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THE IMPACT OF DEPOSIT INSURANCE ON THE RISK-TAKING WILLINGNESS OF BANKS

EVIDENCE FROM US BANKS IN THE POST-CRISIS PERIOD

FABIAN HÄHN (33887)

A Project carried out on the Master in Finance Program, under the supervision of:

André Castro Silva

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Abstract

A permanent increase in the maximum amount covered by the FDIC in the US in 2010 following the financial crisis raised concerns that a larger safety net would foster moral hazard and risk taking among banks. Counterintuitively, this study finds a decreasing riskiness of banks after the FDIC increase. This holds true for standalone bank risk and stock return volatility of publicly traded banks. Explicitly, the introduction of the higher coverage amount increased the average bank's z-score and thus its distance from insolvency. However, this effect may also be caused by other regulations like higher capital ratio requirements and a more expansive monetary policy.

Keywords: *Deposit Insurance, Global Financial Crisis, Risk-Taking Willingness, US Banks*

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1. Introduction

This study analyzes the relationship between the increase in the maximum amount of deposits per bank per person covered by the Federal Deposit Insurance Corporation (*FDIC* hereafter) in 2010 from $100,000 to $250,000 and the risk-taking willingness of banks in the US. The results show that moral hazard and the riskiness of banks decreased after the introduction of the higher coverage amount.

The FDIC was a bearer of hopes upon its introduction: “It is your problem no less than it is mine. Together we cannot fail” (Federal Deposit Insurance Corporation 1933). With these words president Franklin D. Roosevelt announced the foundation of the FDIC in 1933 after the banking crisis in the US wiped out thousands of banks in the beginning of the 1930s. The FDIC became the first nationwide deposit insurance scheme in the world. Nowadays, deposit insurance is a widely adopted tool to ensure banking stability and was even part of multiple international regulatory bodies’ best practices such as the International Monetary Fund (*IMF* hereafter) and the World Bank (Anginer and Demirgüç-Kunt 2018). Ten years after the global financial crisis (*GFC* hereafter), deposit insurance is still heavily discussed due to the shortcomings that became apparent during the very same crisis. Even though deposit insurance can prevent bank runs, it is well established in literature that it also fosters moral hazard and excessive risk taking among insured banks. Especially the increase of the maximum covered amount of deposits per customer per bank in the US from $100,000 to $250,000 during the GFC to re-establish confidence in the banking system has raised concerns about increased risk-taking incentives coming from a larger safety net. This increase was made permanent on July 21, 2010 by the Dodd-Frank Wall Street Reform and Consumer Protection Act (see SEC. 335. Permanent Increase in Deposit and Share Insurance) (Federal Deposit Insurance Corporation 2011). While there is a large amount of evidence before and during the GFC, to the best of my knowledge, this paper is the first to examine the long-term effects of the change of the deposit insurance design after the GFC. For that reason, this paper investigates the development of the risk-taking willingness of US-American banks before and after the permanent increase of the maximum amount covered by the FDIC, leading to the following research question:

Is there a significant positive relationship between the permanent increase of the maximum amount covered by the FDIC and the risk-taking willingness of banks?

The rest of the paper is structured as follows: Section 2 gives an overview of the theoretical background of deposit insurance, existing literature, and the development of deposit insurance in the US. Section 3 describes the construction of the sample and variables and methodology used. Section 4 describes the empirical results. Finally, section 5 discusses the research's limitations and practical implications, while section 6 concludes.

2. Theoretical Framework and Literature Review

2.1. Theory of Deposit Insurance

Financial institutions and in particular banks serve a special purpose in the economy in providing services to customers with short-term and long-term needs. In the so-called maturity transformation, banks transform short-term deposits into long-term loans (Anginer and Demirgüç-Kunt 2018). However, as these long-term investments are illiquid in nature, this transformation process makes banks vulnerable to large waves of withdrawals of customer deposits due to consumption needs or income shocks. Even though inherently unstable, the maturity transformation serves the economic well-being of a given economy (Anginer and Demirgüç-Kunt 2018). If, however, deposit withdrawals of multiple depositors coincide, banks can run into trouble serving the needs of their customers without having to interrupt some or all illiquid long-term investments. The liquidation of these projects, though, can often lead to significant economic losses, which can drive a bank into insolvency. If depositors learn or only hear rumors about their bank running into liquidity problems, it is only reasonable to run to the bank in order to withdraw deposits as customers are served on a first-come, first-serve basis and whoever comes last might not receive anything. This makes the rumor of a bank's illiquidity a self-fulfilling prophecy. Similarly, a decline in the value of assets that a bank holds can cause customers to withdraw deposits at the same time due to the same reason mentioned before (I. Fischer 1912, Bryant 1980, Gorton 1988, Allen and Gale 2000).

Diamond and Dybvig (1983) realized first that the short-term, unpredictable nature of demand deposits combined with the typical high leverage of banks creates a bad Nash equilibrium, which can lead to even solvent banks experiencing runs that result in significant economic losses. The authors figured that depositors need to be credibly convinced that a bank run will not occur. In that case, only depositors with real liquidity needs will withdraw their money, which can be easily served by the bank's cash reserves. In their model, deposit insurance eliminates the bad Nash equilibrium, in which everybody runs, as depositors are convinced that they will receive their money from the deposit insurance fund if the bank fails. However, this idea relies on the assumptions that depositors see the deposit insurance as credible and that the deposit insurance is covering the entire amount deposited by each customer. If fulfilled, deposit insurance prevents the costly liquidation of long-term investments and saves the bank from insolvency (Marini 2003). The notion that deposit insurance can ensure bank stability is supported by several subsequent studies (Hazlett 1997, Chang and Velasco 2001, Green and Lin 2003). The most important extension of the Diamond-Dybvig model, however, is the introduction of investments in risky assets by banks as a consequence of the deposit guarantee from insurance. Moral hazard in the form of higher risk-taking willingness by insured banks resulting from the knowledge of having the coverage of a safety net was subject to most of the later literature (Calomiris 1989, Cooper and Ross 2002). These extensions made the need for design features that would minimize moral hazard obvious.

