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What really drove Silicon Valley and First Republic Bank bankruptcy?

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A B S T R A C T

This paper analyses the possible determinants that induced Silicon Valley and First Republic Bank to Bankruptcy. We employ financial statements for a sample of Banks in line with the business core of Silicon Valley Bank. The period under assessment ranges from 2006-2022. We estimate an indicator of Bank Efficiency using the technique Data Envelopment Analysis (DEA). The latter indicator is used as the primary step to analyze failure within sample banks. According to the CAMEL model, macroeconomic variables are non-significant but relevant variables that drive failure were: Bank Efficiency, Capital adequacy, Earning ability, and Liquidity position ratio. Our study is relevant for any policy making to prevent any future bank failure.

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1. Introduction

On march 10, 2023 we ended up with bad news in the financial bank system[1]. Silicon Valley Bank (SVB) was acquired by Silicon Valley Bridge Bank in California and in May 2023, First Republican Bank was acquired by JPMorgan Chase Bank with the same location as the former. As well as these banks plunge fallout spreads signaling those negative stocks resulting from the incident is far from over. Some banks failed in the California region: First Republic Bank remained under financial stress, with shares sinking 70% in US premarket trading even after the FED actions to try and defeat concern about its liquidity issues after the failure news of SVB. In addition, PacWest Bancorp also missed more than 40%, Western Alliance Bancorp worsened 30%, Charles Schwab Corp. lost about 20% and Zions Bancorp dropped 15%. Comerica Inc. fell 7%. (see Bloomberg, 2023).

Retaining deposits is difficult when money market rates hit almost 50% more than interest paid on savings accounts. And when deposits flee, banks run, and bankers are forced to sell Treasury holdings. Bank Liquidity drops and then probability of bank bankruptcy rises. The Federal Reserve Bank (FED) decision to raise interest rates came after a scenario of rampant inflation above the target 6-8% (DVIF,2022).[2] According to DVIF (2022) the context of the Russian-Ukrainian war has pumped up the process of wheat, corn and oil. The latter area is a world producer of the mentioned commodities and the drop in food´s world supply has raised prices and therefore there is a worldwide inflation (See also in WEO, 2023). Central Banks in every single country as well as the FED in the US are aware of the inflation pressures and then applied contractionary monetary policy in order to combat inflation. There are consequences after the application of the latter policy: Unemployment,

[1] The Economist (2023)

[2] See the seminal paper of Bernanke, B. and Blinder, A. (1992).

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Economy slowing down and high interest rate (See the seminal papers of Christiano and Ljungqvist (1988), Sims (1972) and Friedman and Schwartz (1963)).

This macroeconomic scenario may have induced some bank management issues and triggered bank failures. Our paper will analyze if the negative macroeconomic factors have induced any failure or slid bank efficiency. There are many factors that have produced the bankruptcy of SVB and First Republic Bank. The location of the bank is also relevant as well as the financial statements priori the failure is always relevant. In our paper, we will consider all microeconomic and macroeconomic factors that may have driven the recent failure in the US Financial System. Vassalou and Yifan (2023) pointed out that worries over the health of US regional banks and commercial real estate may drive credit drop. The exposure to the latter situation is mainly focused on small and medium sized enterprises (SMEs). Stress in the SME sector which is a major engine of US growth, may spread into the larger companies then weaker consumption and demand may affect equity markets by a second-round effect. There is not a black market yet but there are coming negative consequences if the inflation situation persists. Vassalou and Yifan (2023) and The Economist (2023) showed that SVB hit $212bn of assets, and failed with significant speed. It was the most relevant bank failure since the global financial subprime crisis of 2007-09. Most of SVB's depositors were located in the Bay Area tech startups. Here the accounts holding were approximately $250,000, all insured by the federal government. There are some bad financial decisions inside the recent failure: loading up on long-term bonds, SVB had assumed an enormous unhedged bet on interest rates to maintain low. Of course, that was a bad decision which left the bank insolvent (or near enough). There are some microeconomic financial decisions in spite of external factors that may have driven the recent financial turmoil. The First Republic Bank is not aligned to the latter situation. According to (Vuillemey, 2023; Dinh, 2023) the current regional banking crisis was induced by a several factors, besides fast rising interest rates , high levels of uninsured deposits, regulatory rollbacks, and careless supervision by the US Federal Reserve are the main drivers of the financial recent instability.

