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What Determines Bank Depositor Behavior?

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Abstract

Bank depositor behavior has been associated with bank specific characteristics, bank-runs and contagion effects. The recent debt crisis events in the Euro Area and particularly in Greece have caused major withdrawals and have weakened the banking system's credibility. This thesis aims to investigate the impact of macroeconomic factors like country risk on depositor behavior. Aggregate data from Eurozone countries were used in panel model regressions. The selected time period covers the years from 2004 to 2017 in order to also estimate the impact of the Global Financial Crisis and the Eurozone Debt Crisis. We find that total deposits in a country are affected by domestic macroeconomic factors and, in particular, by country risk, unemployment and economic sentiment. During the post-crisis period, depositors seem to be more responsive to country risk, while the effect of other factors seems to decline.

Keywords: Banking, Deposits, Bank-runs, Depositor Behavior, Eurozone, Debt Crisis, Panel Model

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Chapter 1: Introduction

Banks are often the center of attention during systemic financial crises. One of the main worries of regulators, authorities and the public is whether their deposits are secure and whether the banks will have enough liquidity to support any major withdrawals and at the same time address the rising credit risk. This thesis tries to approach this issue by looking at the bigger picture. Previous studies show that there are macroeconomic factors that motivate depositors to withdraw more or deposit more, on an aggregate level, regardless of events or bank-specific characteristics. This thesis aims to shed some light on what motivated depositor behavior in the Eurozone shortly before and after the economic crisis of 2008-09.

1.1 Fractional Reserves system in Banking

Commercial banks have two major sources of funds other than the equity provided by owners: deposits and borrowed or other liability funds. A major difference between banks and other firms is banks' high leverage. There two main types of deposit accounts: demand deposits and time deposits. The main difference is that demand deposits provide zero or near zero interest but immediate liquidity (on demand) while time deposits provide a competitive interest rate with a fixed maturity.[1]

All modern banks use the "fractional reserve" system, a practice whereby the bank is only required to keep a fraction of its deposit liabilities as reserves and is free to use the rest of them to make loans or investments. This allows banks to act as financial intermediates between borrowers and savers, by providing long-term loans (assets) and immediate liquidity to depositors. [1]

Based on a model presented by John Bryant (1980), the intermediate (the bank) gets deposits from type A individuals, in exchange for promises of future money. This money is lent to type B individuals, in exchange for promises of future money from them. The case in which type A individuals withdraw their deposits early (earlier than expected) creates an illiquidity cost, which generates a need for reserves. Assuming any intermediary is perfectly diversified against this risk, exactly a% of its deposits will be held by people who withdraw early. Therefore, the intermediary can hold a% of its deposits as fiat money and, with certainty, just meet the demands of those individuals. To generate bank runs, Bryant adds risky intermediary assets

[1] Anthony Saunders, Marcia Millon Cornett – "*Financial Institutions Management: A Risk Management Approach*".

and asymmetric information. By assuming that the bank's loans are risky there is a probability that the endowments of depositors will not be delivered. This information is distributed asymmetrically over the population, the knowledgeable individuals react by withdrawing their deposits. The intermediary cannot distinguish between standard early withdrawers and knowledgeable individuals. Once the withdrawals reach more than the expected a% the bank acknowledges that a bank run is in place. This brings government backed deposit insurance into the model. Bryant, however is skeptical to the properties of deposit insurance "*In the first place, the deposit insurance does not necessarily keep a bank run from occurring. Secondly, the deposit insurance may cause rather complex redistributions of risk. The reaction of the private sector to the deposit insurance influences and may partially offset the redistributive effects of the insurance.*" (Bryant, 1980)

A series of studies follow debating as to how banks, though subject to bank runs, can attract deposits by providing "allocations superior to those of exchange markets" (Diamond, Dybvig, 1983), mainly driven by the investor's demand for liquidity. Bank runs are observed as a demand deposit equilibrium (one of many) and superior contracts, backed by deposit insurance, can reduce the risk of bank runs altogether.

1.2 Bank-Run models in the Literature

A bank-run occurs when a large number of depositors withdraw their money because they believe the bank might fail. As more people withdraw their deposits, the likelihood of default increases, and this encourages further withdrawals. In theory, this can be triggered by mere rumors (if widespread enough) or by actual excessive risk exposure by the banks which becomes known to the public. It is important to note that this effect is contagious, one bad bank can disturb the credibility of the whole banking system and spread mistrust among depositors. Financial contagion, i.e., the situation in which liquidity or insolvency risk is transmitted from one financial institution to another, is viewed by policy makers and academics as a key source of systemic risk in the financial sector. Events in the 2007-2009 financial crisis and the recent European sovereign debt crisis highlight the potential contagion of deposit withdrawals across banks and the resulting implications for financial stability.

In his paper Charles Calomiris (2007) explains that there are two major reasons for bank failures. One is the result of fundamental bank insolvency which triggers a signal to the depositors, who in turn believe their money is no longer safe. The other major reason is unwarranted or unexpected major withdrawals, unrelated to the solvency of the bank, during panics or crises that can become contagious amongst all banks and create systemic instability. This contagion event has motivated public policies and regulations towards banks. Those policies include assistance mechanisms intended to protect banks from unwarranted withdrawals of deposits (central bank lending during crises, deposit insurance, and government-sponsored bank bailouts) and a host of prudential regulatory policies. "*When banks that are intrinsically solvent are subjected to large unwarranted withdrawals and may fail because of this withdrawal pressure*" (Calomiris, 2007). In a previous paper, Diamond and Dybvig (1983) develop a banking model with multiple equilibria. One of the equilibria is a systemic bank run, which occurs simply because depositors believe that others will run. More generally, observers of historical panics sometimes document depositors imitating each other's withdrawal behavior; depositors may line up to withdraw their funds simply because others are doing so, particularly considering the incentives implied by the sequential service constraint. "*Investors face privately observed risks which lead to a demand for liquidity. Traditional demand deposit contracts which provide liquidity have multiple equilibria, one of which is a bank run. Bank runs in the model cause real economic damage, rather than simply reflecting other problems." (Calomiris 2007).* Calomiris points another view of banking distress from a different direction of causality: a chain of causation from non-panic-related, observable, exogenous adverse changes in the economic conditions of banks, to intrinsic weakening of bank condition, ultimately leading to bank failure. "*According to this view, fundamental losses to bank borrowers cause losses to banks, which may bankrupt some banks and lead other weakened banks to curtail the supplies of loans and deposits as part of a rebalancing of portfolios to limit default risk in a disciplined market*" (Calomiris and Wilson 2004). According to this point of view distress can magnify economic downturns even if banks are not the shock does not originate from them. Banks' response through their prudential decisions to curtail the supplies of loans and deposits will magnify macroeconomic shocks, even if banks are passive responders to shocks and even if depositors avoid engaging in unwarranted runs or panics.

Diamond and Dybvig's model is generally considered the basis of a bank run theory. Many recent researchers are based on it. Harald Uhlig (2010) using the 2008 financial crisis attempts to provide a new theoretical model of a systemic bank run. "*A systemic bank run is a situation, in which early liquidity withdrawals by long-term depositors at some bank are larger and a bank run more likely, if other banks are affected by liquidity withdrawals too, i.e. the market interaction of the distressed banks is crucial. This is different from a system-wide run, which may occur if all depositors view their banks as not viable, regardless of whether the depositors* *at other banks do too".* His model can be summarized as follows. Consider an environment, in which depositors interact with a local bank, which in turn refinances itself through a demand deposit account with one of a few core banks, who in turn invest in long-term securities. He assumes that there are two aggregate states, *"a "boom" state and a "bust" state. In the "boom" state, essentially, things are fine. More serious problems arise in the bust state. If the long-term securities become heterogeneous in terms of their long-term returns, and local banks hold heterogeneous beliefs regarding the portfolio of their core bank. Therefore, some local banks may withdraw early, even if local consumption demands are "late"."* Long term securities will then be sold to outside investors, who may be heterogeneous in their information and their beliefs regarding these assets. (Uhlig 2010)

Recent literature presents more quantitative models for bank runs, based on the Diamond and Dybvig (1983) model as a benchmark. In a working paper, Mattana and Panetti (2014) present "A Dynamic Quantitative Macroeconomic Model of Bank Runs". Their model is based on a neoclassical growth model an infinite horizon, general equilibrium, dynamic model populated by households and firms combined with the theory presented by Diamond and Dybvig in which banks provide insurance to their depositors against the realization of an idiosyncratic preference shock, that makes them willing to consume before the maturity of their investment. Their main contribution regards the quantitative evaluation of these effects. In particular, they *"calibrate the probability of the idiosyncratic liquidity shock, which is a standard parameter in many theories of banking*". Chakravartyy, Fonsecaz and Kaplanx (2013) present an experiment on empirical evidence about the causes of bank runs contagions in a modified Diamond-Dybvig setup with two types of banks. In the first type, depositors see their bank's liquidity level before deciding. In the second type, depositors only see first type bank withdrawals before deciding. (This represents the distribution of asymmetrical information in sort of manner). They find evidence that banking fundamentals, in our case short-term liquidity, are strongly correlated not only with the likelihood of a run on a bank, but also with the likelihood of contagion spreading to a separate bank. We identify three mechanisms through which short-term liquidity affects runs. The first is the immediate effect of liquidity under perfect information. The second is the bank's previous level of liquidity. The third concerns the beliefs about one's bank based on the behavior of depositors in another bank. They also find evidence that banking contagions can be caused by panic. When bank liquidities are linked, the level of withdrawals in the one Bank acts as a coordination device for other bank depositors. As such, runs on the latter bank are as easy to start as to stop. However, panic-based contagions are harder to stop when started. In the absence of a reliable signal, depositors may not be able to coordinate on the no-run equilibrium and as such panic-based contagions may be more persistent than information-based ones.