Design features can include a reasonable determination of the maximum amount of covered deposits, the type of covered deposits, and the type of institutions covered by the scheme. Moreover, the choice of fund contribution principle can be a crucial design feature to limit moral hazard (Anginer and Demirgüç-Kunt 2018). In addition, robust supervision and further regulation such as additional capital requirements can curb risk-taking behaviors stemming from deposit insurance (Cooper and Ross 2002). Here central banks in their role as lender of last resort play an important complementary role in providing liquidity to banks (Marini 2003), while deposit insurance ensures that each depositor receives their money. If Bagehot's principle is being followed and if the central bank only lends to illiquid but solvent banks, this should prevent depositors from running on solvent banks (S. Fischer 1999, Kahn and Santos 2005, Ngalawa, Tchana and Viegi 2016). As in practice, deposit insurance schemes are always underfunded, their success depends crucially on their ex-ante credibility. Moreover, depositors that are not covered by deposit insurance play a crucial role in monitoring banks (Anginer and Demirgüç-Kunt 2018).

2.2. Benefits of Deposit Insurance

Due to today's interdependency of the banking world through interbank lending and risk-sharing contracts, bank runs on an individual bank can easily spread to the entire banking sector causing multiple banks to become insolvent (Anginer and Demirgüç-Kunt 2018). This contagion can cause serious problems for the real economy as banks are still the major financing source for households and companies. A disruption on the financing side can cause lower production and output in the real economy as well as delays in the payment system and thus lead to higher unemployment, which in turn increases long-term costs of social benefits. Besides these indirect costs of bank failures, taxpayer support (such as liquidity injections and bailouts) can lead to direct costs of bank insolvency (Hoggarth, Reis and Saporta 2002, Smith 2002). These costs can be prevented by effective deposit insurance.

The effects of deposit insurance systems have been widely tested in empirical literature. As proposed by the Diamond-Dybvig model, deposit insurance should mainly reduce the likelihood of bank runs. This effect can also be found in empirical studies. For instance, using account-level balances of a US bank that failed in the GFC, Martin, Puri and Ufier (2017) find that deposit insurance, temporary or permanent, reduces the outflows from deposit accounts in times of distress and improves the bank's deposit stability, while uninsured investors withdraw deposits quickly. Moreover, Angkinand (2009) investigated the relationship between banking regulation and the severity of banking crises, using data regarding 47 crises in 35 countries between the 1970s and 2003. She finds that countries, which have comprehensive deposit insurance enacted, have lower overall output costs associated with crises. Findings regarding an increase in bank stability from deposit insurance could also be confirmed by Chernykh and Cole (2011) and DeLong and Saunders (2011).

In addition to reducing bank runs, deposit insurance usually has the effect of providing regulations for resolving problematic banks. These regulations can reduce the economic costs of forbearance, in which insolvent banks are allowed to keep operating (Pyle 1986, Lucas and McDonald 2006). When banks are insolvent, they have incentives to take on excessive risk in order to retain the value of lost assets. This risk-taking willingness is later significantly increasing the bank's resolution costs. Moreover, deposit insurance can increase incentives for politicians and regulators for effective supervision. Kane (1989) generally finds unwillingness among regulators and politicians to enforce effective supervision. Especially politicians want banks to lend more to the real economy in order to increase the nation's wealth during their political term and not restrict them by regulations. When deposit insurance is introduced, however, it opens the possibility that ultimately the fund and therefore taxpayers have to bear the costs of a failing bank. This increases the incentives to enact effective regulation and supervision of banks.

2.3. Costs of Deposit Insurance

As mentioned previously, besides having the positive effect of reducing bank runs, deposit insurance also bears the risk of increasing moral hazard on both sides of a bank's balance sheet, i.e. on the asset side in risky investments by banks, but also on the liability side among depositors. This may consequently lead to bank instability (Calomiris 1990, Gennotte and Pyle 1991). For banks, the guarantee of a deposit insurance to help out in case of failing removes market discipline and thus creates the incentive of investing in riskier assets. The socialization of possible losses leads to the search for higher profits in riskier investments that can be internalized by the bank. Additionally, the knowledge of depositors to be insured by the guarantee scheme significantly reduces their incentive to monitor the financial condition of their bank. This leads to the consequence that riskier investments are not compensated with higher interest rates for depositors as they fail to effectively monitor the bank, which again incentivizes banks to invest in riskier loans or increase their leverage (Anginer and Demirgüç-Kunt 2018).

The above mentioned effects have been found multiple times in academic literature. For instance, in conducting a natural experiment by using the introduction of deposit insurance in eight states in the US between 1908 and 1917, Calomiris and Jaremski (2019) find that deposits were attracted away from uninsured to insured banks. They also find that market discipline imposed by depositors was removed for insured banks, but continued to restrict risk-taking of uninsured banks. Furthermore, Demirgüç-Kunt and Detragiache (2002) find that the introduction of explicit deposit insurance increases the likelihood of having a banking crisis in a country and increases bank instability, which they infer on increased moral hazard. With regards to increasing risk by more leverage, Nier and Baumann (2006) as well as Fonseca and González (2010) observe that the introduction of deposit insurance reduces the capital ratio of banks. Moreover, Demirgüç-Kunt and Huizinga (1999) find that the adoption of deposit insurance decreases the correlation between deposit interest rates and changes in bank risk. The previously mentioned findings regarding increased risk-taking and reduced depositor monitoring were confirmed by multiple other studies and over different countries and regions (Wheelock and Wilson 1995, Cull, Senbet and Sorge 2001, Laeven 2002, Carapella and Di Giorgio 2004, Ioannidou and Penas 2010, Karas, Pyle and Schoors 2013, Bergbrant, et al. 2014, Gropp, Gruendl and Guettler 2014, Calomiris and Chen 2016). Also previously mentioned studies that found positive effects of deposit insurance, saw an increase in risk-taking willingness of banks (Chernykh and Cole 2011, DeLong and Saunders 2011).

In short, the net effect of deposit insurance depends on whether the benefits can outweigh the mentioned costs. Anginer, Demirgüç-Kunt and Zhu (2014) examine the effect of deposit insurance on banks' standalone risk as well as an individual bank's contribution to systemic risk before and during the GFC. They find that in the build-up to the crisis, deposit insurance has negative effects on the risk-taking willingness of banks. However, in times of distress during the crisis, they observe that countries with more generous deposit insurance schemes experience less risk-taking of their banks and higher systemic stability. Nonetheless, they close that the overall effect of deposit insurance is negative. This conclusion is supported by the results of Ngalawa, Tchana and Viegi (2016), who find that the costs of moral hazard outweigh the benefits on bank stability.