This paper will attempt to find the main factors that drive the SVB and First Republic Bank failure. Efficiency Estimation is also carried out to sharpen our exploratory analysis. Next sector will introduce the recent literature background discussion on the topic, then comes a section describing the Data, next Efficiency Estimation is described as well as the Logit Failure Model. Finally, Results and Conclusions are presented at the end.

2. Recent Literature Discussion

There are quite a few papers that analyses causes, consequences of the recent financial turmoil produced by SVB and First Republican Bank. Authors like Yousaf (2023) study the negative consequences of the recent financial instability on the stock market.[3] Ali et al. (2023) emphasized the lack of the role of Central Bank Digital Currency (CBDC). The CBDC could have potentially prevented bank failures and market panic by providing better monitoring expertise and allowing regulators to intervene on time. CBDCs could also monitor their banks by assuming faster actions during times of financial uncertainty. Some other authors explore the determinants and lessons of the SVB and First Republican Bank. Vo and Le (2023)[4] pointed out three weaknesses resulting the SVB's collapse. The latter author mentions: first, this bank held significantly less equity capital than competitors. Second, the bank made significant investments in debt securities during times of lower interest rates. Third, this bank had a highly concentrated depositor base[5], containing a small group of venture capitalists. For the authors the interest rate, GDP growth rate, insured deposits, and the withdrawal of concentrated deposits draw the financial bankruptcy. Dinh, H. (2023) blamed the Federal Reserve Bank as the main responsible for the financial bankruptcy. The sudden and significant rise in interest rates did not leave enough time for banks to adjust the duration of their portfolios. The latter author also found that internal bank management is relevant in the financial instability. SVB committed the mistake of mismatching between its demand deposits and its securities was impossible to ignore.[6] Along the line of the lack of regulation Mérő, K. (2023) found several problems in the regulation after the 2009 subprime crisis. Author claims that the issues of "too-big-to fail", and the regulations related to capital structure, management of interest rate risk and liquidity risk are relevant for any regulator. Actual regulation on the latter four issues are not enough to guarantee stability and proper banking crisis controlling. The latter situation holds if banks have to face crises never confronted before. Banking regulations planning financial stability should try to adopt a new approach instead of worsening current rules. The mentioned authors propose reduction of bank´s leverage or the introduction of CBDC. De Rezende (2023) examined the stress levels of sixty US regional banks, by proposing a new "bank stress indicator". Author´s results found high stress in the banks with failure and conclude that they have been highly profitable and have built up strong balance sheet positions over the past years. The main issue with the stressed banks has been their large shares of uncovered deposit (not covered by FDIC). Lack of Regulation is a concern but previous years before the recent financial negative results, Narayanan and Van Vo, L. (2015) found that after 2009 Subprime crisis, the new rules put in place after the financial crisis have diminished the incentives for the banks to participate in risk taking via securitization. Besides new regulations after the 2009 crisis, there are still new challenges in the financial system.

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[3] Bales, S., & Burghof, H. P. (2023) found that news from tweets and google may have influenced negative responses in the stock market. Same idea is found in Cookson, J. A., Fox, C., Gil-Bazo, J., Imbet, J. F., & Schiller, C. (2023). Also Rose (2023) found that technology speed up the bank run deposit.

[4] Similar results were found in Hauf and Posth(2023).

[5] Same results were found in Le, H. T., & Vo, L. V. (2023)

[6] SVB are not committed to follow Dodd-Frank Act's because of the size of their deposits and therefore risk exposure rises.

Next section will describe the Data and Bank Efficiency estimation of our sample that runs in a period before and after the subprime crisis. This efficiency indicator will be used as input for the Logit model of failure.