In another research Kiss, Lara and Garcia (2017) provide experimental evidence that *"panic bank runs occur in the absence of problems with fundamentals and coordination failures among depositors, the two main culprits identified in the literature"*. Their findings suggest that panic also manifests in depositors, who overestimate the probability that a bank run is underway. Loss-aversion has a predictive power on panic behavior, while risk or ambiguity aversion do not. By eliciting beliefs, they find that depositors have unreasonable beliefs about the behavior of others when they observe a withdrawal, a further signal of panic. Their contribution is to show that panic behavior can be regarded as a new source of bank runs besides providing clean evidence on the existence of panic bank runs, they find that "*loss-averse subjects are more likely to withdraw their deposits when they observe others who withdraw."*

1.3 Bank-Runs and Government intervention

Almost all bank runs in recent history have been responded with heavy government intervention (sometimes a coordinated intervention by multiple governments as in the EU).

In a BIS working series paper Mark Carlson and Jonathan Rose (2016) face the question of whether a bank run can be stopped by examining the run on Continental Illinois in 1984. We find that the run slowed but did not stop following an extraordinary government intervention, which included the guarantee of all liabilities of the bank and a commitment to provide ongoing liquidity support.

ECB's working paper "Understanding Bank Run Contagion" by Brown, Trautman and Vlahu (2014) states: "*The liquidity support by the Bank of England to the UK mortgage lender Northern Rock in September 2007 was primarily motivated by fears that restricted access to deposits for Northern Rock clients could trigger a deposit run throughout the UK financial system. When liquidity support to Northern Rock did trigger a depositor run on this bank, the UK authorities announced that all deposits at Northern Rock would be guaranteed. This move came after first signs that the depositor run on Northern Rock might indeed spread to other, similar, UK financial institutions. More recently, in 2012, massive withdrawals from Spanish* *banks sparked fears that depositors of the UK subsidiary of Banco Santander may "run" on their bank*".

Government intervention has also been debated as to whether it creates false motives for risk taking and eases market discipline. Government reactions to the recent crisis included expanding deposit insurance coverage and rescuing troubled institutions, including some institutions that might not otherwise be considered too important to fail. "*These actions may have the unintended consequence of a reduction in market discipline that might otherwise penalize banks for risk-taking behavior"* Berger and Turk-Ariss debate (2014).[12] However, government intervention during the financial crisis of 2008-209 and shortly after was deemed necessary especially in the EU. A series of regulatory measures and legislation forced member states to actively support their banking system, even through direct financing sometimes. The most notable one is the decision in October 2008 to raise the amount of deposits insured by national guarantee schemes to a minimum of 50.000 euros and the to 100.000 euro by 2010 (directive 94/19/EC revised in 2008).[2]

There are however more out loud voices against government intervention. In his paper on Deposit Insurance Eugene White (1995) argues that deposit insurance should not be recommended because "*it presents enormous incentive problems and demands additional regulations and close supervision to make it work".* He presents an alternative instead*: "regulators could require each bank to offer deposit accounts that are segregated, treasury bill mutual funds. Banks could then advertise these funds as safe assets, perhaps guaranteed or backed by the government. This type of account is in effect insurance from the government, offering the same guarantee as government bonds. But it removes the wrong incentives for financial institutions that arise from insuring bank deposits".*

1.4 Factors that determine depositor behavior- Empirical studies

In another research, Ece Ungan and Caner study the depositor behavior and market discipline in Turkey before and after the crisis of 2001. Their results provide evidence for the depositor discipline during the analysis period for the insured and uninsured deposits. The important determinants of depositor discipline are the ratio of total loans to total assets, loans to other banks to total assets, cash, reserves and bonds to total assets and capitalization. However, the announcement of blanket guarantee for uninsured bank debts after the initialization of banking

[2] *https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52008AB0070*

industry restructuring program in 2001 hindered monitoring motives of depositors and uninsured debtholders of the banks.

In a paper by Barajas and Steiner (2000) depositor behavior and market discipline in Colombia is studied. They show through panel data estimations for the period 1985-99 that depositors prefer banks with stronger fundamentals and that banks tend to improve their fundamentals after being "punished" by depositors. Therefore their main focus on bank specific characteristics shows that market discipline is present with deposits.

Depositor behavior has been associated with bank-specific characteristics, random runs, or contagion episodes. In their study, Levy-Yeyati, Peria and Schmukler (2010) study depositor behavior using evidence from Argentina and Uruguay during the events of 2000-2002 bank runs and show that macroeconomic risk is also important. According to their study "*a few macroeconomic shocks can quickly cause large runs. Macroeconomic risk affects deposits regardless of traditional bank-specific characteristics*". Furthermore, they show that bank exposure to macroeconomic factors can explain differences in deposit withdrawals. During crises, the evolution of bank-specific characteristics is mainly driven by macroeconomic factors, while the informational content of bank-specific variables declines. The explanatory power of macroeconomic risk, measured by country risk bond spread and exchange rate risk, is increased significantly during crisis episodes. Overall, depositors seem responsive to risk in a broader sense than that often considered by literature.

In a working paper series of the Central bank of Azerbaijan, Mammadova et al (2016), the response of depositors to macroeconomic, alternative investment and bank specific shocks is analyzed by implementing panel time series methods that are robust to regional heterogeneity and inter-dependencies. They consider that macroeconomic and alternative investment factors are initially exogenous to the banking system and hit all banks simultaneously. Their paper provides evidence regarding the importance of relationship between deposits and macroeconomic factors, specifically currency risk.

1.5 Factors that determine depositor behavior- The question under study

This thesis examines the determinants of depositor behavior on an aggregate-country level, rather than studying deposits in individual banks. The question under study is whether there are country specific characteristics that influence the behavior of the depositors in that particular country. Country risk and the financial crisis are considered as in Levy-Yeyati et al

(2010) and Mammadova et al (2016). This study includes macroeconomic factors that are connected to the capability of depositors to save more or consume more than they save. These factors are unemployment and economic sentiment.

This thesis studies the impact of the abovementioned macroeconomic factors on bank deposits in 9 eurozone countries shortly before and after the financial crisis and the eurozone debt crisis of 2008-09. The main question under study is: Are there factors that influence bank depositor behavior on country level and/or cross-country level, regardless of bank specific characteristics? The attempt to answer this question uses two methodological approaches. First through panel regression estimates using all the available data in panel form. Second through simple linear regressions for each country. The results from each approach will then be discussed and analyzed in comparison with each other and with previous studies as well.

1.6 The events of the 2000s European debt crisis

Since the study focuses on eurozone countries during the period 2004-2017. it is important to go through the events of that period to place a context for the results.

The eurozone (officially called the euro area) is a monetary union of 19 of the 28 European Union member states, which have adopted the euro (€) as their common currency and sole legal tender. The monetary authority of the eurozone is the Eurosystem, which comprises of the European Central Bank (ECB) and the national central banks of each member state.[3]

In 1998, eleven-member states of the European Union had met the euro convergence criteria, and the eurozone came into existence with the official launch of the euro (alongside national currencies) on 1 January 1999. Physical notes and coins were introduced on 1 January 2002 replacing all national currencies. Between 2007 and 2015, seven new states acceded.[3]

From late 2009, fears of a sovereign debt crisis in some European states developed, with the situation becoming particularly tense in early 2010. Greece was most instantly affected, but fellow Eurozone members Cyprus, Ireland, Italy, Portugal and Spain were also significantly affected. In the EU, especially in countries where sovereign debt has increased sharply due to bank bailouts, a crisis of confidence has emerged with the widening of bond yield spreads and

[3] *https://en.wikipedia.org/wiki/Eurozone*

risk insurance on credit default swaps between these countries and other EU members, most importantly Germany.

Concern about rising government deficits and debt levels across the globe together with a wave of downgrading of European government debt created alarm in financial markets. The debt crisis is mostly centered on events in Greece, where the cost of financing government debt has risen. On 2 May 2010, the Eurozone countries and the International Monetary Fund agreed to a €110 billion loan for Greece, conditional on the implementation of harsh austerity measures. On 9 May 2010, Europe's Finance Ministers approved a comprehensive rescue package worth €750 billion (then almost a trillion dollars) aimed at ensuring financial stability across Europe by creating the European Financial Stability Facility. The Greek bail-out was followed by a €85 billion rescue package for Ireland in November, and a €78 billion bail-out for Portugal in May 2011.

The detailed causes of the debt crisis varied. In several countries, private debts arising from a property bubble were transferred to sovereign debt because of banking system bailouts and government responses to slowing economies post-bubble. The structure of the eurozone as a currency union (i.e., one currency) without fiscal union (e.g., different tax and public pension rules) contributed to the crisis and limited the ability of European leaders to respond. European banks own a significant amount of sovereign debt, such that concerns regarding the solvency of banking systems or sovereigns are rising.