2.4. Deposit Insurance in the US

Deposit insurance schemes were first introduced in the US in 1829 as a safety fund for banks operating in New York. After several failed implementations on state-wide levels in the 1910s (Calomiris 1989), the FDIC was established in 1933 as a reaction to the failure of thousands of banks as a consequence of the Great Depression (Federal Deposit Insurance Corporation 2017). The adoption of a federal deposit insurance scheme came despite the rejection of over 50 proposals since the 1880s as they had been regarded as "socially undesirable" and lobbied for by banks (Calomiris and White 1994), but the Great Depression changed the politicians' mindsets. The early introduction of deposit insurance in the US was due to its unique unit-banking structure (Calomiris and Jaremski 2016) and other countries started adopting deposit insurance systems only in the 1960s. The increase in the usage of deposit insurance schemes around the world is partly due to the inclusion of guarantee systems on retail deposits as a recommendation for sound stability measures by international regulatory bodies such as the World Bank, IMF, and the European Union and partly due to the GFC as financial crises make the adoption of deposit insurance more likely because of external political pressure (Demirgüç-Kunt, Kane and Laeven 2008). As of 2018, 115 countries use some form of explicit deposit guarantee scheme according to the Bank Regulation and Supervision Survey conducted by the World Bank (Anginer, Bertay, et al. 2019).

Despite having been planned only as temporary measure, the FDIC quickly became a permanent feature of the US banking regulation that covers more or less all deposits today either by explicit or implict deposit insurance (Calomiris and Jaremski 2016). The FDIC is proud that since its beginnings "no depositor has lost a single cent of insured funds as a result of a failure" (Federal Deposit Insurance Corporation 2017). The coverage limit per depositor per bank was raised multiple times in the history of the FDIC: from $40,000 to $100,000 in 1980 and first only temporarily in 2008 and later perminantely to $250,000 in 2010 to restore confidence in the banking system during the GFC (Anginer and Demirgüç-Kunt 2018). The maximum amount covered by the fund as well as the decision on which institutions and which types of deposits are covered provide a tool for the FDIC to manage moral hazard. In addition, the FDIC uses a form of risk-based pricing to determine the contributions per bank to the fund. This causes banks to internalize the costs of risk-taking and therefore consequently limits it (Anginer and Demirgüç-Kunt 2018).

3. Data and Empirical Methodology

3.1. Sample

The sample consists of all private and publicly traded US-American commercial, savings, and cooperative banks covered by Bureau van Dijk's Orbis database for the years 2007 to 2018 excluding credit unions as these are generally not covered by the FDIC. In addition to the data obtained from Orbis, for publicly traded banks stock information from CSRP has been used. Orbis database summarizes and provides detailed bank-level information regarding balance sheet and income statement data for private and publicly traded companies. Data from Orbis has been downloaded via the Wharton Research Database as this platform provides the possibility to gather data from 2007 on. The data covers 4,947 out of 5,280 banks that are currently insured by the FDIC. CSRP provides daily and monthly stock returns for the US-American market. The final sample is a panel dataset consisting of 4,947 banks and branches, of which 1,008 are publicly traded or belong to a parent bank corporation that is publicly traded.

3.2. Bank Level Variables

Building on the empirical work of Anginer, Demirgüç-Kunt and Zhu (2014) and therefore also on the work of Laeven and Levine (2008), the z-score[1] is used as a measure of standalone bank risk. The z-score is the sum of the mean of the return on assets (*ROA* hereafter) and the capital-asset ratio (*CAR* hereafter) divided by the standard deviation of ROA (see *Equation 1*). This measure is used to find the distance of a bank to insolvency in standard deviations (Roy 1952), i.e. the situation, in which losses have fully depleted equity. Thereby, the probability of insolvency is the probability of the negative ROA being larger than the CAR.

$$Z = \frac{(\mu(ROA) + CAR)}{\sigma(ROA)} \quad (1)$$

[1] It is important to note that this z-score is fundamentally different from the Altman z-score developed by Edward Altman (1968) and should not be confused.

A higher z-score indicates that a bank is more stable. To ensure consistency and comparability with existing literature, the natural logarithm of z-scores is used. For readability, the term z-score will be used for the natural logarithm of the z-score in the following. Even though the z-score can only be as good as the data reported by the financial institutions as it is based purely on accounting data (World Bank 2016), this measure offers the possibility to calculate risk for institutions, which do not over more advanced market data. Hence, looking at the large number of private banks in the sample, z-score is preferred over similar measures such as Distance to Default.

Additionally, for publicly traded banks a second measure of standalone bank risk is calculated with the help of stock return volatilities (*Volatility* hereafter). Volatility is thereby calculated as the standard deviation of daily stock returns in a given fiscal year. A higher Volatility indicates a higher standalone bank risk.

Following Anginer, Demirgüç-Kunt and Zhu (2014) again, for each year and each bank also bank size (natural logarithm of total assets), leverage (total liabilities divided by total assets), provisions (loan loss provisions divided by total assets), reliance on deposits for funding (deposits divided by total assets), and profitability (ROA) are computed as control variables. Moreover, the given years are divided by creating a period variable that is set equal to 0 for the years before the FDIC increase, 2007-2009, which coincides with the GFC, and equal to 1 for the period after the FDIC increase, for the years 2010-2018, which is also the post-crisis period.

3.3. Systemic Stability Measure

More recent literature has stressed the importance of a bank's contribution to the overall risk of a financial system rather than merely the standalone risk of an individual bank. Hereby, the correlation between the risk-taking behavior of banks is of interest (Anginer, Demirgüç-Kunt and Zhu 2014). For this reason, following the expected capital shortfall model by Acharya, Engle and Richardson (2012), the Marginal Expected Shortfall (*MES* hereafter) is computed.