3. Data and Bank Efficiency Estimation (DEA)

We use balance sheets and financial statements from different banks along the line of business of Silicon Valley Bank and First Republican Bank. The period under consideration runs from 2006-2022 which permits us to infer any structural change within two financial crises: the Subprime crisis and the recent turmoil. The banks in our sample are located in the Northeast, Midwest, South, West and Canada areas. There is a control for macroeconomic effects like growth of GDP and Central Bank or FED's interest rate. The growth of GDP is national, the short period of time cannot permit the use regional total production effects. The table below shows a statistical summary of the variables used in the study:

Table 1
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
DEA	270	0.9579107	0.0964366	0.1261	1
Capital/Asset	270	22160.15	32669.28	7.846946	110304.9
Nonperforming Loans/Assets	270	1651.521	4544.104	-2664.657	26663.3
Profits/Assets	270	2036.893	3281.183	-929.2668	13914.6
Inverse (Loan/Deposits)	348	0.0478603	0.0300236	0.00004	0.4512787
DEPOSITASSET	270	143588.4	203972.6	150.9002	724987.3
Bank Failure Dummie	373	0.0938338	0.291989	0	1
Northeast	518	0.2451737	0.430606	0	1
Midwest	518	0.0328185	0.1783336	0	1
South	518	0.3011583	0.4592048	0	1
West	518	0.3725869	0.4839608	0	1
Northeast and Canada	518	0.0482625	0.2145277	0	1
FED	513	1.942632	1.975252	0.08	6.24
GDP Growth	518	2.228229	1.904297	-5.074358	5.945485

Elaboration: Own

The dummy of failure takes the value of 1 if the bank fails and zero in other cases. The failure can be measured three, two or one year before the bank´s bankruptcy.

3.1 Data Envelopment (DEA) Estimation

The collected data permits us to estimate the indicator of efficiency that will be used as an input to the models described in the next section. Several authors attempted to estimate efficiency. For example Farell (1957) pointed out that average productivity of labor was used to measure efficiency, but this indicator failed to use all the information of inputs and outputs available at the same time. For instance, Farell (1957) and Cooper et al. (2004) provided the following definition of "relative efficiency" that solves the problem of the efficiency using all information concurrently:

> "***A Decision Making Unit (DMU) is to be rated fully efficient on the basis of available evidence if and only if the performances of other DMUs do not show that some of its inputs or outputs can be improved without worsening some of its other inputs or outputs***".

In order to consider our estimated banks' relative efficiency, we use Data Envelopment Analysis (DEA) technique with input-Output approach. The DEA comes from the original work of Charnes, Cooper and Rhodes (1978) as well as Farrel (1957). The latter authors introduced the basic idea of measuring relative efficiency using Euclidean distances from a given point observation to an optimal "relative frontier". The word "relative" is used because efficiency is given only for a sample of information. A DMU (Bank in our case) lying on the frontier receives a score of one while Banks sited below the frontier receive scores lower than one. Charnes, Cooper and Rhodes (1978) with the arrival of the computer, introduced a linear program to estimate measures of efficiency, consuming several inputs and outputs at the same time (See some application in Guillen (2009) and Guillen, Rengifo and Ozsoz (2014).

The inputs under consideration in the study are: Fixed Assets, Deposits and Interest Expense and non-Interest Expenses. The outputs are Interest Income and non-Interest Income. The selection of inputs and outputs goes along the line of the literature of banking.[7] The idea to estimate bank efficiency comes from the objective of a bank manager who is planning, incorporating the necessary input allocation needed to attract deposits and make favorable loans and investments, controlling at the same time for all risks.

[7] Berger and Mester (2003), Barr, Killgo and Siemens (1999) and De Young (1998)

Table 2
Summary Statistics for the DEA

Year	Banks	Mean	Min	Max	First Quartile	Median	Third Quartile
2005	12	0.948	0.8043	1	0.9064	1	1
2006	12	0.9697	0.8674	1	0.9736	1	1
2007	13	0.9535	0.823	1	0.941	1	1
2008	13	0.9979	0.9864	1	1	1	1
2009	15	0.8797	0.1261	1	0.8438	0.9968	1
2010	14	0.9718	0.7737	1	0.9981	1	1
2011	15	0.9622	0.7929	1	0.9995	1	1
2012	15	0.9606	0.7876	1	0.9891	1	1
2013	15	0.9367	0.6904	1	0.8927	1	1
2014	15	0.9602	0.7577	1	1	1	1
2015	15	0.9661	0.7019	1	1	1	1
2016	16	0.9360	0.6392	1	1	1	1
2017	16	0.9382	0.6495	1	0.9979	1	1
2018	16	0.9664	0.7173	1	0.9983	1	1
2019	17	0.977	0.7425	1	1	1	1
2020	17	0.9666	0.761	1	0.9559	1	1
2021	17	0.9734	0.7767	1	1	1	1
2022	17	0.978	0.9133	1	0.9445	1	1

Elaboration: Own

Table 2 shows all the summary of efficiency estimations for the sample of Banks similar under consideration in the study. In addition, the figure below permits us to verify significant distance between some quartiles on the bank efficiency estimation. We can notice that most of the banks in the sample are efficient. Next section will use this indicator of efficiency for the Logit Model of failure. Determinants of efficiency are also analyzed.

