



# Disclosure and bank risk: Evidence from European banks<sup>☆</sup>

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## ABSTRACT

We employ a self-developed dictionary designed to analyze bank financial statements to study the link between disclosure and bank risk in a sample of 225 European banks over the period 2011–2017. Disclosure is associated with reduced default risk for all but the most aggressive risk-taking banks, with the result weakly conditional on capital strength. At the same time, disclosure appears to increase systemic risk for European banks.

## 1. Introduction

The risk-taking and maturity transformation role of banks makes them difficult to assess without considerable information on their financial position and risk-taking practices (Flannery et al., 2012).<sup>1</sup> In one view, the obligation for banks to provide greater disclosure would facilitate more effective monitoring by stakeholders and provide banks with an incentive to hold less risky positions (e.g., Grossman, 1981; Verrecchia, 2001). In line with this view, bank regulators in many jurisdictions have introduced a number of reforms in recent years aimed at expanding disclosure by banks on their risk-taking. In the European Union, for example, bank disclosure has been affected by the Banking Union (BU) project introduced in 2014 with its single supervisory mechanism (SSM) aimed at subjecting large banks to enhanced supervision and reporting, and the Markets and Financial Instruments Directive II 2018, which imposes more reporting requirements on all banks.

A second view emphasizes possible adverse effects of additional disclosure, for example, if it improperly suggests that problems are systemic rather than idiosyncratic (Rochet and Vives, 2004; Chen and Hasan, 2006), or if unexpectedly negative information generates deposit withdrawals that necessitate socially inefficient assets sales and reduced lending (Huang and Ratnovski, 2011). Moreover, it is not clear that a greater volume of information will necessarily translate into more transparency, for example, if firms seek to hide poor performance by increasing the complexity of their reports. In this second view, greater disclosure could lead to an increase in bank risk.

In this paper, we examine whether greater disclosure increases or constrains bank risk-taking in European banks employing a self-constructed dictionary designed to analyze bank financial statements. Our paper is in the spirit of several empirical studies that have

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<sup>1</sup> Bank opacity is seen as having contributed to the 2008 financial crisis by magnifying uncertainty about the underlying value of bank assets and on- and off-balance sheet exposures (Sowerbutts et al., 2013).

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examined the impact of disclosure on firm behavior employing self-constructed disclosure indices. For example, such studies have assessed the impact of disclosure on the cost of equity capital for US manufacturing firms (Francis et al., 2008), the stock price volatility of US banks (Baumann and Nier, 2004), the capital buffers of US banks (Nier and Baumann, 2006), the valuation of Chinese listed companies (Cheung et al., 2010), risk-taking by MENA banks (Bourgain et al., 2012), and the default risk of US banks (Zer, 2015). More recently, Altunbaş et al. (2022) employ a self-constructed dictionary to examine the impact of European BU on the risk disclosure practices of a sample European banks. Our results suggest that greater disclosure is associated with lower levels of default risk for all but the most aggressive risk-taker European banks, with the result partially conditional on bank capital levels. In contrast, greater disclosure appears to increase systemic risk for European banks.

## 2. Model and data

Our baseline specification is as follows:

$$Z_{it} = \beta_0 + \beta_1 DI_{it} + \delta BU_t + \delta X_{it-1} + \varepsilon_i \quad (1)$$

In Eq. (1),  $Z_{it}$  is a measure of default risk where we follow common practice (e.g., Boyd and Runkle, 1993; Laeven and Levine, 2009) and employ the inverse of the z-score of each bank such that a higher z-score indicates that the bank is more stable.<sup>2</sup>

$DI_{it}$  an index of bank risk disclosure. To measure bank risk disclosure, we construct a dictionary designed to analyze the financial statements of European banks. The dictionary comprises what we believe to be the most relevant words related to risk-taking in bank financial statements with our selection guided by specialized banking and finance dictionaries (Fitch, 2018; Rutherford, 2013; Shim and Constas, 2016; Law and Smullen, 2018). The procedure resulted in a dictionary of 120 words covering four broad categories of bank risk: (i) risk management disclosure, which are words that financial institutions use to describe the risk management, monitoring, and measurement procedures and functions they adopt to deal with the wide range of risks to which they are exposed; (ii) risk exposure disclosure, which are words that provide information related to the vulnerability of the bank to these risks; (iii) regulatory risk, which are words that identify the most important regulatory and supervisory authorities that influence European banks' activities at the international level; and (iv) reassuring disclosure, which are words that financial institutions may use to reassure stakeholders about the bank's financial position, performance and risk exposure. The dictionary was validated by a panel of experts from the European Central Bank and academia that were asked to suggest additional words, eliminate those that were not considered relevant, and provide suggestions on the categorization.<sup>3</sup> The dictionary is presented in Table 1.