As concerns intensified in early 2010 and thereafter, leading European nations implemented a series of financial support measures such as the European Financial Stability Facility (EFSF) and European Stability Mechanism (ESM). The ECB also contributed to solve the crisis by lowering interest rates and providing cheap loans of more than one trillion euro to maintain money flows between European banks. On 6 September 2012, the ECB calmed financial markets by announcing free unlimited support for all eurozone countries involved in a sovereign state bailout/precautionary program from EFSF/ESM, through some yield lowering Outright Monetary Transactions (OMT).[4]

Return to economic growth and improved structural deficits enabled Ireland and Portugal to exit their bailout program in July 2014. Greece and Cyprus both managed to partly regain market access in 2014. Spain never officially received a bailout program. Its rescue package

[4] *https://en.wikipedia.org/wiki/European_debt_crisis*

from the ESM was earmarked for a bank recapitalization fund and did not include financial support for the government itself.

The crisis has had significant adverse economic effects and labor market effects, with unemployment rates in Greece and Spain reaching 27%, and was blamed for subdued economic growth, not only for the entire eurozone, but for the entire European Union.[5]

The rest of the thesis is structured as follows: Chapter 2 analyzes the methodological approach and the model variables, in Chapter 3 the results of the estimated models are presented and discussed. Finally, Chapter 4 concludes with some comments and proposes future studies. Detailed literature is presented at the end.

[5] *https://en.wikipedia.org/wiki/European_debt_crisis*

Chapter 2: The Model Methodology

2.1 Panel Data Regression Model

In the present study, panel data were used in order to estimate the impact of macroeconomic factors on bank depositor behavior across 9 countries, during the period 2004-2017.

Panel data is used to combine cross-sectional data with time series. Simply put, a cross section of N units is observed repeatedly over T periods. Macro panels are characterized by having a relatively large T and relatively small N. These variables are usually available for a long period of time and for a limited set of countries. A big benefit of using panel data is that it allows to control for unobserved heterogeneity. Some cross sections (countries in our study) may have some unique characteristics that are unknown to the researcher and need to be considered in the estimation to avoid endogeneity bias. A typical two variable panel regression equation is depicted like this:

$$Y_{it} = \alpha + \beta \cdot X_{it} + \varepsilon_{it}$$

where i indicates the specific cross section and t indicates the specific time period (month).

The equation above is much like the simple linear regression but with two dimensional observations. Usual assumptions for the linear regression error term must hold (zero mean, homoscedasticity, no autocorrelation, exogeneity). Yet the assumption that the intercept α is the same across time and cross sections is very restrictive and we have reasons to allow some flexibility and permit variation either cross sectional (Cross Section Effects) or in time (Period Effects).

Most of the time, we allow the intercept to vary within cross units. There are two alternative methods on how to achieve this:

- ***Fixed effects:*** In this case, the model uses the method of dummy variables to estimate N intercepts (α), one for each cross unit. This allows for easy and straight interpretation (each intercept represents section specific effects) but too many new parameters for estimation.

- ***Random effects:*** In this case, the model estimates only an average value and a variance for the intercept (α) and assigns N different intercepts from a random distribution. In this case there are only 2 new parameters to estimate, but no practical interpretation.

To choose between the two methods we apply the Hausman test. This test is the ratio of the squared difference between the two estimated coefficients over the difference between their two corresponding variances. The ratio follows a χ^2 distribution with (k-1) degrees of freedom (where k-1is the number of partial coefficients in the model). The null hypothesis is that the Random Effects are valid (GLS estimates are consistent). The Hausman test explores the null hypothesis that the coefficients estimated by efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. If they are, then it is consistent to use random effects. If we reject the null hypothesis and use the fixed effects method, we should test for the groups having a common intercept. If we accept the null in that case, then we should estimate the Panel model using no effects – Pool OLS with a constant intercept α. [6,7]

2.2 Panel Data model for depositor behavior in different countries

In a previous research, Levy-Yeyati, Peria and Schmukler (2010) study depositor behavior under macroeconomic risk, using evidence from Argentina and Uruguay during the events of 2000-2002 bank runs. Their model is based on fixed effects panel estimates using monthly data. For each country, they conduct panel regressions using monthly bank-level information on deposits and bank characteristics and study the impact of macroeconomic factors by adding to such regressions standard measures of country and exchange rate risks. Simple inspection of their results shows similar patterns for both countries under study. "*In the pre-crisis period, bank-specific attributes are either significant and of the expected sign, or not significant, while measures of country and currency risk are never significant. By contrast, during the crisis periods, macroeconomic factors become highly significant, in some cases overshadowing the importance of bank-specific factor*s". (Levy-Yeyati et al 2010)

Our model under study uses different countries as cross sections and country specific macroeconomic factors and country risk as variables to measure their effect before and after the Eurozone debt crisis.

[6] Walter Enders, *Applied Econometric Time Series*. Fourth Edition. Wiley
[7] *http://gretl.sourceforge.net/gretl-help/gretl-guide.pdf*

The model describes the impact of macroeconomic factors on bank depositor behavior in 9 Eurozone countries. The period under study is from 2004 to 2017 (2^{nd} quarter) and the countries are the following (alphabetically):

1. Belgium
2. Finland
3. Germany
4. Greece
5. Italy
6. Latvia
7. Lithuania
8. Luxemburg
9. Spain

Both the period and the countries were selected for their completeness of required data, but there is also a satisfactory level of diversification (before-after crisis, developed and developing markets). The data used is on monthly frequency and is extracted from Reuter's DataStream.

2.3 The Model Variables

Total Deposits

The aggregate amount of deposits in the country's banking system (time deposits, demand deposits, individual and corporate deposits). This is the main (dependent) variable under study. Each Central Bank monitors commercial banks' deposits and provides the report on the total amount of deposits in the system. Interbank and government deposits are not included in this amount.

Unemployment Level

Unemployment level is important for a series of reasons. Unemployment is a measure of economic wellbeing in a country. During a period of deep recession unemployment tends to rise, and fall during economic growth. Moreover, unemployed people have near zero income, but must consume to live. That means they will liquidate whatever savings they have in their bank accounts. If they don't have any, their expenses will burden families and relatives who will in turn liquidate their bank accounts to offset this imbalance.

Economic Sentiment Indicator (ESI)

"The Economic Sentiment Indicator (ESI) is a composite indicator made up of five sectorial confidence indicators with different weights: Industrial confidence indicator, Services confidence indicator, Consumer confidence indicator, Construction confidence indicator, Retail trade confidence indicator. Confidence indicators are arithmetic means of seasonally adjusted balances of answers to a selection of questions closely related to the reference variable they are supposed to track (e.g. industrial production for the industrial confidence indicator). Surveys are defined within the Joint Harmonized EU Programme of Business and Consumer Surveys. The economic sentiment indicator (ESI) is calculated as an index with mean value of 100 and standard deviation of 10 over a fixed standardized sample period. Data are compiled according to the Statistical classification of economic activities in the European Community." (*DG ECFIN*) It is a measure of both economic impact and expectations in household and enterprises.[8]

Bond Spread

The Bond Spread measures the 10-year government bond yield spread against the German benchmark for European countries. Yields are calculated from executable market bid prices in real time and are subject to change daily. For our study, the monthly average bond spread will be used. Generally speaking, the higher risk a bond or asset class is, the higher its yield spread. Very simply, the reason for this difference is that investors need to be paid to take a risk.

A bond issued by a smaller country with weaker financial strength will trade at a higher spread relative to a strong economy. This explains the gap between higher-risk emerging markets and the usually lower-risk bonds of the developed markets. The spread is used to calculate the yield advantage of different government bonds with the same maturities. Spreads are used as a measure of "country risk" thus making them important in our model.

Note: Because the German Bond yield is the benchmark, for Germany, changes of the actual bond yield are measured instead.

[8] *http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Economic_sentiment_indicator_(ESI)*

The European Crisis

A dummy variable is used to account for the effect of the European Debt Crisis, rather than measuring the effect of the Global Financial Crisis of 2008.Tthe European Debt Crisis (or the European sovereign debt crisis) begins when "*several Eurozone member states were unable to repay or refinance their government debt or to bail out over-indebted banks under their national supervision without the assistance of third parties like other Eurozone countries, the European Central Bank (ECB), or the International Monetary Fund (IMF)*" *(https://en.wikipedia.org/wiki/European_debt_crisis).* The dummy variable takes "0" until September 2009 and "1" from October 2009 onwards.

The selection of October 2009 as a benchmark for the Dummy variable (will also be used to determine structural breaks afterwards) is not at all arbitrary or simply based on assumptions. In advance of running our main model regressions, some primary regressions were conducted for each of the countries under study. In these primary regressions we used the Quandt Likelihood ratio (QLR) test, which automatically computes the usual Chow F-test statistic repeatedly with different break dates giving the date with the largest F-statistic value. In other words, it identifies structural breaks in the regression that are not know a priori to the researcher. In 4 out of 9 countries under study the QLR test identified a structural break in October 2009.

The above variables were selected for their completeness of data in terms of country, period and frequency. Other macro variables were not available on a monthly frequency for all the selected countries, or all the time periods and thus their inclusion would reduce the number of observations that could be studied (sample size). Household income, GDP per capita and stock market indices (for banking sector) are some of the variables that were considered but omitted from the current analysis.

2.4 The Main Model

The main model uses Panel Data with two dimensions, where i indicates country (1-9) and t indicates time period (month):

$$\Delta \log(TotalDeposits_{it}) = a_i + b_1 * \Delta \log(UnemploymentLevel_{it}) + b_2 * \Delta ESI_{it} + b_3 * \Delta BondSpread_{it} + b_4 * DummyCrisis + b_5 * \Delta \log(TotalDeposits_{it-1}) + \varepsilon_{it}$$

α_i: The constant term of the country i

$TotalDeposits_{it}$: The aggregate amount of deposits in millions euro of the country i in month t.

