t-1}$			0.395	0.009
INF	-0.423***	0.000	-0.136***	0.003
INF_{t-1}	-0.009	0.926	0.019	0.809
INF_{t-2}	-0.347**	0.008	-0.076	0.465
LTA	0.162	0.655	-0.449*	0.093
BC	0.107	0.326	0.249*	0.074
LA	-0.009	0.597	-0.007	0.545
Ef	-0.002	0.814	-0.010	0.291
BSD	-0.006	0.385	-0.001	0.985
SMD	0.001	0.926	-0.005	0.190
AQ	-0.011	0.433	0.033***	0.001
GDP	-0.049	0.417	0.007	0.728
Constant	4.707	0.188	7.001**	0.047
Sargan test	306.93	0.000	264.04	0.000
AR(1) test	-3.440	0.001	-1.620	0.105
AR(2) test	-0.790	0.432	1.080	0.278

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's profitability, stability and riskiness: Return on Assets (ROA), Net Interest Margin (NIM), Tier 1 ratio (Tier1), Leverage ratio (Leverage) and the natural logarithm for Z score (LogZscore). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). East Europe includes Romania(1), Lithuania(1), Bulgaria(2), Croatia(6), Hungary(1), Poland(4), Slovenia(1), Malta(2) and Cyprus(2).

Table 10: GMM system estimation results (East Europe)

	ROA		NIM		Tier1		Leverage		LogZscore	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
ROA_{t-1}	0.391**	0.067								
NIM_{t-1}			0.756	0.151						
$Tier\ 1_{t-1}$					0.321	0.108				
$Leverage_{t-1}$							0.421	0.189		
$Logzscore_{t-1}$									0.238	0.671
INF	0.042	0.508	0.028	0.606	-0.003	0.967	0.074	0.414	-0.013	0.670
LTA	-0.264	0.520	-0.766*	0.064	-0.240	0.711	-0.156	0.878	0.215	0.218
BC	0.043	0.667	-0.002	0.985	0.086	0.105	0.369	0.167	0.040	0.123
LA	-0.009	0.614	-0.002	0.941	-0.011	0.496	-0.016	0.671	-0.011	0.293
Ef	-0.023*	0.095	-0.019	0.122	-0.023	0.210	-0.010	0.772	0.001	0.964
BSD	-0.003	0.644	-0.003	0.410	-0.001	0.812	-0.002	0.659	0.000	0.863
SMD	0.002	0.565	-0.001	0.635	0.003	0.648	0.004	0.624	0.004	0.378
AQ	-0.028*	0.058	-0.006	0.639	-0.025	0.250	-0.004	0.803	-0.015	0.225
GDP	0.058	0.172	0.009	0.781	0.075***	0.002	-0.101**	0.034	-0.003	0.849
Constant	4.102	0.494	7.848***	0.002	3.481	0.661	4.320	0.663	-0.157	0.957
Sargan test	192.500	0.007	213.91	0.000	183.480	0.003	144.85	0.246	151.24	0.146
AR(1) test	-1.370	0.170	-1.940	0.053	-1.280	0.199	-1.27	0.203	-1.15	0.251
AR(2) test	0.420	0.673	-0.680	0.497	0.370	0.710	-1.51	0.132	0.87	0.384

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's stability: Tier 1 ratio (Tier1) and Leverage ratio (Leverage). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). East Europe includes Romania(1), Lithuania(1), Bulgaria(2), Croatia(6), Hungary(1), Poland(4), Slovenia(1), Malta(2) and Cyprus(2).

Table 11: GMM system estimation results (East Europe)

	Tier1		Leverage	
	Estimate	p-value	Estimate	p-value
$Tier\ 1_{t-1}$	0.108	0.667		
$Leverage_{t-1}$			0.542	0.103
INF	0.055	0.695	0.181**	0.074
INF_{t-1}	0.071	0.730	0.495***	0.006
INF_{t-2}	0.102	0.570	-0.070	0.376
LTA	2.352**	0.019	0.336	0.723
BC	0.516***	0.001	0.278	0.313
LA	-0.017	0.714	-0.008	0.897
Ef	0.065	0.027	-0.016	0.550
BSD	0.014	0.138	-0.001	0.963
SMD	0.028**	0.032	-0.003	0.778
AQ	0.079***	0.006	0.022	0.248
GDP	-0.021	0.834	-0.003	0.850
Constant	-17.389	0.181	-1.145	0.902
Sargan test	146.29	0.142	131.31	0.427
AR(1) test	-0.420	0.674	-1.460	0.144
AR(2) test	-1.350	0.179	-1.360	0.172