The MES is the expected loss a shareholder of a financial instution would suffer in a substantial market downturn and is defined as:

$$MES_t^i = E\left(R_t^i | R_t^m < C\right) \quad (2)$$

In *Equation 2*, R_t^i is bank *i*'s stock return and R_t^m is the return of the market index at the same time *t*. The aforementioned substantial market downturn is indicated by a market decline below a certain threshold C, thus defining the downturn as $R_t^m < C$. Following Anginer, Demirgüç-Kunt and Zhu (2014), this threshold is defined as the market index's return at its lowest 5% over the previous one year of available return data. Thus, a lower MES indicates higher systemic risk (Anginer, Demirgüç-Kunt and Zhu 2014). As before, daily stock return data from CSRP is used. For the market index data, the Nasdaq Composite index is taken as a proxy for the development of the US-American economy. Price data for the Nasdaq Composite index, from which returns are then calculated, is downloaded from Bloomberg.

3.4. Empirical Methodology

The permanent increase of the maximum amount covered by the FDIC in 2010 raises the question if the risk-taking willingness of banks was increased by having a larger safety net for failing institutions. Following this thought, intuitively the permanent raise should have a significant negative impact on an average bank's z-score (*Hypothesis 1*), a significant positive impact on the Volatility (*Hypothesis 2*), and a significant negative impact on bank systemic risk (*Hypothesis 3*). The effects on these dependent bank risk variables are tested with the help of linear regressions in the following section. Stata was used for data processing and analysis.

4. Results

4.1. Summary Statistics

Table 1 shows the summary statistics of the tested variables. The z-score of an average bank in the sample is 3.605, while the Volatility of an average publicly traded bank in the sample is

0.021 (i.e. 2.1%) and the MES is -0.014 (i.e. -1.4%). Moreover, an average bank in the sample has a bank size (logarithm of total assets) of 19.229 and a leverage ratio of 0.889 (i.e. 88.9%).

Table 1
Summary Statistics

Variable	N	Mean	Std.Dev.	Min	Max
Log (z-score)	45,209	3.605	.89	-2.987	6.383
Volatility	3,867	.021	.014	.006	.225
MES	3,867	-.014	.009	-.055	.013
Log (Total Assets)	45,276	19.229	1.089	16.928	23.857
Leverage	45,276	.889	.044	0	1.064
Provisions	45,262	.003	.006	-.07	.306
Deposits	45,266	.864	.057	0	1.044
ROA	45,276	.008	.012	-.14	.665

The table reports the summary statistics of the variables used in this paper. The sample consists of 4,947 banks in the US over the time period 2007-2018, using yearly financial statement and balance sheet data. Of these banks, 1,008 are publicly traded or belong to a parent bank corporation that is publicly traded. Log (z-score) is the natural logarithm of the sum of the mean of ROA and CAR divided by the standard deviation of ROA. Volatility is the stock return volatility of publicly traded banks, calculated as the standard deviation of daily stock returns in one fiscal year. MES is the average return of publicly traded banks on days when the Nasdaq Composite index' return, as a proxy for the US-American economy, is at its lowest 5% over a given year. Log (Total Assets) is the natural logarithm of total assets and corresponds to the bank's size. Leverage is total liabilities divided by total assets. Provisions is loan loss provisions divided by total assets. Deposits is total deposits divided by total assets. ROA is net income divided by total assets.

Table 2
Sub-Sample Comparison of Means
Crisis Period

	N	Mean	Std.Dev.	Min	Max
Log (z-score)	4,800	3.446	.976	-2.157	6.383
Volatility	326	.045	.021	.009	.164
MES	326	-.022	.017	-.055	.013
Log (Total Assets)	4,845	18.98	1.025	16.933	23.756
Leverage	4,845	.893	.043	.158	1.053
Provisions	4,842	.007	.01	-.07	.198
Deposits	4,842	.86	.053	0	1.044
ROA	4,845	.004	.013	-.14	.135

Post-Crisis Period

	N	Mean	Std.Dev.	Min	Max
Log (z-score)	40,409	3.624	.877	-2.987	6.212
Volatility	3,541	.019	.011	.006	.225
MES	3,541	-.014	.008	-.034	.005
Log (Total Assets)	40,431	19.259	1.093	16.928	23.857
Leverage	40,431	.888	.044	0	1.064
Provisions	40,420	.002	.005	-.062	.306
Deposits	40,424	.864	.057	0	.999
ROA	40,431	.009	.012	-.107	.665

The table reports mean values for Log (z-score), Volatility, and MES as well as for the mentioned control variables for two sub-sample periods, before and after the increase of the maximum covered amount by the FDIC. Definitions for the variables are provided in *Table 1*.

The values for z-score, Volatility, systemic risk (MES), and leverage ratio are comparable to those of Anginer, Demirgüç-Kunt and Zhu (2014). In addition to the shown summary statistics, *Table 2* provides a sub-sample comparison of the means of the explained statistics by period. The results suggest that the z-score is higher in the post-crisis period than in the crisis period, contradicting the intuition that forms the basis for *Hypothesis 1*. Also, Volatility of publicly traded banks is lower in the post-crisis period in comparison to the crisis period. Likewise, the systemic risk measured by MES is also less negative after the permanent increase of the maximum covered amount.

4.2. Hypotheses Testing

To be able to confirm the intuition of the sub-sample comparison in the previous section that there are significant differences between the means of the dependent variables in the two time periods, a statistical test is performed. The conducting of a Doornik-Hansen test and a Shapiro-Wilk test for normality both yield that neither of the three main variables of interest (Log (z-score), Volatility, and MES) are normally distributed. Therefore, the comparison between the means of either variable in the two defined periods is performed with the help of a Mann-Whitney U Test. Here, a nonparametric test is chosen as the true distributions of the variables' values are not known. For each variable, H_0 is defined as follows in *Equation 3*, where var is replaced with the respective dependent variable of interest:

$$H_0 = var(period == crisis\ period) = var(period == post - crisis\ period) \qquad (3)$$

The results displayed in *Table 3* show that H_0 needs to be rejected for Log (z-score), Volatility, and MES as the differences in means for these variables are all significant at the 99%-level. This means, that a significant change has occurred between the two observed periods. Hence, further analysis is conducted to identify the causes for those changes in means.

Table 3
Mann-Whitney U Test Results

	N Crisis	N Post-Crisis	rank sum1	rank sum2	z	p-value
Log (z-score) by period	4,800	40,409	98,957,212 (1.085e+08)	9.230e+08 (9.134e+08)	-11.17	0.0000
Volatility by period	326	3,541	1,122,737 (630,484)	6,356,041 (6,848,294)	25.52	0.0000
MES by period	326	3,541	472,962 (630,484)	7,005,816 (6,848,294)	-8.17	0.0000

The table reports the results for the Mann-Whitney U Test conducted for all three dependent variables of interest (Log (z-score), Volatility, and MES). The rank sum for the crisis period is shown in column *rank sum1* and the rank sum for the post-crisis period is provided in column *rank sum2*. The expected values per rank sum are displayed in brackets below the rank sum figure. Definitions for the variables are provided in *Table 1*.