The disclosure index is computed as the standardized mean of the occurrences of each word in the financial statements divided by the total number of words of the financial statement, as suggested by previous disclosure studies (Tetlock et al., 2008; Bushman et al., 2016).<sup>4</sup> The balance sheet and annual reports were collected manually from each bank's official website with the websites identified using the Orbis Bank Focus (Bureau van Dijk) database. We selected the largest nationally supervised entities that provide an audited English version of their annual report and excluded those banks that did not provide documentation for all years. The final sample consists of 75 SSM-supervised significant banks and 200 other large but less important European financial institutions supervised by national regulators. The host countries and number of banks in each are listed in Table 2.

$BU_t$  is a dummy variable equal to one from 2014 (zero otherwise) to capture the effects on bank risk of the BU that was created in that year.  $X_{it-1}$  is a vector of bank-specific characteristics that includes measures of bank capital, leverage, efficiency, liquidity, and asset quality, as well as the rates inflation, unemployment and GDP growth for each country as macroeconomic controls.<sup>5</sup> Our dataset comprises a balanced panel of annual data for the period 2011 to 2017. Summary statistics are shown in Table 3 and Table 4 provides variable definitions and data sources.

## 3. Empirical results

Panel estimates of our baseline regression with fixed time and bank effects are reported in Table 5. We begin in column (1) with the disclosure index,  $DI_{it}$ , as the sole independent variable, then we add the banking union dummy variable,  $BU_t$  in column (2), and then the bank-specific control variables in column (3), and in column (4) we drop country fixed effects from the estimate and add the macroeconomic variables. In each estimate the coefficient on  $DI_{it}$  is negative and statistically significant, indicating that an increase in bank disclosure is associated with a fall in bank risk as measured by the inverse of the z-score; not surprisingly, the size of the coefficient declines as more controls are added, but it is always statistically significant at least at the 5% level. The economic impact of bank disclosure on risk is quite modest, however, with a one standard deviation increase in the disclosure index reducing bank risk by only between 0.01–0.02 percentage point (where the sample mean for the z score is 4.18).<sup>6</sup>

The coefficients on the banking union dummy variable,  $BU_t$ , are negative and highly statistically significant in all estimates,

<sup>2</sup> The z-score is defined as  $z = \frac{k + \mu}{\sigma}$ , where  $k$  is equity capital as percent of assets,  $\mu$  is return as percent of assets, and  $\sigma$  is standard deviation of return on assets as a proxy for return volatility.

<sup>3</sup> We especially thank Giuseppe Avignone, Alessio Reghezza and Laura Santucci for their help in the validation of the dictionary.

<sup>4</sup> More detail on the construction of the disclosure index is provided in Altunbaş et al. (2022).

<sup>5</sup> The balance sheet variables are winsorized at the 1% and 99% level to avoid the influence of outliers.

<sup>6</sup> For example,  $-0.01 = -0.03$  (coefficient on the disclosure index in column 3)  $\times$  0.249 (the standard deviation on the disclosure index reported in Table 3).

