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Disclosure, Volatility, and Transparency: An Empirical Investigation into the Value of Bank Disclosure

1. Introduction and Motivation

Over the past years, a number of initiatives have sought to increase the transparency of financial institutions. Among those initiatives, a push toward more disclosure of information in published accounts has been prominent. In particular, policy proposals such as the New Basel Accord (Pillar 3) have introduced a number of disclosure requirements that aim to improve the market's ability to assess a bank's risk and value.

Whether such initiatives are beneficial is an open question. Indeed, there are a number of good reasons to be sceptical. First, it can be argued that banks are inherently opaque institutions, and increases in disclosure may not be able to materially change this. "The push for increased market discipline and disclosure may shed light. But reformers should remember what they are dealing with. To use a popular metaphor: banks may be the black holes of the universe—hugely powerful and influential, but to some irreducible extent—unfathomable" (Morgan 2002, p. 888).

Second, an increase in quantitative disclosures may not necessarily increase transparency. In the words of Federal Reserve Chairman Alan Greenspan: "A more complex question is whether greater volume of information has led to comparable improvements in transparency of firms. In the minds of some, public disclosure and transparency are interchangeable. But they are not. Transparency challenges market participants not only to provide information but also to place that information into a context that makes it meaningful" (Greenspan 2003, p. 7).

Third, disclosure is costly. Clearly, "requiring disclosure of information imposes a cost on banks, as on any firm, and this cost must be offset by resulting benefits for it to be justified" (Schaffer 1995, p. 26). The costs of disclosure include the direct costs of producing and disseminating information, but also indirect costs that might arise when a bank's competitors are able to exploit the information that the bank provides to the financial market.

To date, little, if any, empirical evidence has been found to help resolve the questions about the benefits of bank disclosure.[1] This paper attempts to fill this gap by presenting evidence on whether disclosure is beneficial for banks and whether disclosure is useful for financial markets. We investigate empirically the relationship between the volatility of a bank's stock price and the amount of information the bank discloses to the market. In particular, we ask whether banks that disclose a lot of information might have lower stock volatility than do banks that disclose little information.

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A finding in favour of this hypothesis would point to the benefits of disclosure from the banks' point of view. First, lower stock volatility is likely to reduce a bank's cost of capital. In addition, lower stock volatility is likely to increase the effectiveness and reduce the cost of stock-based executive compensation. A finding that supports this hypothesis might also highlight a benefit from the point of view of investors and the financial markets. If volatility is a measure of investor uncertainty, and if disclosure reduces volatility, then volatility may be an indication that more disclosure reduces uncertainty in financial markets.

In addressing this question, we make use of a unique data set on about 600 banks across thirty-one countries over the period 1993-2000. The data set contains detailed information about the items that banks disclose in their annual accounts. We use this information in two ways. First, we construct a composite disclosure index that provides information about disclosure at the bank level. Second, we analyse each of the seventeen subindexes of disclosure that make up the composite index in order to investigate which—if any—items of bank disclosure may be most beneficial for banks and most useful for financial markets.

The remainder of this paper is organised as follows. Section 2 offers some conceptual background and describes related literature. In Section 3, we outline our research strategy. Section 4 describes the way we measure the amount of information that banks disclose in their annual accounts and provides descriptive statistics for our measure of disclosure. In Section 5, we discuss other factors likely to affect the volatility of a bank's stock and in Section 6 we investigate the association between disclosure and stock volatility, while controlling for those other factors.

2. Conceptual Background and Related Literature

Economic theory suggests a number of reasons why an increase in disclosure should reduce stock volatility. First, a commonly cited benefit of disclosure is that by mitigating uncertainty, disclosure may reduce the magnitude of the impact of news about a firm's performance, which would reduce stock price volatility (Lang and Lundholm 1993; Bushee and Noe 2000). Second, simple theories of market microstructure theory suggest that by increasing the amount of public information, disclosure is likely to reduce information asymmetries in the market that result in pronounced price changes in response to changes in demand for the stock (Diamond and Verrecchia 1991). Finally, disclosure may reduce heterogeneity of beliefs about the true value of the firm. It may thus reduce both the volume traded and the volatility of the stock price.