$TotalDeposits_{it-1}$: The aggregate amount of deposits in millions of euro of the country i in month t-1 (1 lag). This is an autoregressive AR1 term that controls for autocorrelation.

$UnemploymentLevel_{it}$: The number of unemployed people in the country (Seasonally Adjusted) of the country i in month t.

$BondSpread_{it}$: 10-year government bond yield spread against the German benchmark (actual change for German Bond) of the country i in month t.

$DummyCrisis_{it}$: Dummy variable takes 1 from October 2009 onwards, takes 0 otherwise.

ε_{it}: The error term of the regression

The model is estimated using Panel fixed effects in Gretl. Hausman test shows that the coefficients estimated by efficient random effects estimator are not consistent. We also test for the groups having a common constant term, in which we reject the null hypothesis as well. Fixed effects allow for country specific constant term a_i that controls for country specific deposit levels.

2.5 Estimated models for sub-samples: the Chow test

To further analyze the primary results, the sample was split in two time periods: pre-crisis and post-crisis respectively. Rather than arbitrarily splitting the sample and running two regressions, we would impose a test to ensure that a structural break (assumed to be known a priori) is indeed present. This test is the Chow Test.

The Chow test determines whether the coefficients from two regression analyses are the same (null Hypothesis). To do this, three regressions are required: one for each group/sub-sample and one for the entire sample. Then an F test is imposed to determine if the models are significantly different from each other.[9]

[9] Krämer Walter. (1989) *The Robustness of the Chow Test to Autocorrelation among Disturbances.*

As mentioned before, there is strong evidence to support using the Chow test to identify whether structural break in October 2009 is present. The test is ran on Gretl using the panel regression model with respect to the DummyCrisis variable (which is omitted from the model) and the results show rejection of the null hypothesis (no structural break) with a p-value of $\sim 5*10^{-8}$. Thus, it is safe to assume that a break is present and calculate two separate regression models for each sub-sample/period.

As before, the models are estimated using Panel fixed effects in Gretl. Hausman test shows that the coefficients estimated by efficient random effects estimator are not consistent. We also test for the groups having a common constant term, in which we reject the null hypothesis as well.[10,11]

2.6 Linear Regression models for each country

The panel regression models are useful for providing results by combining data from specific cross sections across the same time periods. But in order to further analyze this evidence, we use the same data to run separate simple linear regressions for each of the 9 countries. In this case the variables will be one dimensional (time series) and our model equation will be the following, where t indicates time period (month):

$$\Delta \log(TotalDeposits_t) = \alpha + b_1 * \Delta \log(UnemploymentLevel_t) + b_2 * \Delta ESI_t + b_3 * \Delta BondSpread_t + b_4 * DummyCrisis + b_5 * \Delta \log(TotalDeposits_{t-1}) + \varepsilon_t$$

The model is estimated using Ordinary Least Squares method in Gretl. Every regression was tested for autocorrelation and heteroscedasticity. When there was either of them present, the model was re-estimated using HAC standard errors (Heteroskedasticity and Autocorrelation Consistent Standard Errors). When the main regression was estimated, a Chow test was applied to test whether a structural break is present during the month 10/2009. When the Chow test showed the presence of structural break, two more regressions were estimated for the two periods. The same procedure was applied for each of the 9 countries under study and the results are depicted in the Tables 2-10.[11]

[10] Walter Enders, Applied Econometric Time Series. Fourth Edition. Wiley
[11] http://gretl.sourceforge.net/gretl-help/gretl-guide.pdf

2.7 Descriptive Statistics tables for the model Variables

Table A. Average for the period 2004-2017 (2nd Q)				
Country	Total Deposits (in millions €)	Unemployment Level (in thousands)	ESI	Bond Spread
Belgium	459.243,19 €	421,81	101,11	0,54
Finland	148.461,86 €	217,60	100,88	0,21
Germany	2.816.705,48 €	3.386,78	101,09	0,02*
Greece	178.890,82 €	813,21	94,08	6,37
Italy	1.198.659,71 €	2.311,96	98,95	0,82
Latvia	4.638,31 €	98,10	102,35	2,41
Lithuania	7.301,34 €	164,78	103,11	1,99
Luxemburg	122.819,10 €	12,53	98,44	0,26
Spain	2.276.448,11 €	3.482,66	98,02	1,30
Total Average	801.463,10 €	1.212,16	99,78	1,82
*For Germany, actual m-o-m 10Y bond yield is measured instead of bond spread				

Table B. Maximium Values for the period 2004-2017 (2nd Q)				
Country	Total Deposits (in millions €)	Unemployment Level (in thousands)	ESI	Bond Spread
Belgium	628.489,00 €	495,14	117,20	2,91
Finland	214.527,00 €	324,00	115,40	0,79
Germany	3.370.259,00 €	5.011,00	117,40	4,58*
Greece	246.590,28 €	1.356,90	113,20	39,75
Italy	1.651.012,90 €	3.334,27	112,20	4,87
Latvia	8.859,30 €	181,51	115,30	10,53
Lithiania	11.457,00 €	332,25	118,70	11,04
Luxemburg	231.258,00 €	18,00	114,40	1,36
Spain	3.069.577,00 €	4.899,89	111,80	5,48
Total Max.	3.370.259,00 €	5.011,00	118,70	39,75
*For Germany, actual m-o-m 10Y bond yield is measured instead of bond spread				

Table B. Minimum Values for the period 2004-2017 (2nd Q)				
Country	Total Deposits (in millions €)	Unemployment Level (in thousands)	ESI	Bond Spread
Belgium	305.402,00 €	334,57	68,80	0,00
Finland	90.558,00 €	144,00	77,80	-0,07
Germany	2.145.786,00 €	2.539,00	70,40	-0,13
Greece	129.048,57 €	362,90	75,20	0,03
Italy	664.207,80 €	1.387,79	73,70	-0,54
Latvia	1.400,10 €	49,86	70,20	-0,37
Lithiania	2.499,00 €	63,52	67,40	-0,07
Luxemburg	55.436,00 €	9,00	74,10	-0,33
Spain	1.228.724,00 €	1.986,54	72,20	-0,02
Total Min.	1.400,10 €	9,00	67,40	-0,54
*For Germany, actual m-o-m 10Y bond yield is measured instead of bond spread				

Source: Thomson Reuters Datastream

Chapter 3: Results of the estimated models

3.1 Results of the estimated panel model in the full sample

The main results are shown in Table 1.1. All variables show some level of statistical significance. The highest p-value is found in ESI's coefficient (~ 0,05*), but still a sufficient level of statistical significance to imply that economic sentiment affects bank deposits with a positive coefficient (~0,0005), so when residents' income and welfare increases they tend to save more (mainly because they earn more). The lowest p-value (excluding the constant) is found in lagged total deposits (~4*10-15***) with a negative coefficient that may suggest that depositors tend to withdraw more after a period where they deposited more and vice versa.

The Crisis also seems to affect deposit movements negatively (coeff~ -0,006, p-value~ 2*10-6***), which is expected. The impact of the Global Financial Crisis in 2008 raised concerns about the banking system's resilience and later the European Debt Crisis by the end of 2009 introduced the probability of default of Eurozone member States, which weakened the credibility of deposit insurance. Therefore, many depositors rushed to withdraw their savings mainly due to lack of trust rather than spending needs. This created a series of bank runs in response to events that raised uncertainty even more (elections, political events, Eurogroup announcements and austerity measures).

The effects of unemployment (coeff~ -0,03, p-value~ 0,01**) seem to validate our assumption that the unemployed tend to liquidate their savings, or at least stop saving money, which is expected. Periods of economic growth, which is linked to lower unemployment levels, could also be linked to increased deposit rates due to increased income.

Country risk (BondSpread, coeff~ 0,002, p-value ~ 0,0075***) seems to be significant as assumed. Higher country risk means higher probability of default for the state, thus raising uncertainty. Most Central Banks provide depositor insurance for deposits in commercial bank, but a possible government bankruptcy weakens the insurance credibility, and raises the risk of keeping bank deposits. When the risk outweighs the benefits (safety from theft, interest rate) depositors withdraw. In total, all these macroeconomic factors seem to affect depositor behavior one way or another.

3.2 Results of the estimated panel model in the two sub-periods

Pre-crisis period

In the Pre-Crisis model (Table 1.1) the coefficients of Unemployment and ESI are statistically significant (p-values 0,0068*** and 0,0389** respectively) while the coefficient of Bond spread is not (p-value 0,8396). This shows that, prior to the economic and debt crisis, country risk did not affect depositor behavior, as there was little concern about states going bankrupt and thus bank deposits were considered secure and Central Bank's insurance credible. However, economic sentiment and unemployment have more impact during this period, which is shown by higher coefficients and lower p-values than the full period model.

The significance of these two factors should not be underestimated when studying consumption-saving or borrower-lending models (like Samuelson's 1958 & Bryant's 1980 respectively). Any saving plan that an individual may follow could be disturbed by a sudden change in his/her financials. These changes can occur on aggregate level, like a recession, a rise in unemployment and austerity measures etc., even without the occurrence of a major financial crisis. On the other hand, when the aggregate economic wellbeing is on the rise and unemployment falls, the amount of bank deposits is expected to rise. These factors represent the potentiality of depositors rather than their motivation or utility.