**Table 1**  
Dictionary tailored to the content analysis of European bank annual reports.

Advanced measurement approach	Enterprise risk	Market risk	Risk monitoring
Ambiguity	Enterprise risk management	Model risk	Risk provisioning
Asset quality review	European Banking Authority	Measurement	Risk tolerance
Back test	European Central Bank	Net stable funding ratio	Risk transfer
Bail out	European Stability Mechanism	Operational risk	Safe
Bank for International Settlements	European Systemic Risk Board	Other risk	Settlement risk
Bank risk	Evaluation	Panic	Single Resolution Mechanism
Bank run	Evaluation risk	Peril	Single Supervisory Mechanism
Bankrupt	Expected loss	Political risk	Sound
Basel Committee	Exposure at default	Probability of default	Sovereign risk
Basel pillar	External credit assessment institutions	Process	Stability
Boom	Failure	Prudential regulation	Standard
Business risk	Foreign exchange risk	Quantitative impact study	Standardized model
Central bank	Fraud	Rating	Strategic risk
Commodity risk	Idiosyncratic risk	Regulation	Stress
Compliance	Illiquid	Regulatory risk	Stress test
Compliance risk	Incremental risk charge	Reputation	Stressed value at risk
Conditional value at risk	Insolvency risk	Reputational risk	Supervision
Contagion	Instability	Rescue	Test
Contingency funding and recovery plan	Institutional Protection Scheme	Residual risk	Too big to fail
Counterparty risk	Interest rate risk	Reverse stress test	Trust
Country risk	Internal assessment	Risk	Unexpected loss
Credit rating	Internal capital adequacy assessment	Risk appetite framework	Valuation risk
Credit risk	Internal control	Risk avoidance	Value at risk
Crisis	Internal model approach	Risk concentration	
Currency risk	Internal rating based	Risk coverage	
Danger	International Accounting Standard	Risk culture	
Default	International Financial Reporting Standard	Risk exposure	
Default risk	Lender of last resort	Risk factor	
Economic growth	Liquidity coverage ratio	Risk management	
Emergency	Liquidity risk	Risk measurement	
Emergency risk	Loss given default	Risk mitigation	

Notes: This dictionary draws on the specialized banking and finance dictionaries of [Fitch \(2018\)](#), [Rutherford \(2013\)](#), [Shim and Conostas \(2016\)](#) and [Law and Smullen \(2018\)](#). See [Altunbaş et al. \(2022\)](#) for further details.

suggesting that the additional reporting requirements and enhanced supervision associated with it also contributed to reducing bank risk. The coefficients on the bank-specific characteristics are mostly statistically significant and in line with the banking literature. For example, higher levels of capital and liquidity provide buffers that reduce the probability of a bank distress and reduce bank risk ([Gambacorta and Mistrulli, 2004](#); [Shleifer and Vishny, 2010.](#)). Large banks are typically viewed in the literature as being associated with more risk-taking because they are considered as “too big to fail” ([Morrison, 2011](#)); however, the negative and statistically significant coefficient on bank assets in our estimate is more consistent with recent research on European banks suggesting that the presence of a supranational supervisor under banking union has been effective in reducing bank risk-taking due to the supervisor’s enhanced organizational capacity ([Farnè and Vouldis, 2021](#)). The positive and statistically significant coefficient on bank efficiency is consistent with inefficient banks being viewed as riskier because they reduce the scope for strengthening capital levels ([Berger and De Young, 1997](#)). The positive and significant coefficient on bank leverage is consistent with greater leverage increasing bank risk-taking because banks do not internalize the losses imposed on depositors and bondholders ([Dell’Aricca et al., 2017](#)). Finally, the positive and statistically significant coefficient on loan provisioning is consistent with this activity being viewed as increasing bank risk because provisioning may be used to smooth earnings and inhibit outside monitoring ([Bushman and Williams, 2012](#)).

European bank reform has placed considerable emphasis on enhanced supervision under banking union and on revised quantitative capital and liquidity requirements.<sup>7</sup> In [Table 6](#), we look more closely at the extent to which the relationship between bank disclosure and risk depends upon banking union and on bank capital and liquidity levels—i.e., whether these factors condition the impact of disclosure on bank risk. The table reports regression results that include terms for the interaction of the disclosure index with banking union (DI\*BU) reported in column (1), the capital ratio (DI\*capital) reported in column (2), and the liquidity ratio (DI\*liquidity) reported in column (3). The coefficients on these variables reflect the conditional effects of banking union and bank capital and liquidity on bank disclosure as disclosure affects bank risk. The results suggest that the impact of disclosure on bank risk is not conditional on banking union or bank liquidity and only weakly conditional on bank capital levels. That is, the coefficients on (DI\*BU) and (DI\*liquidity) are not statistically significant and the coefficient on (DI\*Capital) is positive and statistically significant only at the 10% level. Thus, disclosure impacts bank risk independently of banking union and bank liquidity, and the impact of disclosure on reducing bank risk is somewhat less when banks have high capital ratios (specifically, a one standard deviation increase in the capital

<sup>7</sup> The outcomes of European regulatory initiatives were particularly evident in three areas: European Banking Union, including a bail-in regime; capital and liquidity requirement regulations (Basel III); and reforming the role of credit rating agencies.