4.2.1. Bank Risk

First, the impact of the permanent change in the maximum amount covered by the FDIC from \$100,000 to \$250,000 in 2010 on the z-score of the sample banks is tested. As mentioned before, in theory this change could create a larger incentive for moral hazard and thus increased risk-taking (in the form of a lower z-score) due to a larger safety net that would benefit banks if they are failing. In order to test the relationship, ordinary least squares (OLS) is used for the following regression specification:

$$logzscore_{it} = \beta_0 + \Omega \times controlvariables_{it-1} + \beta_1 \times period_{it} + \varepsilon_{it} \tag{4}$$

The dependent variable in the regression in *Equation 4* is bank *i*'s risk at time *t* in the form of the z-score ($logzscore_{it}$). The independent variable of interest is $period_{it}$, which is a variable that takes 1 for the years after the maximum amount covered by the FDIC was increased to \$250,000, and 0 for the years before, i.e. 2007-2009. Furthermore, control variables that can affect risk are included in the regression. These control variables are all lagged by one year to prevent any reverse causality problem.

The regression results can be found in *Table 4*. The coefficent of the variable $period_{it}$ shows that the permanent increase in the maximum amount covered per customer per account from \$100,000 to \$250,000 has a significant positive impact on the bank z-score, refuting *Hypothesis*

1. A possible reason for this result is that $period_{it}$ not only incorporates the changes in the maximum covered by the FDIC, but also other measures such as increased requirements for capital ratios due to new regulation or an expansive monetary policy by the FED after the GFC. In their totality, those measures may have a positive effect on the risk-taking willingness of banks. However, the effect of each single one is utterly difficult to differentiate. This problem will be discussed more in depth in Section 5.

Table 4

Regression Log (z-score) with Robust SEs

Log (z-score)	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Log (Total Assets)	0.102	0.004	25.31	0.000	0.094	0.110	***
Leverage	-3.619	0.301	-12.02	0.000	-4.210	-3.029	***
Provisions	-38.835	2.176	-17.85	0.000	-43.100	-34.570	***
Deposits	0.130	0.157	0.83	0.408	-0.178	0.438	
ROA	4.887	1.873	2.61	0.009	1.215	8.559	***
period	0.741	0.050	14.73	0.000	0.642	0.839	***
Constant	4.107	0.257	16.01	0.000	3.604	4.610	***

Mean dependent var	3.614	SD dependent var	0.883
R-squared	0.140	Number of obs	40,202
F-test	376.754	Prob > F	0.000
Akaike crit. (AIC)	98021.151	Bayesian crit. (BIC)	98081.363

**** p<0.01, ** p<0.05, * p<0.1*

The table reports the results of the regression described in Section 4.2.1. The sample consists of 4,947 banks in the US over the years 2007-2018. Definitions for variables are provided in *Table 1*. The standard errors of the coefficients have been adjusted for heteroskedasticity and autocorrelation.

With regards to control variables, the results show that banks with higher leverage have higher risk. On the contrary, larger banks (Log(Total Assets)) are more stable. The same holds true for banks with higher loan loss provisions. Moreover, banks with higher profitability (ROA) show lower risk levels as well. The results for leverage, loan loss provisions and profitability confirm the findings by Anginer, Demirgüç-Kunt and Zhu (2014). The finding for the reliance on deposits for funding is not statistically significant.

4.2.2. Stock Return Volatility

As an additional measure, the impact of the permanent increase in the maximum amount covered by the FDIC on the Volatility of publicly traded US banks is tested. An increase in risk-taking willingness after the increase should be reflected by a higher Volatility. Again, the following regression specification is tested with the help of OLS:

$$volatility_{it} = \beta_0 + \Omega \times controlvariables_{it-1} + \beta_1 \times period_{it} + \varepsilon_{it} \quad (5)$$

In *Equation 5*, $volatility_{it}$ is the dependent variable of the regression. As before, the regressor of main interest is $period_{it}$ and the impact of the aforementioned control variables lagged by one year will be tested.

Table 5
Regression Volatility with Robust SEs

Volatility	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Log (Total Assets)	-0.001	0.000	-8.23	0.000	-0.001	-0.001	***
Leverage	0.014	0.007	1.87	0.062	-0.001	0.028	*
Provisions	0.334	0.058	5.70	0.000	0.219	0.448	***
Deposits	-0.002	0.005	-0.39	0.698	-0.011	0.007	
ROA	-0.028	0.019	-1.50	0.135	-0.065	0.009	
period	-0.031	0.004	-7.07	0.000	-0.040	-0.023	***
Constant	0.060	0.007	8.68	0.000	0.047	0.074	***

Mean dependent var	0.019	SD dependent var	0.011
R-squared	0.117	Number of obs	3,416
F-test	28.007	Prob > F	0.000
Akaike crit. (AIC)	-21226.958	Bayesian crit. (BIC)	-21184.004

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

The table reports the results of the regression described in Section 4.2.2. The sample consists of 1,008 banks in the US over the years 2007-2018. Definitions for variables are provided in *Table 1*. The standard errors of the coefficients have been adjusted for heteroskedasticity and autocorrelation.

Table 5 provides the results of the regression. The coefficient for $period_{it}$ shows that the permanent increase of the maximum amount covered by the FDIC has a significant negative impact on the Volatility of publicly traded US banks, i.e. decreasing stock return volatility and thereby refuting *Hypothesis 2*. In economic terms, the increase in the maximum coverage amount by $150,000 led to 3.1 percentage points less volatility of an average bank's stock returns. However, as mentioned before, it is difficult to attribute this effect solely to the changes made by the FDIC. With regards to control variables, banks with higher leverage and banks with higher loan loss provisions also have higher Volatility, although the observation for leverage is only significant at a 90%-confidence level. Bank size has a significant negative but rather limited effect on Volatility. The effects of reliance on deposits for funding and profitability are not significant.