Post crisis period

In the Post-Crisis model (Table 1.2) the image is reversed. The effect of country risk (BondSpread) shows statistical significance (p-value 0,0006) while Unemployment and ESI have quite high p-values (0,8 & 0,7 respectively). This may be due to financial crisis events and Eurozone member states default possibility, as explained before. But during this period, country risk seems to be the main driver of depositor behavior. Major political events take place that raise uncertainty even more, thus raising the Bond Spreads, and cause major bank withdrawals and bank-runs. This effect overrides the effects of the other two factors, which are considered less important.

This is in line with other studies, particularly Levy-Yeyati et al (2010) who find that country risk effect is more significant during the crisis period in Argentina and Uruguay. Moreover, it is in line with the initial hypothesis that depositor insurance by the state (or other government related institutes) is considered less credible when country risk rises. The main motivation of depositors seems to be loss aversion, although there is only one case in the euro area countries where the depositors lost their savings: Cyprus, where uninsured deposits above 100.000 euro received a haircut of ~9%.

3.3 Results of the estimated linear regression models in each country

The results shown on tables 2-10 can be further analyzed in comparison with the above, to draw some country specific conclusions about when and where the initial assumptions apply.

3.3.1 Belgium

The results for Belgium are shown in Table 2. The lowest p-value is found in lagged total deposits (~0,02***) with a negative coefficient, which is consistent with the panel data estimates, and may suggest that depositors tend to withdraw more after a period where they deposited more and vice versa. All other explanatory variables, bond spread, unemployment, ESI and the crisis, seem to be insignificant for Belgium depositor behavior during the period under study, with p-vales above 0,2. Chow test shows there is no structural break at observation month 10/2009. This is not surprising as Belgium is a robust economy and a center of the EU operations and almost unaffected by the eurozone debt crisis. Deposits are insured by a depositor's Protection Fund and the amount was raised from €20.000 to €100.000 in 2009.

Belgium ranks 35^{th} worldwide in GDP per capita (€39.500), its GDP grew by 1.7% in 2017 and the budget deficit was 1.5% of GDP. Its Gross National saving rate was 23,5% in 2017 and ranks 63^{th} in world comparison. Unemployment stood at 7.3%, however the unemployment rate is lower in Flanders than Wallonia, 4.4% compared to 9.4%, because of industrial differences between the regions. Present government has pledged to further reduce the deficit in response to EU pressure to decrease Belgium's high public debt of about 104% of GDP, but such efforts could also dampen economic growth. In addition to restrained public spending, low wage growth and higher inflation promise to curtail a more robust recovery in private consumption.

The social security system, which expanded rapidly during the prosperous 1950s and 1960s, includes a medical system, unemployment insurance coverage, child allowances, and other benefits and pensions. With the onset of a recession in the 1970s, this system became an increasing burden on the economy and accounted for much of the government budget deficits.[27]

3.3.2 Finland

The results here are similar to Belgium (Table 3). The lowest p-value is found in lagged total deposits (~0,009***) with a negative coefficient, which is consistent with the panel data estimates, and may suggest that depositors tend to withdraw more after a period where they deposited more and vice versa. All other explanatory variables, bond spread, unemployment, ESI and the crisis, seem to be insignificant for Finland depositor behavior during the period under study, with p-vales above 0,4. Chow test shows there is no structural break at observation month 10/2009. Bank deposits in Finland are insured by the "Deposit Guarantee Fund" and the amount was increased from €25.000 to €50.000 in October 2008 and then to €100.000 in January 2011.

Finland had been one of the best performing economies within the EU before 2009 and its banks and financial markets avoided the worst of global financial crisis. However, the world slowdown hit exports and domestic demand hard in that year, causing Finland's economy to contract from 2012 to 2014. The recession affected general government finances and the debt ratio. The economy returned to growth in 2016, posting a 1.9% GDP increase before growing an estimated 3.3% in 2017, supported by a strong increase in investment, private consumption, and net exports. GDP is expected to grow a rate of 2-3% in the next few years. Finland ranks 37th in GDP per capita (€39.044) and 72nd in the Gross National saving rate with 22,4% in 2017. Unemployment security benefits for those seeking employment are at an average OECD level. The labor administration funds labor market training for unemployed job seekers, the training for unemployed job seeker can last up to 6 months, which is often vocational.

3.3.3 Germany

In Germany (Table 4), ESI seems to have the lowest p-value in the full period, but a negative sign, which is unexpected. It may suggest that a rise in economic sentiment may drive German citizens to consume more and save less and a fall in economic sentiment would have the opposite effect. Unemployment level has a p-value of 0,08 and a negative sign as expected, consistent with the panel model estimates. The crisis through the dummy variable shows statistical significance with a p-value of 0,0038. On the other hand, bond spread (which is the actual m-o-m change of the 10Y government bond yield in this case) has a relative high p-value (~0,4) which makes the effect statistically insignificant, so does the lagged deposits variable. Chow test show there is a structural break in the month October 2009, with a mediocre p-value of 0,59, thus we proceed with the estimation of two models for the two sub-samples.

In the pre-crisis period (table 4.1) the ESI has the lowest p-value (0,0018) but again with a negative sign as in the full period model, not in line with our initial hypothesis. The rest of the explanatory variables do not show statistical significance as they have p-values above 0,4.

In the post crisis period (Table 4.2) unemployment is the variable with the lowest p-value (~0,03) and a negative sign as expected. However, in the estimated panel model unemployment's effect was limited in the post-crisis period. This can be explained through the effect that the Crisis had on Germany in particular. Country risk may not have been a significant factor, as the state's credibility was never questioned, but the effect that the Crisis had on unemployment affected depositor's behavior directly or indirectly. All other variables have p-values above 0,1 and are not considered statistically significant.

The German economy - the fifth largest economy in the world in PPP terms and Europe's largest - is a leading exporter of machinery, vehicles, chemicals, and household equipment and benefits from a highly skilled labor force. In 2016, Germany recorded the highest trade surplus in the world worth $310 billion, making it the biggest capital exporter globally. Germany's GDP per capita is €42.795, ranks 28th worldwide, and Gross national saving rate is 27% which ranks 39th worldwide. Unlimited state guarantee for deposits was announced in October 2008 and the 4 banking associations run voluntary additional guarantee schemes, which go beyond the European minimum of EUR 100,000.

The German economy practically stagnated in the beginning of the 2000s. The worst growth figures were achieved in 2002 (+1.4%), in 2003 (+1.0%) and in 2005 (+1.4%). Unemployment was also chronically high. Due to these problems, together with Germany's aging population, the welfare system came under considerable strain. In the later part of the first decade of 2000 the world economy experienced high growth, from which Germany as a leading exporter also profited. The nominal GDP of Germany contracted in the second and third quarters of 2008, putting the country in a technical recession following a global and European recession cycle. Germany exited the recession in the second and third quarters of 2009, mostly due to rebounding manufacturing orders and exports - primarily from outside the Euro Zone - and relatively steady consumer demand.

3.3.4 Greece

In the model estimated for the full period (2004-2017, Table 5), the lowest p-value is found in the Crisis dummy variable (~$5*10^{-5}$), which is expected considering how depositors in Greece reacted to the public debt crisis and the supervisory mechanism set up by EU, IMF and ECB (troika). ESI has a positive sign and Bond spread a negative one and both have low p-values (~0,04 and ~0,0007 respectively) as expected. Unemployment however shows no statistical significance for the full period. Another observation that can be made is that the R-squared for this model is 0,25, the highest estimated for this thesis. The Chow Test shows that there is a structural break in the month October 2009 and so two more models are estimated in this case.

In the pre-crisis model (Table 5.1) bond spread has a p-value of 0.02 and lagged deposits a p-value of 0,016, thus being the only statistical significant explanatory variables in the model. Seems that in Greece, country risk has always been a driver of depositor behavior, regardless of crisis, and moving deposits to off-shore accounts has been a common safe practice, particularly for large depositors.

In the post crisis model (Table 5.2) however, all variables show a level of statistical significance. The lowest p-value is found in the Bond Spread (0,009) which is expected considering the effect that the crisis had on the state’s and the banking system’s credibility. Unemployment levels rose dramatically during this period, subsequently influencing depositor’s behavior as expected (p value 0.03). ESI has a p-value of 0.0622, also depicting how the dramatic change of economic condition of households and businesses in Greece during this period affected bank deposits.

Greece’s GDP per capita is €23.699 in 2017, ranking 73rd, and Gross national saving rate is 10.5% of GDP ranking 155th worldwide. The severe recession of recent years has seen GDP per capita fall from 94% of the EU average in 2009 to 67% in 2017. Actual Individual Consumption (AIC) per capita fell from 104% of the EU average to 77% during the same period. Deposit insurance was increased from €20.000 to €100.000 in 2008 and provided by the Deposits and Investments Security Fund (TEKE), which is secured by the state, the Central Bank of Greece and the Hellenic Bank Association.

The Greek economy averaged growth of about 4% per year between 2003 and 2007, but the economy went into recession in 2009 because of the world financial crisis, tightening credit conditions, and Athens' failure to address a growing budget deficit. By 2013, the economy had contracted 26%, compared with the pre-crisis level of 2007. Greece met the EU's Growth and Stability Pact budget deficit criterion of no more than 3% of GDP in 2007-08, but violated it in 2009, when the deficit reached 15% of GDP. Deteriorating public finances, inaccurate and misreported statistics, and consistent underperformance on reforms prompted major credit rating agencies to downgrade Greece's international debt rating in late 2009 and led the country into a financial crisis. Under intense pressure from the EU and international market participants, the government accepted a bailout program that called on Athens to cut government spending. Austerity measures reduced the deficit to 1.3% in 2017.