However, one can also think of a number of reasons why an increase in disclosure might increase stock volatility. First, an increase in disclosure implies that more information is released, which in and of itself might move the price and increase volatility (Ross 1989). Second, an increase in the disclosure of information relies on sophisticated investors to interpret and put the disclosed information into context. Indeed, in view of recent attempts to encourage more quantitative disclosures by banks, the banks themselves have argued that specific disclosure requirements could provide the markets with more data that might be misconstrued by analysts. More disclosure might thus inject more market volatility (Institute of International Finance 2003).

The impact of disclosure on stock price volatility may therefore be thought of as ambiguous. This calls for empirical evidence. We are not aware of any other study that investigates the association between disclosure and stock price volatility at banks. Prior empirical research invariably relates to corporations and provides mixed evidence on the association between disclosure and stock volatility. For instance, Lang and Lundholm (1993) find that corporate disclosure—as measured by disclosure scores assigned by the Association for Investment Management and Research (AIMR), an association of financial analysts—is weakly *positively* associated with firms' stock return volatility for a sample of U.S. firms. A paper by Leuz and Verrecchia (2000) appears to confirm this result. For a sample of German firms, a reporting change from German to U.S. generally accepted accounting principles, which is interpreted as an increase in disclosure, was found to increase volatility. The authors of the study point out that the increase in volatility was driven largely by smaller, less frequently traded stocks. Bushee and Noe (2000) develop this idea and point to a clientele effect as a possible explanation for this finding. Their paper suggests that an improvement in corporate disclosure practices, measured by AIMR ratings, may attract short-sighted investors, whose aggressive trading strategies (for example, large-scale selling when faced with bad news) may lead to higher stock return volatility. But in their results, this effect is outweighed by the fact that institutional investors that hold large, diversified portfolios and trade infrequently also tend to invest more in high-disclosure firms. Overall, firms with a high disclosure ranking are associated with lower volatility as long as they attract both investor clienteles.

Finally, a number of papers provide indirect evidence on the question at hand. Welker (1995) investigates the cross-sectional relationship between AIMR ratings of disclosure and firms' bid-ask spreads, which, like volatility, may be thought of as a measure of asymmetric information. In a sample of 427

U.S. firms, Welker documents a negative relationship between disclosure rankings and bid-ask spreads. Botosan (1997) and Sengupta (1998) document a negative relationship between disclosure and the firm's cost of capital for U.S. firms, using a disclosure index based on annual accounts and AIMR ratings, respectively.

3. Research Design

We reexamine the question of how higher disclosure may be related to stock volatility by estimating the following model for a cross-country sample of banks:

$$(SD) \quad SD_i = f(DISC_i, Z_i) \quad \forall i \in I,$$

where SD_i is the standard deviation of a bank's weekly equity returns, $DISC_i$ is a measure of disclosure, and Z_i is a vector of control variables. Our data set comprises close to 600 banks in thirty-one countries over the period 1993-2000. The initial sample consists of all the banks that BankScope identifies as listed and that—again, according to information available on BankScope—are incorporated in one of the thirty-one countries we selected for our analysis.[2]

We focus on the cross-sectional relationship between volatility and disclosure by performing "between" regressions on our panel data set. While in principle our sample would allow an extension to an analysis of the time-series relationship between disclosure and stock volatility, we do not attempt to exploit this dimension of the data set for two main reasons. First, doing so would require us to study the dynamics of stock volatility. This is a difficult topic in and of itself and would complicate the estimation, in particular in a short panel context—our data are annual and range from 1993 to 2000, so that T=8 while N=591. Second, in a time-series setting, it is difficult to distinguish between a potential temporary "news" effect of new disclosures and the potential permanent effects related to reductions in asymmetric information. We therefore follow the existing empirical literature—for example, Bushee and Noe (2000)—and focus on the cross-sectional relationship between volatility and disclosure, by first averaging all variables across time and then estimating the association between average volatility and average disclosure.