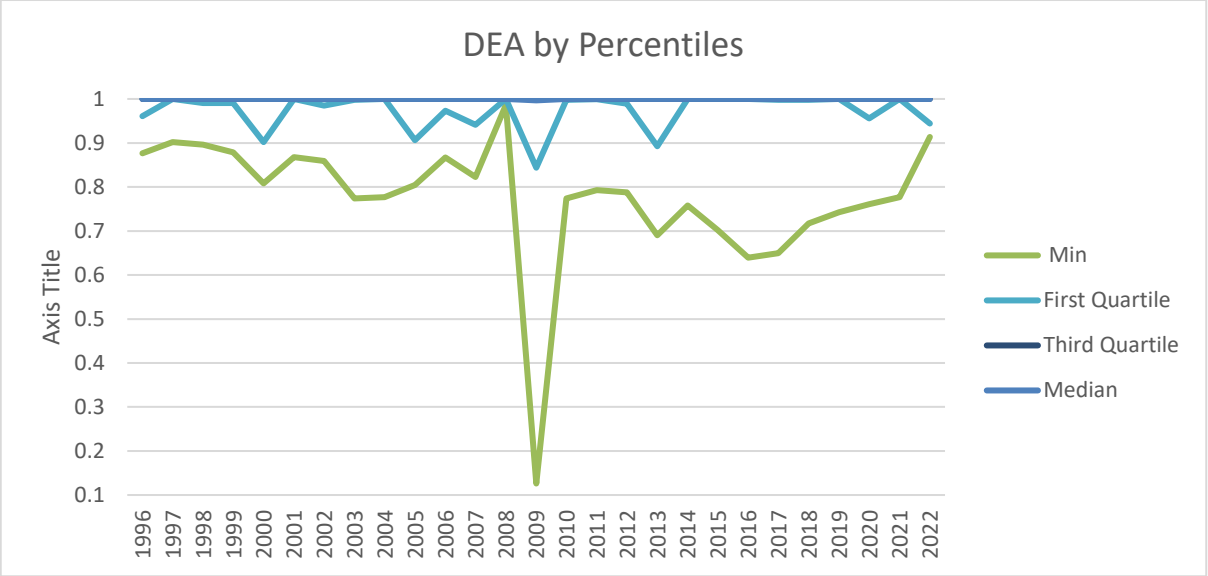

Fig. 1. DEA Estimation by Quartiles

4. LOGIT Model and Determinants of Bank Efficiency

In order to test for the main drivers of failure, we employ the following Logit Model:

$$Failure_{it} = \alpha + \beta_1 CAPITAL/ASSET_{it} + \beta_2 DEA + \beta_3 NONPERFORMING\ LOANS/ASSET_{it} + \beta_4 PROFIT/ASSET_{it} + \beta_5 Inverse\ (LOAN/DEPOSIT)_{it} + \beta_6 FED_t + \beta_7 GDP\ Growth_t + \beta_8 WEST_i \quad (1)$$

where:

$FAILURE_{it}$: the failure dummy for Bank "i" in period "t"
$CAPITAL/ASSET_{it}$: The ratio of Capital/Asset for Bank "i" in period "t"
DEA_{it}: Efficiency Estimation for bank "i" in period "t"

NONPERFORMING LOANS/$ASSET_{it}$: Is the ratio of Nonperforming Loasns/Assets for Bank "i" in period "t"
$PROFIT/ASSET_{it}$: Is the ratio of Profit/Asset for Bank "i" in period "t"
$Inverse(LOAN/DEPOSIT)_{it}$: Is the inverse of the ratio of Loan/Deposit for Bank "i" in period "t"
FED_t: The Federal Fund rate at time "t"
GDP $Growth_t$: Growth Rate of GDP at time "t"
$WEST_i$: Dummie of location at West for bank "i"