3.3.5 Italy

As shown in Table 6, The lowest p-value (apart from the constant) is found in lagged total deposits (0,08) with a negative coefficient, as expected. All the other explanatory variables have coefficients with p-values over 0,2 and are considered not statistically significant. The Chow test show no structural break at the month October 2009.

Italy is the third-largest economy in the euro zone, but its exceptionally high public debt and structural impediments to growth have rendered it vulnerable to scrutiny by financial markets. Public debt has increased steadily since 2007, reaching 131% of GDP in 2017. Investor concerns about Italy and the broader euro-zone crisis eased in 2013, bringing down Italy's borrowing costs on sovereign government debt from euro-era records. Italy's economy returned to modest growth in late 2014 for the first time since 2011. In 2015-16, Italy's economy grew at about 1% each year, and in 2017 growth accelerated to 1.5% of GDP. In 2017, overall unemployment was 11.4%, but youth unemployment remained high at 37.1%. GDP growth is projected to slow slightly in 2018.

Italy's GDP per capita is €32.400 ranking 50th worldwide. Its Gross national savings rate was 19.6% of GDP in 2017 ranking 94th. Italy's coverage limit for deposits insurance is at 100.000 euro, secured by the deposit guarantee fund (Fondo Interbancario di Tutela dei Depositi). Though Italy was not unaffected by the eurozone debt crisis and its bond spreads skyrocketed in 2011, there was is no evidence of a bank run, or a drop on deposits level during that period. Even the talks about exiting eurozone and returning to a national currency did not affect depositors, who continued to believe their money is safe.

3.3.6 Latvia

In Latvia (Table 7) the lowest p-value is found in the ESI (0,0014) with a positive sign as expected. Also, the Bond Spread coefficient has a p-value of 0,02 and a negative sign as expected. These results agree with the key findings of the panel data model. While

Unemployment and the dummy variable for the crisis show no statistical significance, surprisingly the Chow test for a structural break on October 2009 is positive and two more models are estimated.

In the pre-crisis period (Table 7.1) the lowest p-value is found in ESI (0,0009) while the rest of the variables are considered not statistically significant. Also, the adjusted R-squared is much higher than the one for the full period model (0,16 vs 0,06) which shows better goodness of fit.

In the post crisis period for Latvia (Table 7.2) the coefficient for the Bond Spread variable has a p-value of 0,006 and is considered statistically significant along with the variable for lagged deposits (p-value 0,0025). The rest of the variable are not considered statistically significant. The results here are consistent with panel model and our initial hypothesis. Before the crisis, the macroeconomic factors like ESI seem to be connected to depositor behavior, while after the crisis the effect of these factors is replaced by country risk.

Latvia's GDP per capita is 23.300 euro, ranking 74th worldwide and its Gross national saving rate 20,9% of GDP, ranking 84th. Latvian bank deposits are insured by the standard EU coverage limit of 100.000 euro.

Latvia's economy experienced GDP growth of more than 10% per year during 2006-07, but entered a severe recession in 2008 because of an unsustainable current account deficit and large debt exposure amid the slowing world economy. Triggered by the collapse of the second largest bank, GDP plunged by more than 14% in 2009 and, despite strong growth since 2011, the economy took until 2017 return to pre-crisis levels in real terms. Strong investment and consumption helped the economy grow by more than 4% in 2017, while inflation rose to 3%. In the wake of the 2008-09 crisis, the IMF, EU and other international donors provided substantial financial assistance to Latvia as part of an agreement to defend the currency's peg to the euro in exchange for the government's commitment to stringent austerity measures. The IMF/EU program successfully concluded in December 2011, although, the austerity measures imposed large social costs.

3.3.7 Lithuania

For the full period (2004-2017, Table 8) in Lithuania the lowest p-value is found in the dummy variable for the Crisis (p-value 0,017). Unemployment level also shows a level of statistical significance with a negative coefficient and a p-value of ~0,06. The results regarding these two variables are consistent with the panel model estimates. However, the rest of the variables are statistically insignificant with p-values above 0,1. The Chow test shows a structural break on October 2009 is present and so two more models are estimated.

Despite the Chow test result, in both models estimated for the two sub-periods (shown in Tables 8.1 and 8.2) all the explanatory variables show no statistical significance, with p-values above 0,1 and the F statistic's p-value is above 0,1 in both models. This is somewhat controversial when compared to the full period model and we cannot conclude much from these results. It seems that in the long run unemployment level influences depositor behavior and that the eurozone debt crisis had a negative impact on bank deposits, but when broken down in the sub-periods none of the variables under study seem to be relevant.

GDP per capita in Lithuania is 27.400 euro ranking 62nd worldwide and its Gross national savings rate is 16% of GDP ranking 121st. Deposit insurance amount was increased in 2008 to 100% of deposits up to €20,000. In 2009, the limit was increased to €100,000.

Lithuania is the largest economy among the three Baltic states. It also has the highest GDP per capita in PPP. GDP growth reached its peak in 2007, increasing by 11.1%, and still growing slightly in 2008. Like the other Baltic States, the Lithuanian economy suffered a deep recession in 2009, with GDP falling by almost 15%. GDP growth has resumed in 2010, although at a slower pace than before the crisis.

3.3.8 Luxemburg

The results on Luxemburg for the full period under study (Table 9) show a level of statistical significance for the variable of unemployment level, with a p-value of 0,038 and a negative sign as expected. The lowest p-value is found in lagged total deposits (<0.0001) with a negative sign, while the rest of the variables are not statistically significant. R-squared is also quite high for this model at 0,28 (higher than most of the rest estimated models) which shows goodness of fit despite only two variables being statistically significant.

Despite its small landmass and small population, Luxembourg is the fifth wealthiest country in the world when measured on a gross domestic product (PPP) per capita basis with a € 93.700 GDP per capita in 2017. It's gross national savings rate is 23,2% ranking 61st worldwide. In 2009, the deposit insurance limit was increased to €100.000 from the previous €20.000 limit.

In 2009, a budget deficit of 5% resulted from government measures to stimulate the economy, especially the banking sector, because of the world economic crisis. This was however reduced to 1.4% in 2010. Luxembourg remains a financial powerhouse – the financial sector accounts for more than 35% of GDP. Luxembourg is the world's second-largest investment fund asset domicile, after the US, with $4 trillion of assets in custody in financial institutions.

3.3.9 Spain

For our last country under study, Spain, in the model estimated for the full period (Table 10), the lowest p-value is found in the dummy variable for the Crisis, with a negative sign, which is expected considering that Spain is one of the countries mostly affected by the Crisis. The p-value for the ESI coefficient is 0,04 but with a negative coefficient, contradicting the panel model estimates and the initial hypothesis. The rest of the variables are not statistically significant for this period. The Chow test shows that a structural break is present on October 2009 and so two more models are estimated.

For the pre-crisis period of 2004-09 (Table 10.1) the only variable that seems to be statistically significant is the lagged total deposits variable with a p-value of 0,058 and a coefficient with a negative sign. The rest of the variables' coefficients have p-values above 0,2 and thus are considered not statistically significant.

For the post crisis period of 2009-17 (Table 10.2) the only variable that seems to be statistically significant is the ESI, with a p-value of 0,07 but a negative sign still, as in the full period model for Spain, which is not expected. The rest of the variables are not statistically significant and have p-values over 0,4.

Spain's GDP per capita is €32.800, ranking 49th, its gross national saving rate was 22.5% in 2017 ranking 71st. Spain has two different deposit insurance schemes for retail banks and saving banks both with a deposit limit guarantee for deposits up to €100.000. The economy of Spain is the world's seventeenth-largest by nominal GDP, and it is also one of the largest in the world by purchasing power parity. The Spanish economy is the fifth-largest in Europe behind Germany, United Kingdom, Italy and France; and the fourth-largest in the Euro zone, based on nominal GDP statistics.

The financial crisis of 2008 broke 16 consecutive years of economic growth for Spain, leading to an economic contraction that lasted until late 2013. In that year, the government successfully shored up its struggling banking sector - heavily exposed to the collapse of Spain's real estate boom - with the help of an EU-funded restructuring and recapitalization program. In aggregated terms, the Spanish GDP contracted by almost 9% during the 2009-2013 period. The economic situation started improving by 2013-2014. By then the country managed to reverse the record trade deficit which had built up during the boom years attaining a trade surplus in 2013 after three decades of running a trade deficit. The surplus kept strengthening during 2014 and 2015.[12]