**Table 2**  
Number of banks by host country.

Country	Number of banks	Percent of total
Austria	12	4.36
Belgium	7	2.55
Bulgaria	6	2.18
Croatia	4	1.45
Cyprus	4	1.45
Czech Republic	6	2.18
Denmark	8	2.91
Estonia	4	1.45
Finland	4	1.45
France	26	9.45
Germany	28	10.18
Greece	6	2.18
Hungary	6	2.18
Ireland	8	2.91
Italy	26	9.45
Latvia	3	1.09
Lithuania	3	1.09
Luxembourg	7	2.55
Malta	7	2.55
Netherlands	20	7.27
Poland	10	3.64
Portugal	6	2.18
Romania	4	1.45
Slovakia	5	1.82
Slovenia	3	1.09
Spain	12	4.36
Sweden	8	2.91
United Kingdom	32	11.64
<b>Total</b>	<b>275</b>	<b>100.00</b>

Source: Orbis Bank Focus (Bureau van Dijk) database.

**Table 3**  
Summary statistics.

	Observations	Mean	Median	Maximum	Minimum	Standard deviation
Z score	1925	4.184	3.955	15.538	0.380	1.599
Disclosure index	1925	0.038	0.000	3.222	-0.165	0.249
Banking Union dummy	1925	0.642	0.610	1.000	0.000	0.479
Total assets (log)	1925	17.530	15.753	22.292	11.481	1.981
Capital ratio	1925	11.524	11.011	45.100	2.170	4.285
Liquidity ratio	1925	7.056	4.213	50.134	0.023	9.344
Leverage ratio	1925	65.857	70.207	87.990	5.491	16.054
Efficiency ratio	1925	37.067	37.110	178.858	2.456	18.651
Loan loss provisions ratio	1925	1.198	0.999	5.778	0.199	0.965
GDP growth (%) <sup>1</sup>	1925	1.993	2.022	11.874	-10.149	2.758
Inflation (%)	1925	1.325	1.117	5.789	-2.097	1.509
Unemployment rate (%)	1925	9.785	8.280	27.690	2.890	4.919

Notes: The data comprises a balanced panel of annual data for the period 2011–2017.

<sup>1</sup> Data for Ireland refer to GNP.

ratio reduces the effect of disclosure on bank risk by about 0.03% point<sup>8</sup>). The sign and size of the coefficients on the control variables are broadly in line with those of the baseline regressions reported in Table 5.

In Table 7 we report the results of some additional tests. First, we test for possible endogeneity in the baseline results. For example, a bank exposed to higher risk may choose to disclose more information to reduce uncertainty and change investors' assessment of its risk or value. Instrumental variable (IV) estimates of Eq. (1) are reported in column (1) where the set of instruments includes a number of bank level variables (loan ratio, return on equity, total assets, market share and the cost-income ratio). While all of these variables are endogenous over longer horizons, they are unlikely to be controlled by the bank over a one-year period. The coefficient on  $DI_{it}$  remains negative and statistically significant and the Kleibergen-Paap and Stock-Yogo test statistics reject the null hypothesis that the equation is under-identified.

König et al. (2021) show that bank disclosure can increase bank risk because it can reduce the agency costs associated with debt

<sup>8</sup> That is,  $-0.03 = -0.006$  (coefficient on  $(DI \times \text{Capital}) \times 4.285$  (the standard deviation on the capital ratio reported in Table 3)).

**Table 4**  
Variables, definitions, and data sources.

Variables	Description	Source
z-score	Return on assets plus capital asset ratio divided by total by the standard deviation of return on assets at given year.	Orbis Bank Focus
Disclosure index	The standardized mean of the occurrences of each word of the dictionary in banks' financial statements divided by the total number of words of the financial statement	Author's construction
Banking Union	A dummy variable equal to one from 2014 (zero otherwise)	Author's construction
Leverage	The ratio of total book value of liabilities to total assets at given year.	Orbis Bank Focus
Liquidity	The ratio of liquid assets to total assets at given year.	Orbis Bank Focus
Loan provisions	The ratio of loan loss provision to total loans at given year.	Orbis Bank Focus
Capital	The ratio of risk-weighted capital to total assets at given year.	Orbis Bank Focus
Efficiency	The ratio of operating expenses to total operating income at given year.	Orbis Bank Focus
Total assets	Natural logarithm of total assets at given year.	Orbis Bank Focus
Systemic risk	The reported beta of each bank estimated from the CAPM model	Orbis Bank Focus
GDP growth <sup>1</sup>	Annual% change of real GDP growth (2015 constant prices)	World Bank, WDI
Inflation	Annual% change of consumer price index	World Bank, WDI
Unemployment	Annual% unemployment rate (level)	World Bank, WDI