4.2.3. Systemic Risk

Furthermore, the impact of the permanent increase in the maximum amount covered by the FDIC on the systemic risk of the sample banks is tested. An increase in a bank's systemic risk should be reflected in a lower MES. Again, OLS is used to test the following regression specification:

$$MES_{it} = \beta_0 + \Omega \times controlvariables_{it-1} + \beta_1 \times period_{it} + \varepsilon_{it} \qquad (6)$$

In *Equation 6*, bank i's Marginal Expected Shortfall (MES_{it}) is the dependent variable. Once again, $period_{it}$ is the regressor of interest and the impact of the above mentioned control variables lagged by one year is tested, respectively.

Table 6
Regression MES with Robust SEs

MES	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Log (Total Assets)	-0.001	0.000	-10.36	0.000	-0.001	-0.001	***
Leverage	0.020	0.005	3.70	0.000	0.009	0.030	***
Provisions	-0.120	0.032	-3.72	0.000	-0.183	-0.057	***
Deposits	-0.022	0.003	-8.78	0.000	-0.027	-0.017	***
ROA	-0.072	0.015	-4.95	0.000	-0.101	-0.044	***
period	0.005	0.003	1.48	0.139	-0.001	0.011	
Constant	0.008	0.006	1.44	0.149	-0.003	0.020	

Mean dependent var	-0.014	SD dependent var	0.008
R-squared	0.050	Number of obs	3,416
F-test	30.997	Prob > F	0.000
Akaike crit. (AIC)	-23452.279	Bayesian crit. (BIC)	-23409.326

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

The table reports the results of the regression described in Section 4.5. The sample consists of 1,008 banks in the US over the years 2007-2018. Definitions for variables are provided in *Table 1*. The standard errors of the coefficients have been adjusted for heteroskedasticity and autocorrelation.

Table 6 provides the results of the regression. The findings for $period_{it}$ suggest that the permanent increase of the maximum amount covered by the FDIC does not have a significant impact on bank systemic risk, i.e. refuting *Hypothesis 3*. Given this finding it can be inferred that increasing the maximum coverage amount of a deposit guarantee scheme has no effect on the systemic risk of insured banks. Regarding control variables, the effect of an increase in MES holds true for banks with higher leverage ratio. Moreover, larger banks (though only marginally), banks with higher profitability, banks with more reliance on deposits for funding, and banks with higher loan loss provisions have a lower MES, i.e. higher systemic risk.

5. Discussion

5.1. Limitations

The results of the analysis show that the period has a significant impact on the development of z-score and Volatility for the average bank of the sample. However, no signifcant impact on the systemic risk of a bank measured by MES could be identified.

The main limitation of the study results from the permanent increase in the maximum amount covered by the FDIC coinciding with the end of the GFC. This makes it difficult to differentiate the effects of the crisis itself from the effects of the change in regulation by the FDIC. Integrating control variables for the impact of new regulation after the GFC by including the impact of higher capital ratios (in the form of Total Capital Ratio) and a more expansive monetary policy that resulted in less volatile financial markets and lower risk premia (in the form of the VIX[2]) led to problems of multicollinearity in the regression. Conducting hierachical regressions integrating more control variables with every hierarchical step in the regression, however, showed that the meaningfulness (i.e. the R-squared) of the model for z-score is the highest when Total Capital Ratio and VIX are not integrated. When observing the results for Volatility and MES, they show that Total Capital Ratio does not have significant impact on the development of those two risk measures. Moreover, even though VIX has a significant impact,

[2] Data for the VIX has been obtained from Bloomberg.

the coefficient is minimal. Hence, regressions have been calculated without incorporating Total Capital Ratio or VIX. The coefficents of the hierachical regressions for z-score, Volatility, and MES, their significance as well as the R-squared of each regression can be found in *Appendix A*. Nonetheless, this leads to the conclusion that the observed changes in the dependent variables can not solely be attributed to the FDIC's change in the maximum amount covered. Hence, all changes in regulation and monetary policy after the GFC have to be interpreted in their totality in the independent variable $period_{it}$.

In addition, results are weakened by comparing merely three crisis years to a post-crisis period of nine years. This is limiting the meaningfulness of the crisis period results as means of nine years are representing the population better than values of merely three years. Also, for some banks, data is only available after 2008, creating a shorter time line for these institutions.

Excluding the year 2010 completely, as the permanent increase of the maximum amount covered by the FDIC's deposit insurance has been enacted in the middle of the year, yields similar results in terms of coefficients and significance compared to keeping 2010 in the sample. Hence, for the sake of having a larger sample size, 2010 was kept as part of the post-crisis period sample.

5.2. Practical Implications

The results of the multiple regressions have shown that the independent variable $period_{it}$ has a significant impact on the standalone bank risk in the form of z-score and Volatility, leading to a higher bank stability and less stock return volatility. Due to the previously discussed limitations of the research design, however, these results can not solely be attributed to the increase in the maximum amount covered by the FDIC from $100,000 to $250,000 in 2010. The introduction of multiple regulations such as higher required capital ratios and a more expansive monetary policy after the GFC coinciding with FDIC changes and the apparent interdepency between those adaptions make it difficult to attribute the observed changes in bank stability to a single factor. Hence, at this point, the influences of the aforementioned factors need to be analyzed in their totality. What can be infered from the findings is that after the GFC there has indeed occured an improvement in the standalone stability of banks in the US. Which factors had prime importance on this development need to be analyzed in a more granular study.

6. Conclusions

The permanent increase of the maximum amount covered by the FDIC in 2010 raised concerns among economists that a larger safety net would foster moral hazard and more risk-taking willingness among banks in the US. For this reason, this study investigates whether there is a significant positive relation between the aforementioned actions applied by the FDIC and the riskiness of financial institutions. Explicitly, the study tests whether the permanent raise has a significant negative impact on the z-score of the average bank in the sample (*Hypothesis 1*), a significant positive impact on the stock return volatility (*Hypothesis 2*), and a significant negative impact on bank systemic risk (*Hypothesis 3*). The study finds that the totality of changes in regulation and monetary policy after the GFC increased the z-score of the average bank in the sample after the crisis period, i.e. financial institutions actually became more stable. Moreover, after the permanent introduction of the higher maximum amount covered and other policy measures, the stock return volatility of the publicly traded banks in the sample decreased significantly. Thereby, all three hypotheses have been refuted by the results obtained from the regressions. Limitations in the reliability of these findings result from the introduction of the increased maximum coverage amount by the FDIC coinciding with the end of the GFC as well as several other changes in regulation such as the necessity of higher capital ratios (which mitigate moral hazard created by deposit insurance) and a more expansive monetary policy by the FED after the GFC. These influences on the risk-taking willingness of banks cannot be properly differentiated. Further research should focus on separating the effects of multiple regulation and monetary policy changes more clearly to analyze the true effect of the change in the US deposit insurance scheme on banks' risk-taking willigness. Moreover, research should try to confirm the obtained results with data from other countries; preferably countries, in which the introduction of a larger safety net does not coincide with the end of a financial crisis.