[12] https://www.cia.gov/library/publications/resources/the-world-factbook/

3.3.10 Regression Results Tables

Table 1	**Panel Regression on 9 Euro Area countries (full period)**		
Model Type	*Panel Fixed Effects*		
Period	*2004 - 2017 (2nd Q)*		
Frequency	*Monthly*		
No of Observations *Cross Sectional Units* *Time Periods*	*1422* *9* *158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variable	Coefficient	p-Value	Std. Error
constant	0,0105906	4,07e-025 ***	0,00100341
ΔlogUnemployment	−0,0312831	0,0113 **	0,0123335
ΔESI	0,000521239	0,0516 *	0,000267567
ΔBondSpread	−0,00183895	0,0075 ***	0,000686384
DummyCrisis	−0,00611989	2,09e-06 ***	0,00128444
Δlog(TotalDeposits)(-1)	−0,205866	3,92e-015 ***	0,0259088

p-Value(F) = 2,32e-19

LSDV R-squared = 0,081192

Chow test for structural difference with respect to DummyCrisis*

Null hypothesis: no structural difference

Test statistic: F(5, 1412) = 8.58468

with p-value = P(F(5, 1412) > 8.58468) = 5.05379e-008

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 1.1	**Panel Regression on 9 Euro Area countries (Pre-Crisis)**		
Model Type	*Panel Fixed Effects*		
Period	*2004-2009 (3rd Q)*		
Frequency	*Monthly*		
No of Observations *Cross Sectional Units* *Time Periods*	*585* *9* *65*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variable	Coefficient	p-Value	Std. Error
constant	0,0113746	3,53e-019 ***	0,00122598
ΔlogUnemployment	−0,0565266	0,0068 ***	0,0207976
ΔESI	0,00102303	0,0389 **	0,000494241
ΔBondSpread	−0,000403882	0,8396	0,00199400
Δlog(TotalDeposits)(-1)	−0,278442	7,50e-012 ***	0,0398128
p-Value(F) = 7,11e-10 LSDV R-squared = 0,111407			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 1.2	**Panel Regression on 9 Euro Area countries (Post-Crisis)**		
Model Type	*Panel Fixed Effects*		
Period	*2009(4th Q)- 2017 (2nd Q)*		
Frequency	*Monthly*		
No of Observations *Cross Sectional Units* *Time Periods*	*837* *9* *93*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variable	Coefficient	p-Value	Std. Error
constant	0,00429511	3,04e-010 ***	0,000673736
ΔlogUnemployment	−0,00283817	0,8431	0,0143324
ΔESI	9,59441e-05	0,7389	0,000287730
ΔBondSpread	−0,00211118	0,0006 ***	0,000610020
Δlog(TotalDeposits)(-1)	−0,132348	0,0001 ***	0,0341797
p-Value(F) = 6,52e-13 LSDV R-squared = 0,096573			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 2	**Belgium (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0066	0.0266**	0.0029
ΔlogUnemployment	0.0094	0.8178	0.040
ΔESI	−0.0007	0.3241	0.0007
ΔBondSpread	0.02	0.2011	0.015
DummyCrisis	−0.0022	0.5639	0.0038
Δlog(TotalDeposits)(-1)	−0.18	0.0239**	0.080
p-Value(F) = 0.151549 Adjusted R-squared = 0.02			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(4, 148) = 1.26624 with p-value = P(F(4, 148) > 1.26624) = 0.285897			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 3	**Finland (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2nd Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00675273	0.0077 ***	0.00250203
ΔlogUnemployment	−0.00621939	0.6327	0.0129882
ΔESI	0.000403747	0.5652	0.000700522
ΔBondSpread	0.0217015	0.4392	0.0279820
DummyCrisis	−0.000576372	0.8576	0.00320690
Δlog(TotalDeposits)(-1)	−0.215291	0.0089 ***	0.0812969
p-Value(F) = 0.091446 Adjusted R-squared = 0.028959			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(4, 148) = 0.815909 with p-value = P(F(4, 148) > 0.815909) = 0.516914			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 4	**Germany (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00395093	2.41e-09***	0.000622590
ΔlogUnemployment	−0.0609908	0.0825*	0.0348957
ΔESI	−0.000760795	0.0030***	0.000252033
ΔBondSpread	−0.00193451	0.4422	0.00251077
DummyCrisis	−0.00196988	0.0038***	0.000670364
Δlog(TotalDeposits)(-1)	−0.0454136	0.5616	0.0780555
p-Value(F) = 0.001449 Adjusted R-squared = 0.093355			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(5, 148) = 2.18013 with p-value = P(F(5, 148) > 2.18013) = 0.0593786			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's 10Y G-Bond Yield. Because the German Bond yield is the benchmark, for Germany, changes of the actual bond yield are measured instead of the Bond spread..**DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 4.1	**Germany (pre-crisis period)**		
Model Type	*OLS*	*Frequency*	*Monthly*
Period	*2004 - 2009 (3rd Q)*	*No of Observations*	*65*
Dependent Variable	*Δlog(TotalDeposits)*		

Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00421909	1.07e-06 ***	0.000776691
ΔlogUnemployment	−0.0263126	0.5066	0.0393772
ΔESI	−0.00106032	0.0018 ***	0.000324813
ΔBondSpread	0.00256855	0.4834	0.00364178
Δlog(TotalDeposits)(-1)	−0.0758267	0.5839	0.137691
p-Value(F) = 0.017651 Adjusted R-squared = 0.123314			

Table 4.2	**Germany (post-crisis period)**		
Model Type	*OLS*	*Period*	*2009 - 2017 (2nd Q)*
Frequency	*Monthly*	*No of Observations*	*93*
Dependent Variable	*Δlog(TotalDeposits)*		

Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00133814	0.1122	0.000833959
ΔlogUnemployment	−0.231078	0.0372 **	0.109216
ΔESI	−0.000606597	0.1509	0.000418626
ΔBondSpread	−0.00449	0.2453	0.00383837
Δlog(TotalDeposits)(-1)	−0.06786	0.4499	0.0894150
p-Value(F) = 0.053544 Adjusted R-squared = 0.052176			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Yield. (in percentages)

Table 5	**Greece (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00792919	0.0006***	0.00100341
ΔlogUnemployment	−0.0835776	0.2191	0.0123335
ΔESI	0.00119707	0.0457**	0.000267567
ΔBondSpread	−0.00196326	0.0007***	0.000686384
DummyCrisis	−0.0129074	5.05e-05 ***	0.00128444
Δlog(TotalDeposits)(-1)	0.175919	0.0215 ***	0.0259088

p-Value(F) = 8,03e-10

Adjusted R-squared = 0,259924

Chow test for structural break at observation 68 (October 2009)

Null hypothesis: no structural break

Test statistic: F(4, 148) = 5.4634

With p-value = P(F(4, 148) > 5.46343) = 0.000394339

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 5.1		**Greece (pre-crisis)**		
Model Type	*OLS*	*Period*		*2004 - 2009 (3rd Q)*
Frequency	*Monthly*	*No of Observations*		*67*
Dependent Variable		*Δlog(TotalDeposits)*		
Independent Variables		Coefficient	p-Value	Std. Error
constant		0.0117191	5.56e-08 ***	0.00188851
ΔlogUnemployment		−0.0853965	0.2148	0.0681132
ΔESI		0.00038	0.6501	0.00083
ΔBondSpread		0.0182905	0.0224**	0.00780141
Δlog(TotalDeposits)(-1)		−0.290708	0.0166**	0.117918
p-Value(F) = 0.014501 Adjusted R-squared = 0.129871				

Table 5.2		**Greece (post-crisis)**		
Model Type	*OLS (with HAC standard errors)*	*Period*		*2009 - 2017 (2nd Q)*
Frequency	*Monthly*	*No of Observations*		*93*
Dependent Variable		*Δlog(TotalDeposits)*		
Independent Variables		Coefficient	p-Value	Std. Error
constant		−0.00324998	0.0648 *	0.00173811
ΔlogUnemployment		−0.203342	0.0346 **	0.0947549
ΔESI		0.00140382	0.0622 *	0.000743212
ΔBondSpread		−0.00200635	0.0095 ***	0.000756183
Δlog(TotalDeposits)(-1)		0.298340	0.0121 **	0.116458
p-Value(F) = 4.96e-06 Adjusted R-squared = 0.247034				
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.				

Table 6	**Italy (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.008	0.0024***	0.00284038
ΔlogUnemployment	−0.0443	0.5224	0.0691946
ΔESI	0.0002	0.7770	0.000819429
ΔBondSpread	−0.0016	0.8168	0.00707208
DummyCrisis	−0.00399	0.2739	0.00364026
Δlog(TotalDeposits)(-1)	−0.1412	0.0819*	0.0806601
p-Value(F) = 0.461017 Adjusted R-squared = -0.00212			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(5, 147) = 0.258342 with p-value = P(F(5, 147) > 0.258342) = 0.935021			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 7	**Latvia (full period)**		
Model Type	*OLS*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0145539	0.0089***	0.00549360
ΔlogUnemployment	−0.0375129	0.6707	0.0880659
ΔESI	0.00402233	0.0014***	0.00123980
ΔBondSpread	−0.00840516	0.0198**	0.00356930
DummyCrisis	−0.00565805	0.3338	0.00583574
Δlog(TotalDeposits)(-1)	0.0151016	0.8601	0.0855316
p-Value(F) = 0,00105 Adjusted R-squared = 0,068571			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(4, 148) = 3.7345 with p-value = P(F(4, 148) > 3.7345) = 0.00632305			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 7.1	**Latvia (pre-crisis period)**			
Model Type	*OLS (HAC standard errors)*	*Period*		*2004 - 2009 (3rd Q)*
Frequency	*Monthly*	*No of Observations*		*65*
Dependent Variable		*Δlog(TotalDeposits)*		
Independent Variables		Coefficient	p-Value	Std. Error
constant		0.0133292	0.0099***	0.00500480
ΔlogUnemployment		−0.140632	0.3859	0.161011
ΔESI		0.00531799	0.0009***	0.00151486
ΔBondSpread		−0.00202079	0.8416	0.0100704
Δlog(TotalDeposits)(-1)		0.166860	0.2151	0.133168
p-Value(F) = 0.000012 Adjusted R-squared = 0.168720				