A potential econometric issue when estimating the effect of disclosure in our model is that a bank's decision to disclose information is—at least in part—voluntary and therefore likely to be a function of other variables. In principle, such endogeneity of the explanatory variable can result in a number of problems for the estimation. First, the data-generating process might consist of two simultaneous equations where the variable x is a function of y and the variable y is a function of x. In general, neither equation in this situation can be estimated consistently using the ordinary least squares (OLS) method, and other techniques, such as instrumental variables (IV), have to be employed. We therefore need to assess whether it is likely that we are experiencing reverse causality. This would be the case if the bank's stock volatility was one of the determinants of the amount of disclosure that the bank decides to release. This is not implausible in a time-series context. In particular, it is conceivable that if a bank's volatility is high in a particular period, the bank has an incentive to increase disclosure in the same period or in later periods in an attempt to reduce volatility.[3] But we argue that it is less plausible that this would result in a positive relationship between the long-run average of volatility (measured over several years) and the long-run average of disclosure.

Second, the data-generating process might consist of two recursive equations where x is a function of z and y is a function of x and z. In this case, the OLS method can be used to estimate both equations, provided that the errors of the two equations are uncorrelated. In a cross-sectional setup, the main source of correlation among the errors is omitted variables, that is, variables that belong in both equations, such as z, but are not included. In the case of our regression, this clearly is a serious concern. It may pose a problem for an attempt to estimate the effect of disclosure across countries, but it is also relevant for bank-level analysis. In particular, economic theory (Diamond and Verrecchia 1991) and evidence (Leuz and Verrecchia 2000) suggest that the amount of disclosure that a firm provides depends on its size as well as on the need for external funds. The amount of disclosure that a bank provides is therefore likely to depend on the bank's characteristics. However, these same bank characteristics may well have an independent effect on stock volatility and, if so, need to be included as controls. We attempt to address the problem of omitted variables by carefully examining the drivers of cross-sectional variation in volatility and including them as controls.

4. Measuring Disclosure

To conduct our analysis, we need a measure of disclosure. For a number of reasons, the concept of disclosure is difficult to measure. First, there are a number of different channels of disclosure. Firms may disclose information in published annual accounts, but they may also communicate material information to analysts and the financial market using ad hoc press briefings. Indeed, depending on their listing status, firms

may be required to issue profit warnings when there is information indicating that the firm may not achieve its stated earnings target. Information may also be disclosed by third parties. Rating agencies have access to information that is not available to the public at large and that the agency feeds into the rating assigned to the firm. In the context of banks, information may also be released by supervisors. For instance, in the United States, the Call Reports that banks file with their supervisors are made public. Second, there are a number of dimensions to the concept of disclosure that are more or less difficult to measure. One can distinguish the timeliness (of press briefings), the periodicity (quarterly results versus first- and second-half results), the quantity, and the quality (truthfulness) of disclosure.

Existing cross-country research on the effects of disclosure has relied to a large extent on the Center for International Financial Analysis Research (CIFAR) index of transparency, introduced by La Porta et al. (1998). This index represents the average number of ninety items included in the annual reports of a sample of domestic companies, where nonfinancial companies make up 70 percent of the sample. As pointed out by Bushman and Smith (2003),[4] this cross-country variable is highly correlated with numerous other country characteristics. Moreover, the CIFAR index measures overall corporate disclosure and may therefore not be closely related to disclosure by banks.

The measure of disclosure used in this paper is an index based on whether a bank discloses information on seventeen categories of disclosure related to interest rate risk, credit risk, liquidity risk, market risk, and capital in its annual accounts as represented in the BankScope database.[5] The construction of the index is therefore similar to that of the CIFAR index. Like the CIFAR index, our index measures the amount of information firms provide in their annual accounts. (The appendix box describes the index and subindexes in more detail.) Compared with the CIFAR index, the key advantage of our index is its availability at the bank level.