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's profitability, stability and riskiness: Return on Assets (ROA), Net Interest Margin (NIM), Tier 1 ratio (Tier1), Leverage ratio (Leverage) and the natural logarithm for Z score (LogZscore). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). Eurozone area is Austria(6), Belgium(1), Cyprus(2), France(14), Finland, Germany(3), Greece(5), Ireland(3), Italy(10), Lithuania(1), Malta(2), Netherlands(2), Portugal(1), Slovenia(1) and Spain(5).

Table 12: GMM system estimation results (Eurozone)

	ROA		NIM		Tier1		Leverage		LogZscore	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
ROA_{t-1}	0.118	0.145								
NIM_{t-1}			0.830***	0.000						
$Tier\ 1_{t-1}$					0.780***	0.000				
$Leverage_{t-1}$							0.426***	0.005		
$Logzscore_{t-1}$									0.201**	0.021
INF	0.022	0.482	0.006	0.542	-0.347***	0.000	-0.176**	0.012	-0.074***	0.008
LTA	0.010	0.902	0.022	0.448	0.025	0.921	-0.183	0.279	-0.028	0.778
BC	0.044***	0.000	-0.001	0.885	0.133	0.221	0.230*	0.083	0.053***	0.001
LA	-0.007*	0.093	0.002	0.099	-0.025	0.108	0.005	0.515	-0.003	0.496
Ef	-0.018***	0.000	-0.003***	0.008	0.003	0.667	-0.009	0.230	-0.006**	0.014
BSD	0.000	0.938	-0.001	0.910	0.001	0.812	-0.001	0.717	0.000	0.714
SMD	0.004**	0.021	-0.002**	0.011	0.002	0.746	-0.006**	0.017	0.003**	0.048
AQ	-0.030***	0.001	0.005***	0.000	0.007	0.564	0.023***	0.008	-0.021***	0.000
GDP	0.066***	0.000	0.006**	0.051	-0.020	0.608	0.008	0.680	0.025**	0.018
Constant	1.395*	0.062	0.248	0.516	3.501	0.184	4.301**	0.060	1.751	0.119
Sargan test	397.620	0.000	305.890	0.000	294.600	0.000	296.54	0.000	298.890	0.000
AR(1) test	-2.020	0.044	-3.070	0.002	-4.280	0.000	-1.810	0.071	-3.550	0.000
AR(2) test	-1.340	0.180	-3.480	0.001	-1.610	0.107	0.930	0.350	-0.260	0.798

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's stability: Tier 1 ratio (Tier1) and Leverage ratio (Leverage). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). Eurozone area is Austria(6), Belgium(1), Cyprus(2), France(14), Finland, Germany(3), Greece(5), Ireland(3), Italy(10), Lithuania(1), Malta(2), Netherlands(2), Portugal(1), Slovenia(1) and Spain(5).

Table 13: GMM system estimation results (Eurozone)

	Tier1		Leverage	
	Estimate	p-value	Estimate	p-value
$Tier\ 1_{t-1}$	0.723	0.000		
$Leverage_{t-1}$			0.389	0.010
INF	-0.315***	0.000	-0.179***	0.002
INF_{t-1}	0.002	0.988	0.027	0.717
INF_{t-2}	-0.244*	0.057	-0.046	0.645
LTA	-0.095	0.892	-0.137	0.623
BC	0.152	0.192	0.261*	0.072
LA	-0.036	0.216	0.006	0.590
Ef	-0.002	0.808	-0.008	0.323
BSD	0.001	0.753	-0.002	0.637
SMD	0.006	0.339	-0.008***	0.004
AQ	0.002	0.847	0.021***	0.010
GDP	-0.023	0.608	0.014	0.492
Constant	6.180	0.425	4.008	0.202
Sargan test	289.23	0.000	277.49	0.000
AR(1) test	-3.850	0.000	-1.730	0.084
AR(2) test	-1.580	0.113	0.880	0.377

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's profitability, stability and riskiness: Return on Assets (ROA), Net Interest Margin (NIM), Tier 1 ratio (Tier1), Leverage ratio (Leverage) and the natural logarithm for Z score (LogZscore). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). The sub-sample with countries which have different currency is Romania(1), Croatia(6), Bulgaria(2), Hungary(1), Poland(4), United Kingdom(8), Denmark(18) and Sweden(3).