Note: Data are annual, and the sample period is 2011 to 2017. WDI is the World Bank's World Development Indicators database. Data for Ireland refer to GNP.

**Table 5**  
Bank disclosure and bank risk: panel estimates with fixed effects, dependent variable is the inverse of a bank's z-score.

	(1)	(2)	(3)	(4)
Disclosure index	-0.086*** (0.033)	-0.073** (0.032)	-0.030*** (0.015)	-0.026** (0.013)
Banking Union		-0.145*** (0.011)	-0.058*** (0.015)	-0.046*** (0.015)
Total assets			-0.005*** (0.002)	-0.053** (0.010)
Capital			-0.050*** (0.003)	-0.049*** (0.003)
Liquidity			0.004 (0.015)	-0.258*** (0.085)
Leverage			0.080*** (0.018)	0.160*** (0.035)
Efficiency			0.075*** (0.023)	-0.003 (0.039)
Loan provisioning			0.024*** (0.004)	0.023*** (0.005)
Inflation				-0.007* (0.004)
GDP growth				-0.002* (0.001)
Unemployment				-0.000 (0.003)
Intercept	-1.380*** (0.044)	-1.290*** (0.090)	-1.390*** (0.159)	-1.219*** (0.411)
Year fixed effects	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	NO
Bank fixed effects	YES	YES	YES	YES
R <sup>2</sup>	0.451	0.472	0.825	0.861

Notes: Robust standard errors are in parentheses below the estimated coefficients. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

issuance, which might lead more risk aggressive banks to issue more debt. To test for this possibility, we examine whether disclosure constrains risk-taking by the most aggressive risk-taker banks. Here we estimate the impact of disclosure in a sub-sample of European banks comprising those banks that have a z score that falls in the top quartile of z scores of all banks in the sample (see, e.g., Altunbaş et al., 2017). Accordingly, for this estimate our sample of banks is reduced from 275 to 67. An IV estimate for this group of banks is reported in column (2) of Table 7 where the coefficients on  $DI_{it}$  and  $BU_t$  are both now positive and statistically significant. That is, risk disclosure and enhanced supervision do not appear to constrain risk-taking in the most aggressive risk-taker banks.

Finally, the z-score measure of bank risk focuses on overall default risk—i.e., on the probability that a bank's losses exceed its capital. However, bank disclosure might at least change the *systematic* component of default risk if it gives rise to risks that are viewed as not being diversifiable against (Fiordelisi and Marqués-Ibañez, 2013). This might occur for example, if a bank default can generate a wave of other failures, or if it is related to bank diversification practices (e.g., securitization) that have distributed risk among banks more easily and increased the chances of joint failure, or if there are likely to be adverse effects on the future supply and cost of credit to

**Table 6**

Bank disclosure and bank risk with interactions: panel estimates with fixed effects, dependent variable is the inverse of a bank's z-score.

	(1)	(2)	(3)
Disclosure index (DI)	-0.038* (0.020)	-0.106* (0.055)	-0.034** (0.014)
Banking Union (BU)	-0.047*** (0.015)	-0.047** (0.015)	-0.048*** (0.007)
DI*BU	0.004 (0.014)		
Total assets	-0.053*** (0.010)	-0.055*** (0.010)	-0.054*** (0.010)
Capital	-0.049*** (0.003)	-0.048*** (0.003)	-0.048*** (0.003)
DI*Capital		0.006* (0.003)	
Liquidity	-0.258*** (0.086)	-0.248*** (0.085)	-0.247*** (0.050)
DI*Liquidity			-0.043 (0.078)
Leverage	0.159*** (0.035)	0.155*** (0.035)	0.158*** (0.016)
Efficiency	-0.003 (0.039)	0.002 (0.001)	-0.004 (0.029)
Loan provisioning	0.023*** (0.005)	0.023*** (0.005)	0.023*** (0.005)
Inflation	-0.007* (0.004)	-0.007* (0.004)	-0.007** (0.003)
GDP growth	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.002)
Unemployment	-0.000 (0.003)	-0.001 (0.003)	-0.001 (0.003)
Intercept	-1.218*** (0.416)	-1.157* (0.406)	-1.293*** (0.395)
Year fixed effects	YES	YES	YES
Country fixed effects	NO	NO	NO
Bank fixed effects	YES	YES	YES
R <sup>2</sup>	0.869	0.868	0.869