Failure is a dummy that takes the value of 1 if the bank fails and zero otherwise. If the bank fails, we consider setting the value of 1 with two, three and five years before the bankruptcy. Bank's health[8] has been evaluated using the Capital adequacy, Asset quality, Management quality, Earning ability, and Liquidity position ratio. The latter model is well known as the C.A.M.E.L. model. For capital adequacy, capital as a ratio of assets used. The latter variable has been extremely important in the explanation of failures in the US system. Authors like Altman (1968), Guillen (2009) proceed in a similar way. When there is a drop in the ratio of capital divided by assets would force bank failure. For Management proxy, we employ DEA (DeYoung, 1998) and we expect this sign to be negative (See also in Guillen, Rengifo and Ozsoz (2014). For asset quality, we apply nonperforming loans (NPL) as a ratio of assets. Most of the literature considers this variable as a good proxy of asset quality because when most loans are bad, it makes a considerable problem for the bank. In addition, a higher ratio of NPL is a sign that the bank is incurring in riskier activities that may trigger failure. We use profits as a ratio of Capital, to capture earning ability, which is the typical return to Capital (ROE) indicator. The measure is used by Martin (1977), Wilson and Wheelock (2000), Guillen (2009) and others. A higher ratio of profits as a ratio of Capital reduces the likelihood of bankruptcy. For liquidity, we use loans as a ratio of deposits. This indicator reflects the ability to support loan with deposits. Higher values of this ratio imply a drop in the bank´s liquidity which increases the likelihood of failure. We also control for macroeconomic effects in failure, then it is included: growth rate of GDP, Federal Fund Rate and location of the bank as possible explanatory variables of failure.[9] We also explore the determinants of Bank´s efficiency according to the following model:

$$DEA_{it} = \alpha + \beta_1 NORTHEAST\ and\ CANADA_i + \beta_2 SOUTH_{\ i} + \beta_3 WEST_i + \beta_4 FED_t + \beta_5 GDP\ Growth_t \quad (2)$$

where:

DEA_{it} : The Bank Efficiency for Bank "i" in period "t"
NORTHEAST AND $CANADA_i$: The location dummy in Northeast and Canada for Bank "i" in period "t"
$SOUTH_i$: The location dummy in South for Bank "i" in period "t"
$WEST_i$: The location dummy in West for Bank "i" in period "t"
FED_t: The Federal Fund rate at time "t"
GDP $Growth_t$: Growth Rate of GDP at time "t"
$WEST_i$: Dummie of location at West for bank "i"

The variable DEA is the Data Envelopment Analysis indicator that measures efficiency and was discussed previously. Regional Dummies of Banks located in the Northeast, Canada, South and West are introduced to control for location. This variable varies across individuals in the sample. Then there is a control for Macroeconomic variables that may affect a bank´s cost and balance of sheet which are GDP Growth and Federal Reserve Fund Rate. Next section will introduce the estimations of the models presented[10]

5. The results

Table 2a
Determinants of Banks Failure without Control Variables

	Two year model			Three year model			Five year model		
	Coefficient	Z-statistic		Coefficient	Z-statistic		Coefficient	Z-statistic	
Capital/Asset	-0.000519	-0.86		-0.0011374	-2.09	***	-0.0011722	-2.93	***
DEA	5.210086	0.48		-5.069791	-0.42		-28.92352	-1.8	**
Nonperforming Loans/ASSET	-0.0015549	-0.3		0.0002579	0.28		0.0002313	0.26	
Profits/Asset	0.0035299	0.89		0.0071096	2.17	***	0.0060363	2.84	***
Inverse (Loan/Deposit)	-221.1894	-1.82	*	-230.2575	-2.75	***	-104.2074	-4.02	***
Constant	-3.566406	-0.33		8.867313	0.74		31.91096	1.97	*
LR χ^2	9.84			23.75			49.34		
Prob > χ^2	0.08			0.0002			0		
Pseudo R^2	0.4228			0.4853			0.3981		
Number of Obs.	248			248			248		
Failure	50			47			48		

[8] See also in Guillen (2009).
[9] See Bernanke and Blinder (1992) also in Friedman and Schwartz (1963), Sims (1972) and Christiano and Ljungqvist (1988) to find the effect of monetary policy in banks' sheet balance and therefore fails rises. Since we capture any systemic determinants of failure not otherwise accounted for in the model: Growth and regional are included. The Economy and Location can influence the Logit for time effects.
[10] A high discount rate increases the banks' cost negatively affecting banks' efficiency. Chen, Mason and Higgins (2001) obtain similar results. We expect a similar effect for GDP but in this case the relationship must be positive.