Table 14: GMM system estimation results (Non-Eurozone)

	ROA		NIM		Tier1		Leverage		LogZscore	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
ROA_{t-1}	0.456**	0.017								
NIM_{t-1}			0.950***	0.000						
$Tier\ 1_{t-1}$					0.494***	0.002				
$Leverage_{t-1}$							0.487***	0.000		
$Logzscore_{t-1}$									-0.034	0.928
INF	0.048	0.355	0.060**	0.011	-0.278*	0.099	0.049	0.580	0.013	0.676
LTA	-0.011	0.982	-0.523	0.110	0.298	0.533	-0.345	0.293	0.090	0.503
BC	0.037	0.693	-0.053	0.514	0.393**	0.052	0.255***	0.007	0.006	0.727
LA	-0.001	0.911	-0.014*	0.071	-0.022	0.531	0.025	0.422	-0.007	0.332
Ef	-0.014	0.288	-0.020*	0.051	0.028	0.260	0.001	0.979	-0.009	0.354
BSD	-0.004	0.242	-0.002	0.359	-0.008	0.506	-0.004	0.579	-0.006**	0.013
SMD	0.003	0.103	-0.001	0.153	0.011	0.202	0.007	0.277	0.005*	0.071
AQ	-0.024	0.353	-0.027	0.148	0.019	0.595	-0.028	0.259	-0.022***	0.006
GDP	0.077***	0.003	-0.001	0.670	-0.082	0.533	-0.154***	0.000	-0.025*	0.075
Constant	1.206	0.842	7.647*	0.074	0.619	0.918	3.520	0.471	2.340	0.250
Sargan test	165.100	0.000	174.53	0.000	110.970	0.302	103.380	0.499	127.990	0.055
AR(1) test	-1.260	0.209	-1.930	0.053	-1.700	0.089	-1.800	0.247	-1.010	0.315
AR(2) test	-0.710	0.477	-0.530	0.596	-0.950	0.340	-1.160	0.072	0.820	0.415

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Our sample consists of 101 European commercial banks. Dependent variables are bank's stability: Tier 1 ratio (Tier1) and Leverage ratio (Leverage). Estimation method is the two-step GMM dynamic panel estimator. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals. The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. Independent variables are inflation rate (INF), bank size (LTA), bank capitalization (BC), Liquidity (LA), Efficiency (Ef), Banking Sector Development (BSD), Stock Market Development (SMD), Asset Quality (AQ) and growth rate (GDP). The sub-sample with countries which have different currency is Romania(1), Croatia(6), Bulgaria(2), Hungary(1), Poland(4), United Kingdom(8), Denmark(18) and Sweden(3).

Table 15: GMM system estimation results (Non-Eurozone)

	Tier1		Leverage	
	Estimate	p-value	Estimate	p-value
$Tier\ 1_{t-1}$	0.258	0.107		
$Leverage_{t-1}$			0.252	0.453
INF	-0.236	0.129	0.017	0.838
INF_{t-1}	-0.003	0.987	0.114	0.319
INF_{t-2}	-0.022	0.918	0.470	0.758
LTA	0.680	0.439	0.633	0.888
BC	0.451*	0.052	0.433*	0.090
LA	-0.020	0.604	0.011	0.857
Ef	0.036	0.288	0.014	0.533
BSD	-0.005	0.689	-0.002	0.894
SMD	0.004	0.698	0.004	0.669
AQ	0.318	0.418	-0.023	0.388
GDP	-0.064	0.646	-0.107	0.110
Constant	-0.581	0.958	0.270	0.965
Sargan test	113.35	0.154	94.74	0.603
AR(1) test	-1.260	0.208	-0.770	0.441
AR(2) test	-1.070	0.284	-1.000	0.317

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

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