Notes: Robust standard errors are in parentheses below the estimated coefficients. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

banks and nonbank. In these situations, an increase in bank default risk could increase the systematic component of default risk. To examine this possibility, column (3) of [Table 7](#) reports the impact of disclosure on systematic risk for European banks, where we define systematic risk as the reported beta of each bank estimated from the CAPM model (see, e.g., [Altunbaş et al., 2017](#)). The result suggests that disclosure raises the systematic component of default risk: specifically, a 1 standard deviation increase in the disclosure index increases systematic risk by about 0.23 percentage point. This may be because the size of many European banks makes it likely that their failure would generate a wave of other failures, and/or because European bank balance sheets are quite highly securitized, and/or because a default would threaten the future supply and cost of bank credit.

#### 4. Conclusion

We employed a self-developed dictionary tailored to the analysis of bank financial statements to study the link between disclosure and risk-taking by European banks. We found that disclosure was associated with reduced default risk with the result weakly conditional on banks' capital strength. This supports the view that disclosure is associated with greater market discipline. We found two exceptions to our baseline result. The first was with respect to the most aggressive risk-taking banks, where more disclosure is associated with greater default risk. The second exception was when we measured the systematic component of default risk, where we found that disclosure appears to increase systematic risk for European banks.

#### Declaration of Competing Interest

None.

#### Data availability

The authors do not have permission to share data.

**Table 7**  
Disclosure and bank risk: IV panel estimates with fixed effects.

	(1)	(2)	(3)
Dependent variable:	Inverse of z-score (All banks)	Inverse of z-score (Aggressive risk-taker banks)	Systematic risk (All banks)
Disclosure index	-0.135** (0.055)	0.414*** (0.112)	0.927** (0.211)
Banking Union	-0.088*** (0.008)	0.004 (0.010)	0.052** (0.026)
Total assets	-0.007*** (0.002)	-0.009*** (0.004)	0.080*** (0.008)
Capital	-0.050*** (0.002)	-0.111*** (0.008)	-0.001 (0.002)
Liquidity	-0.034** (0.016)	0.097 (0.072)	-0.057 (0.208)
Leverage	0.131*** (0.0113)	0.106*** (0.020)	0.093** (0.033)
Efficiency	-0.022 (0.021)	-0.032 (0.028)	-0.217*** (0.075)
Asset quality	0.017*** (0.003)	0.005 (0.005)	0.020** (0.009)
Inflation	-0.015*** (0.002)	-0.015*** (0.003)	0.001 (0.007)
GDP growth	-0.001 (0.001)	-0.008** (0.002)	-0.011 (0.004)
Unemployment	0.000 (0.001)	0.0001 (0.002)	-0.007* (0.004)
Intercept	-1.725*** (0.103)	-0.943*** (0.166)	0.500* (0.298)
Year fixed effects	YES	YES	YES
Country fixed effects	NO	NO	NO
Bank fixed effects	YES	YES	YES
Kleibergen-Paap rk test statistic	33.90	33.510	34.514
Stock-Yogo test statistic	18.37	19.31	19.28
R <sup>2</sup>	0.794	0.577	0.092

*Notes:* In columns (1) and (2) the dependent variable is the inverse of each bank's z score; and in column (3) it is the reported beta of each bank estimated from the CAPM model. The banks included in the estimate reported in column (2) are a sub-sample of the total—i.e., those with z scores that fall into the top quartile of z scores of all banks in the sample. These (67) banks are labelled “aggressive risk-taker banks”. Robust standard errors are in parentheses below the estimated coefficients. \*\*\*, \*\* and \* indicate statistical significance at the 1%, 5% and 10% levels, respectively.

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