Table 2b
Determinants of Banks Failure with Control Variables

	Five year ahead			Three year ahead			Two year ahead		
	Coefficient	**Z-statistic**		**Coefficient**	**Z-statistic**		**Coefficient**	**Z-statistic**	
Capital/Asset	-0.0012761	-3.03	***	-0.0011924	-2.99	***	-0.0012027	-2.92	***
DEA	-32.51035	-1.9	**	-30.44722	-1.79	**	-30.38419	-1.83	**
Nonperforming Loans/ASSET	0.0002459	0.26		0.0002094	0.2		0.0002446	0.24	
Profits/Asset	0.0065152	2.94	***	0.0061115	2.88	***	0.0061128	2.82	***
Inverse (Loan/Deposit)	-99.10789	-3.85	***	-91.89144	-3.65	***	-90.95442	-3.54	***
FED	-0.0878566	-0.59		-	-		-0.0638495	-0.42	
GDP Growth	-	-		-0.1369285	-0.85		-	-	
West	-	-		0.7360767	0.88		0.7301367	0.87	
Constant	35.73933	2.06	**	32.88507	1.91	*	32.64277	1.93	*
LR χ^2	50.29			51.66			51.13		
Prob > χ^2	0			0			0		
Pseudo R^2	0.3896			0.4002			0.3961		
Number of Obs.	248			248			248		
Failures	48			47			47		

***Significant at 99%
**Significant at 95%
*Significant at 90%
Elaboration: Own

The tables above show the result for the Logit Model described here. The tables show the Logit endogenous failure under several specifications. We found that the ratio of Capital/Asset, DEA, Profit/Asset and Inverse pf Loan/Deposits are significant according to the expected sign. Therefore, in the CAMEL Model: Capital adequacy, Management quality, Earning ability, and Liquidity position ratio may explain failure, mainly five years before failure. Table 2b, includes control variables like GDP and Federal Fund Rate. These variables were unexpectedly non-significant. So, there is no influence of the Federal Fund Rate and the economy on bank´s failure. The financial variables of the CAMEL[11] were significant with the expected sign even if we incorporate control variables in the Logit Model. We have tested for the logit estimation above. Table 3 shows the number of failures predicted correctly and the model can predict mostly 72% and 96% of the positive and negative cases of failure. Also, the fitness of the Logit model is tested in Fig. 2 Fig. and 3.[12] Fig. 2, shows a graph of sensitivity and specificity as a function of the cutoff probability. Sensitivity is the fraction of yj=1 observations that are correctly classified. Specificity is the percentage of yj=0 observations that are correctly classified. In a more accurate way, Fig. 3, shows the area under the ROC curve which provides a measure of the model's ability to discriminate. The value is higher than 0.5 so it indicates a good ability to discriminate.

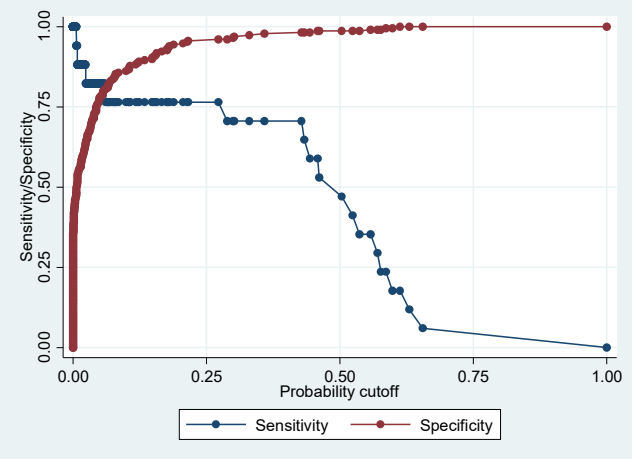

Fig. 2. Sensitivity Analysis of the Failure Model
*Area under ROC is 0.9516
Elaboration: Own