7. Bibliography

Acharya, Viral V., Robert Engle, and Matthew Richardson. 2012. "Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks." *American Economic Review Papers and Proceedings* 59-64.

Allen, Franklin, and Douglas Gale. 2000. "Financial Contagion." *Journal of Political Economy* 1-33.

Altman, Edward I. 1968. "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy." *Journal of Finance* 589-609.

Anginer, Deniz, and Asli Demirgüç-Kunt. 2018. "Bank Runs and Moral Hazard: A Review of Deposit Insurance." *Policy Research Working Paper 8589.*

Anginer, Deniz, Asli Demirgüç-Kunt, and Min Zhu. 2014. "How Does Deposit Insurance Affect Bank Risk? Evidence from the Recent Crisis." *Journal of Banking & Finance* (World Bank) 48: 312-321.

Anginer, Deniz, Ata Can Bertay, Robert Cull, Asli Demirgüç-Kunt, and Davide S. Mare. 2019. *Bank Regulation and Supervision Ten Years after the Global Financial Crisis.* Working Paper, New York City: World Bank Group.

Angkinand, Apanard P. 2009. "Banking Regulation and the Output Cost of Banking Crises." *International Financial Markets, Institutions & Money* 240-257.

Bergbrant, Mikael C., Kaysia T. Campbell, Delroy M. Hunter, and James E. Owers. 2014. *Does Deposit Insurance Retard the Development of Financial Markets?* Working Paper, University of South Florida.

Bryant, John. 1980. "A Model of Reserves, Bank Runs and Deposit Insurance." *Journal of Banking & Finance* 335-344.

Calomiris, Charles W. 1989. "Deposit Insurance: Lessons from the Record." *Economic Perspectives* 10-30.

Calomiris, Charles W. 1990. "Is Deposit Insurance Necessary? A Historical Perspective." *Journal of Economic History* 283-295.

Calomiris, Charles W., and Eugene N. White. 1994. "The Origins of Federal Deposit Insurance." In *The Regulated Economy: A Historical Approach to Political Economy*, by Claudia Goldin and Gary D. Libecap, 145-188. Chicago: University of Chicago Press.

Calomiris, Charles W., and Matthew Jaremski. 2016. "Deposit Insurance: Theory and Facts." *Annual Review of Financial Economics* 97-120.

Calomiris, Charles W., and Matthew Jaremski. 2019. "Stealing Deposits: Deposit Insurance, Risk-Taking, and the Removal of Market Discipline in Early 20th-Century Banks." *Journal of Finance* 74 (2): 711-754.

Calomiris, Charles W., and Sophia Chen. 2016. *The Spread of Deposit Insurance and the Global Rise in Bank Leverage Since the 1970s.* Working Paper, Columbia Business School.

Carapella, Francesca, and Giorgio Di Giorgio. 2004. "Deposit Insurance, Institutions and Bank Interest Rates." *Transition Studies Review* 77-92.

Chang, Roberto, and Andres Velasco. 2001. "A Model of Financial Crises in Emerging Markets." *The Quarterly Journal of Economics* 489-517.

Chernykh, Lucy, and Rebel A. Cole. 2011. "Does Deposit Insurance Improve Financial Intermediation?" *Journal of Banking & Finance* 388-402.

Cooper, Russell, and Thomas W. Ross. 2002. "Bank Runs: Deposit Insurance and Capital Requirements." *International Economic Review* 55-72.

Cull, Robert, Lemma W. Senbet, and Marco Sorge. 2001. *Deposit Insurance and Financial Development.* Working Paper, World Bank.

DeLong, Gayle, and Anthony Saunders. 2011. "Did the Introduction of Fixed-Rate Federal Deposit Insurance Increase Long-Term Bank Risk-Taking?" *Journal of Financial Stability* 19-25.

Demirgüç-Kunt, Asli, and Enrica Detragiache. 2002. "Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation." *Journal of Monetary Economics* 1373–1406.

Demirgüç-Kunt, Asli, and Harry Huizinga. 1999. *Market Discipline and Financial Safety Net Design.* Working Paper, World Bank.

Demirgüç-Kunt, Asli, Edward J. Kane, and Luc Laeven. 2008. *Deposit Insurance Around the World: Issues of Design and Implementation.* Cambridge: The MIT Press.

Diamond, Douglas W., and Philip H. Dybvig. 1983. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 401-419.

Federal Deposit Insurance Corporation. 2011. *Selected Sections of the Dodd-Frank Wall Street Reform and Consumer Protection Act* . December 8. Accessed October 11, 2019. https://www.fdic.gov/regulations/reform/dfa_selections.html#5.

—. 1933. *Transcript of Speech by President Franklin D. Roosevelt Regarding the Banking Crisis.* March 12. Accessed September 20, 2019. https://www.fdic.gov/about/history/3-12-33transcript.html.

—. 2017. *Who is the FDIC?* May 3. Accessed September 20, 2019. https://www.fdic.gov/about/learn/symbol/.

Fischer, Irving. 1912. *The Purchasing Power of Money: Its Determination and Relation to Credit Interest and Crises.* New York: The MacMillan Company.

Fischer, Stanley. 1999. "On the Need for an International Lender of Last Resort." *Journal of Economic Perspectives* 85-104.

Fonseca, Ana Rosa, and Francisco González. 2010. "How Bank Capital Buffers Vary Across Countries: The Influence of Cost of Deposits, Market Power and Bank Regulation." *Journal of Banking & Finance* 892-902.

Gennotte, Gerard, and David Pyle. 1991. "Capital Controls and Bank Risk." *Journal of Banking & Finance* 805-824.

Gorton, Gary. 1988. "Banking Panics and Business Cycles." *Oxford Economic Papers* 751-781.