Table 7.2	**Latvia (post-crisis period)**		
Model Type	*OLS*		
Period	*2009 - 2017 (2nd Q)*		
Frequency	*Monthly*		
No of Observations	*93*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0135028	<0.0001***	0.00244806
ΔlogUnemployment	0.0793051	0.5421	0.129581
ΔESI	0.00194500	0.1420	0.00131282
ΔBondSpread	−0.0117035	0.0060***	0.00415849
Δlog(TotalDeposits)(-1)	−0.264669	0.0025***	0.0851903
p-Value(F) = 0.007258 Adjusted R-squared = 0.080109			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

Table 8	**Lithuania (full period)**		
Model Type	*OLS (HAC standard errors)*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0177606	<0.0001***	0.00356962
ΔlogUnemployment	−0.0533920	0.0671*	0.0289482
ΔESI	0.000304852	0.6922	0.000768568
ΔBondSpread	1.53093e-06	0.9990	0.00120652
DummyCrisis	−0.0122671	0.0017***	0.00384618
Δlog(TotalDeposits)(-1)	−0.107261	0.1733	0.0784060
p-Value(F) = 0.000968 Adjusted R-squared = 0.063436			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(5, 148) = 3.15581 with p-value = P(F(5, 148) > 3.15581) = 0.00976695			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 8.1	**Lithuania (pre-crisis period)**		
Model Type	*OLS (HAC standard errors)*	*Period*	*2004 - 2009 (3rd Q)*
Frequency	*Monthly*	*No of Observations*	*65*
Dependent Variable		*Δlog(TotalDeposits)*	

Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0173902	<0.0001***	0.00360396
ΔlogUnemployment	−0.0644571	0.1201	0.0408839
ΔESI	0.000297299	0.7965	0.00114759
ΔBondSpread	0.000335076	0.7875	0.00123755
Δlog(TotalDeposits)(-1)	−0.0810296	0.3685	0.0894300
p-Value(F) = 0.188398 Adjusted R-squared = 0.039			

Table 8.2	**Lithuania (post-crisis period)**		
Model Type	*OLS*	*Period*	*2009 - 2017 (2nd Q)*
Frequency	*Monthly*	*No of Observations*	*93*
Dependent Variable		*Δlog(TotalDeposits)*	

Independent Variables	Coefficient	p-Value	Std. Error
constant	0.00600702	0.0003***	0.00159421
ΔlogUnemployment	0.00969783	0.8326	0.0457567
ΔESI	2.76509e-05	0.9802	0.00110978
ΔBondSpread	−0.00250009	0.1992	0.00193253
Δlog(TotalDeposits)(-1)	−0.152403	0.3011	0.146507
p-Value(F) = 0.455069 Adjusted R-squared = 0.031510			

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

Table 9	**Luxembourg (full period)**		
Model Type	*OLS (HAC st. errors)*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0100997	0.0389**	0.00484763
ΔlogUnemployment	−0.157519	0.0379**	0.0752014
ΔESI	0.000949008	0.1702	0.000688666
ΔBondSpread	−0.00303572	0.9084	0.0263462
DummyCrisis	0.00574748	0.3011	0.00553944
Δlog(TotalDeposits)(-1)	−0.507773	<0.0001***	0.0892329
p-Value(F) = 1.18e-08 Adjusted R-squared = 0.275907			
Chow test for structural break at observation 68 (October 2009) Null hypothesis: no structural break Test statistic: F(5, 148) = 1.40432 with p-value = P(F(5, 148) > 1.40432) = 0.225965			
Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros) **Δlog(TotalDeposits)(-1):** m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month. **ΔlogUnemployment:** m-o-m log growth of unemployed individuals in the country **ΔESI:** m-o-m change of the country's Economic Sentiment Indicator **ΔBondSpread:** m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages) **DummyCrisis:** Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.			

Table 10	**Spain (full period)**		
Model Type	*OLS (HAC st. errors)*		
Period	*2004 - 2017 (2^{nd} Q)*		
Frequency	*Monthly*		
No of Observations	*158*		
Dependent Variable	*Δlog(TotalDeposits)*		
Independent Variables	Coefficient	p-Value	Std. Error
constant	0.0122638	<0.0001***	0.00204201
ΔlogUnemployment	−0.0693169	0.5100	0.104967
ΔESI	−0.00135260	0.0432**	0.000663463
ΔBondSpread	0.00955809	0.2659	0.00855938
DummyCrisis	−0.0124393	0.0002***	0.00331502
Δlog(TotalDeposits)(-1)	−0.0931225	0.1610	0.0661050

p-Value(F) = 1.63e-07

Adjusted R-squared = 0.130191

Chow test for structural break at observation 68 (October 2009)

Null hypothesis: no structural break

Test statistic: F(5, 148) = 4.23013

with p-value = P(F(5, 148) > 4.23013) = 0.00126778

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Table 10.1	Spain (pre-crisis period)			
Model Type	*OLS (HAC standard errors)*	*Period*	*2004 - 2009 (3rd Q)*	
Frequency	*Monthly*	*No of Observations*	*65*	
Dependent Variable		*Δlog(TotalDeposits)*		
Independent Variables		Coefficient	p-Value	Std. Error
constant		0.0138761	<0.0001***	0.00189165
ΔlogUnemployment		−0.147282	0.2454	0.125539
ΔESI		−0.00115181	0.2725	0.00104002
ΔBondSpread		0.00976643	0.7766	0.0342575
Δlog(TotalDeposits)(-1)		−0.168063	0.0587*	0.0872005
p-Value(F) = 0.079592 Adjusted R-squared = 0.060584				

Table 10.2	Spain (post-crisis period)			
Model Type	*OLS*	*Period*	*2009 - 2017 (2nd Q)*	
Frequency	*Monthly*	*No of Observations*	*93*	
Dependent Variable		*Δlog(TotalDeposits)*		
Independent Variables		Coefficient	p-Value	Std. Error
constant		0.000212975	0.9107	0.00189407
ΔlogUnemployment		0.195885	0.4274	0.245662
ΔESI		−0.00159385	0.0754*	0.000885730
ΔBondSpread		0.00685272	0.4415	0.00886421
Δlog(TotalDeposits)(-1)		−0.0226914	0.8155	0.0969714
p-Value(F) = 0.022132 Adjusted R-squared = 0.029581				

Δlog(TotalDeposits): m-o-m log growth of the country's aggregate bank deposits (in Euros)

Δlog(TotalDeposits)(-1): m-o-m log growth of the country's aggregate bank deposits (in Euros), lagged over 1 month.

ΔlogUnemployment: m-o-m log growth of unemployed individuals in the country

ΔESI: m-o-m change of the country's Economic Sentiment Indicator

ΔBondSpread: m-o-m change of the country's Bond Spread. Bond Spread is the difference between the country's 10Y G-Bond yield and the German Benchmark 10Y G-Bond (in percentages)

DummyCrisis: Dummy value takes 0 until 9/2009, takes 1 from 10/2009 onwards.

Chapter 4: Conclusion

This study aims to estimate the effect of macroeconomic factors on depositor behavior at aggregate country level. For this purpose, data from 9 eurozone countries were used to estimate a panel regression model, along with two sub-models for the breakdown in two periods, as well as 9 simple linear regression models, along with 5 sub-models for the breakdown in two periods when a structural break was present. The panel model shows that unemployment, ESI, country risk (measured by the 10Y government bond spread) and the Eurozone debt crisis of 2009 all influence bank deposits on an aggregate level. The effects of unemployment and ESI are more intense before the crisis, while the effects of country risk intensify in the post crisis period. The main finding is consistent with the work of Levy-Yeyati et al (2010), that depositors' reaction to macroeconomic risk increases in response to crisis events. With regards to the rest of the explanatory factors our main hypothesis regarding their effect on deposits also seems to be validated.

When estimating the country specific models, the country that seems to be most in line with the above findings is Greece. It is also the most interesting case to study with regards to the depositor behavior during this specific period, as there have been major bank withdrawals following the events of the debt crisis and the 2010 bailout program, which could be considered as bank-runs. Many claim that the deposits have been moved to off-shore accounts (like Swiss banks) or are hidden in the form of cash in houses, lockers and safes. That may be the case for depositors responding to macroeconomic country risk. A possible state bankruptcy could be destabilizing for the domestic banks and at the same time their deposit insurance could be less credible to compensate them in case of bank failure. Both bank and state failure risk were high throughout the Greek crisis period.

The effects of ESI and unemployment on bank deposits, as shown in our results, are not necessarily linked to failure and bankruptcy risk. As per our initial hypothesis, unemployed people with zero income are likely to liquidate their savings in order to consume what is necessary for their living. This can be evident in cases where there are sudden rises in unemployment after long periods of employment and relatively high earnings. Apart from the panel model, unemployment's effect is present in the results for Greece but also for Lithuania (where unemployment peaked roughly around the same period) and Germany where the effect was reversed: a stable drop in unemployment level is linked to a stable growth in deposit levels. The effect of ESI (or rather the actual conditions that influence this index) on the is seemingly weaker than that of unemployment (with respect to p-values) but it is present in the panel model estimates as well as 4 out of 9 country specific models.

Concluding, the study suggests that macroeconomic factors that indicate depositor capability (unemployment, income etc) along with country risk and specific events that affect that risk do influence depositors' behavior . Previous studies have focused on bank specific characteristics and market discipline (Berger and Turk (2014)) while others have focused on market/county risk and specific events (Levy-Yeyati et. al. (2010)). This thesis introduced some factors that may be considered as country specific macroeconomic measures and could be taken into account in future studies regarding depositor behavior and bank runs.

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