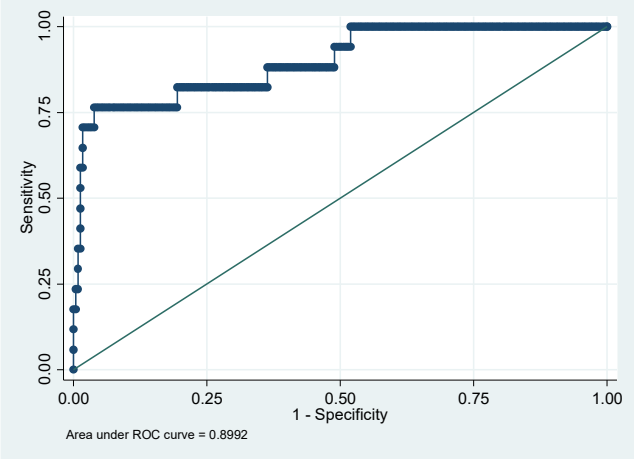

Fig. 3. Sensitivity Analysis of the Failure Model

What drives DEA in the management explanation of failure? Table 4 below shows the determinants of a bank´s relative efficiency. Only the regional variables of being located in the North East and Canada were significant with positive sign which implies that banks located in these areas are efficient. Being in the West like Silicon Valle or Forst Republic Bank is non-significant but signs were the expected (negative).

[11] Only Capital adequacy, Management quality, Earning ability, and Liquidity position were also significant.
[12] We tested the logit for the model with endogenous variable that is five years before banking failure.

Table 3
Robustness of the Model

Logistic model for FAIL			
	----------True--------		
Classified	D	not D	Total
+	8	3	11
	9	228	237
-			
Total	17	231	248
Classified + if predicted Pr(D) >=0.5			
True D defined as Fail !=0			
Sensitivity		Pr (+/D)	47.06%
Specificity		Pr (-/notD)	98.70%
Positive predictive value		Pr (D/+)	72.73%
Negative predicted value		Pr (not D/-)	96.20%
False + rate for true notD		Pr (+/notD)	1.30%
False - rate for true D		Pr (-/D)	52.94%
False + rate for classified +		Pr (notD/+)	27.27%
False - rate for classified -		Pr (D/-)	3.80%
Correctly classified			95.16%

Elaboration: Own

Table 4
Bank´s Efficiency Determinants

	Model 1			**Model 2**			**Model 3**			**Model 4**		
	Coefficient	**Z-statistic**		**Coefficient**	**Z-statistic**		**Coefficient**	**Z-statistic**		**Coefficient**	**Z-statistic**	
Northeast and Canada	0.395271	2.66	***	0.0403385	2.72	***	0.056608	3.88	***	-0.0565955	3.89	***
South	0.0170684	1.23		0.0162695	1.17		-	-				
West	-	-		-	-		-0.0162695	-1.17		-0.0170684	-1.23	
FED	-0.0021513	-0.87		-	-		-	-		-0.0021513	-0.87	
GDP Growth	-	-		0.0010346	0.38		0.0010346	0.38				
Constant	0.9623914	60.07	***	0.9561407	57.37	***	0.9724102	57.01	***	0.9794598	57.74	***
Wald χ^2	16.3			15.66			15.66			16.3		
Prob > χ^2	0.001			0.0013			0.0013			0.001		
R^2 within	0.0524			0.0495			0.0495			0.0524		
R^2 between	0.2733			0.3035			0.3035			0.2733		
R^2 overall	0.0814			0.0821			0.0821			0.0814		
Number of Obs.	270			270			270			270		
Number of Groups	17			17			17			17		

*** Significant at 99%
** Significant at 95%
* Significant at 90%
Elaboration: Own

6. Conclusion

We have made an assessment of the main drivers that have triggered the failure of Silicon Valley Bank and First Republic Bank. The assessment found that Capital adequacy, Management quality, Earning ability, and Liquidity position ratio drove failure five years before the bank's official bankruptcy. The policy maker should pay attention to these financial indicators in order to avoid any bank run or financial instability. Contrary to most of the literature consensus, we could not find that external factors like Federal Fund Rate and GDP growth affect insolvency. Bank regulators should pay more attention to financial variables in order to avoid financial stress. The transmission mechanism to failure comes from internal factors instead of the external. Our indicator of management or bank efficiency (DEA) resulted in significant prediction failure and the variables that drive this DEA indicator are mainly the location of the bank. Although our sample banks located in the north have clients as technological startups, their location permits them to have better management. Further study can be done under the latter finding from a regional regulator perspective.

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