Green, Edward J., and Ping Lin. 2003. "Implementing Efficient Allocations in a Model of Financial Intermediation." *Journal of Economic Theory* 1-23.

Gropp, Reint, Christian Gruendl, and Andre Guettler. 2014. "The Impact of Public Guarantees on Bank Risk-Taking: Evidence from a Natural Experiment." *Review of Finance* 457-488.

Hazlett, Denise. 1997. "Deposit Insurance and Regulation in a Diamond-Dybvig Banking Model with a Risky Technology." *Economic Theory* 453-470.

Hoggarth, Glenn, Ricardo Reis, and Victoria Saporta. 2002. "Costs of Banking System Instability: Some Empirical Evidence." *Journal of Banking & Finance* 825-855.

Hovakimian, Armen, Edward J. Kane, and Luc Laeven. 2003. "How country and safety-net characteristics affect bank risk-shifting." *Journal of Financial Services Research* 177–204.

Ioannidou, Vasso P., and María Fabiana Penas. 2010. "Deposit Insurance and Bank Risk-Taking: Evidence from Internal Loan Ratings." *Journal of Financial Intermediation* 95-115.

Kahn, Charles M., and Joao A.C. Santos. 2005. "Allocating Bank Regulatory Powers: Lender of Last Resort, Deposit Insurance and Supervision." *European Economic Review* 2107-2136.

Kane, Edward J. 1989. *The S&L Insurance Mess: How did it Happen?* Washington, D.C.: The Urban Institute Press.

Karas, Alexei, William Pyle, and Koen Schoors. 2013. "Deposit Insurance, Banking Crises, and Market Discipline: Evidence from a Natural Experiment on Deposit Flows and Rates." *Journal of Money, Credit and Banking* 179–200.

Laeven, Luc. 2002. "Bank Risk and Deposit Insurance." *The World Bank Economic Review* 109-137.

Laeven, Luc, and Ross Levine. 2008. "Bank Governance, Regulation, and Risk Taking." *Working Paper.*

Lucas, Deborah, and Robert L. McDonald. 2006. "An Options-Based Approach to Evaluating the Risk of Fannie Mae and Freddie Mac." *Journal of Monetary Economics* 155-176.

Marini, Francois. 2003. "Bank Insolvency, Deposit Insurance and Capital Adequacy." *Journal of Financial Services Research* 67-78.

Martin, Christopher, Manju Puri, and Alexander Ufier. 2017. *On Deposit Stability in Failing Banks.* Working Paper, Federal Deposit Insurance Corporation.

Ngalawa, Harold, Fulbert Tchana Tchana, and Nicola Viegi. 2016. "Banking Instability and Deposit Insurance: The Role of Moral Hazard." *Journal of Applied Economics* 323-350.

Nier, Erlend, and Ursel Baumann. 2006. "Market Discipline, Disclosure and Moral Hazard in Banking." *Journal of Financial Intermediation* 332-361.

Pyle, David H. 1986. "Capital Regulation and Deposit Insurance." *Journal of Banking & Finance* 189-201.

Roy, Andrew Donald. 1952. "Safety First and the Holding of Assets." *Econometrica* 431-449.

Smith, Bruce D. 2002. "Monetary Policy, Banking Crises, and the Friedman Rule." *American Economic Reviews* 128-134.

Wheelock, David C., and Paul W. Wilson. 1995. "Explaining Bank Failures: Deposit Insurance, Regulation and Efficiency." *The Review of Economics and Statistics* 689-700.

World Bank. 2016. *Financial Stability.* Accessed December 16, 2019. https://www.worldbank.org/en/publication/gfdr/gfdr-2016/background/financial-stability.

Appendix

Appendix A: Hierarchical Regression

Appendix A.1
Regression Log(z-score) with Robust SEs

Variable	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
Period	0.18***	0.85***	0.86***	0.76***	0.76***	0.74***	omitted	omitted
Log (Total Assets)		0.09***	0.11***	0.11***	0.11***	0.10***	0.10***	0.11***
Leverage			-4.14***	-3.97***	-4.03***	-3.12***	-7.63***	-7.92***
Provisions				-42.45***	-42.42***	-38.84***	-38.06***	-42.49***
Deposits					0.06	0.13	0.07	0.24
ROA						4.89*	4.09*	4.07***
Total Capital Ratio							-0.04***	-0.04***
VIX								0.02***
Constant	3.45***	0.99***	4.41***	4.48***	4.48***	4.11***	8.95***	8.59***
N	45,209	40,211	40,211	40,202	40,202	40,202	39,594	39,594
R2	0.004	0.026	0.067	0.137	0.137	0.140	0.127	0.134

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

Appendix A.2
Regression Volatility with Robust SEs

Variable	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
Period	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	omitted	omitted
Log (Total Assets)		-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
Leverage			0.02***	0.02***	0.02**	0.01	0.04	0.04
Provisions				0.35***	0.35***	0.33***	0.32***	0.15***
Deposits					-0.00	-0.00	-0.00	0.00
ROA						-0.03	-0.03	-0.03
Total Capital Ratio							0.00	0.00
VIX								0.00***
Constant	0.05***	0.07***	0.06***	0.05***	0.05***	0.06***	0.01	-0.02
N	3,867	3,417	3,417	3,416	3,416	3,416	3,380	3,380
R2	0.245	0.083	0.087	0.115	0.115	0.115	0.046	0.125

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

Appendix A.3
Regression MES with Robust SEs

Variable	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
Period	0.01***	0.01	0.01	0.01	0.00	0.01	omitted	omitted
Log (Total Assets)		-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
Leverage			0.01***	0.01***	0.03***	0.02***	0.09	0.09
Provisions				-0.06*	-0.08**	-0.12***	-0.13***	-0.08**
Deposits					-0.02***	-0.02***	-0.02***	-0.02***
ROA						-0.07***	-0.07***	-0.07***
Total Capital Ratio							0.00	0.00
VIX								-0.00***
Constant	-0.02***	0.00	-0.01	-0.01	-0.01	0.01	-0.06	-0.05
N	3,867	3,417	3,417	3,416	3,416	3,416	3,380	3,380
R2	0.060	0.023	0.027	0.029	0.040	0.048	0.049	0.059

*** *p<0.01*, ** *p<0.05*, * *p<0.1*