However, it is important to realise that the bank-level indexes we construct share some limitations with the CIFAR index. They capture the quantity of disclosure that firms provide in their annual accounts. Other important dimensions and channels of disclosure are captured only to the extent that they may be positively correlated with the amount of information that banks provide in their annual accounts.

Table 1 presents descriptive statistics on the disclosure index and its subindexes. Most banks disclose information on

TABLE 1
Descriptive Statistics on the Disclosure Indexes 1993-2000

Item	Title	Disclosure in All Periods (Percent)	Disclosure in No Period (Percent)	Average	Standard Deviation	Within-Country Standard Deviation	Across-Country Standard Deviation	Coefficient of Variation
S1	Loans by maturity	13	63	0.27	0.39	0.20	0.35	1.42
S2	Loans by type	55	15	0.72	0.38	0.23	0.33	0.53
S3	Loans by counterparty	22	69	0.27	0.43	0.10	0.21	1.55
S4	Problem loans	24	18	0.58	0.38	0.24	0.25	0.65
S5	Problem loans by type	16	38	0.29	0.38	0.16	0.32	1.28
S6	Securities by type	59	2	1.65	0.53	0.25	0.24	0.32
S7	Securities by holding purpose	45	24	0.63	0.42	0.21	0.34	0.67
S8	Deposits by maturity	36	36	0.52	0.44	0.22	0.29	0.86
S9	Deposits by type of customer	38	6	0.59	0.39	0.23	0.17	0.66
S10	Money market funding	51	14	0.71	0.37	0.25	0.27	0.53
S11	Long-term funding	53	6	0.77	0.32	0.25	0.16	0.41
S12	Reserves	30	22	0.50	0.39	0.25	0.33	0.78
S13	Capital	28	18	1.50	1.16	0.17	0.73	0.77
S14	Contingent liabilities	54	8	0.76	0.34	0.79	0.21	0.45
S15	Off-balance-sheet items	55	8	0.76	0.34	0.29	0.21	0.44
S16	Noninterest income	60	6	0.80	0.31	0.29	0.22	0.39
S17	Loan loss provisions	56	9	0.76	0.39	0.26	0.23	0.51

Source: Authors' calculations.

Table 2
Volatility and Bank-Specific Control Variables

Variable	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Number of Observations
Standard deviation of equity returns	0.05	0.03	0.03	0.04	0.05	591
Log size	15.60	1.80	14.34	15.49	16.78	735
Dividend ratio	0.41	1.01	0.22	0.35	0.49	667
Cost-to-income ratio	0.63	0.30	0.56	0.64	0.71	726
Loan ratio	0.60	0.17	0.52	0.63	0.72	734
Leverage ratio	15.38	15.24	9.51	12.97	20.03	735
Beta	0.54	0.42	0.23	0.46	0.86	591
Loan growth	10.20	24.79	0.58	8.47	15.65	728
Return on assets	0.01	0.03	0.00	0.01	0.01	734

Source: Authors' calculations.

noninterest income and on securities by type[6] throughout the whole period. More than half of the banks in the sample also disclose information on the banks' nondeposit funding structure (that is, on money market and long-term funding sources such as bonds and hybrid capital), loan loss provisions, contingent liabilities, and off-balance-sheet items. The least amount of information is disclosed on the breakdown of bank loans. In terms of banks providing information on loans by type—such as loans to municipalities or the government, mortgages, or leases—the record is relatively good, with about 55 percent of the banks reporting this information in all periods. However, a large share of the banks do not disclose information on their loans by maturity or counterparty, or on their problem loans by type (that is, overdue, restructured, or other nonperforming).

As shown in Table 1 and documented in more detail in Tables A2 and A3 in the appendix, disclosure varies both across countries and within countries. For the composite index, the across-country standard deviation[7] is 0.12 and the within-country standard deviation is 0.17.

Another interesting point is that in general, if banks decide to disclose information on some items of information, they are more likely to be willing to disclose information on other items of information. This can be seen from the mostly positive correlation coefficients between the disclosure indexes (see Table A3 in the appendix). On average, the correlation between two subindexes is a positive and sizable 0.37.[8]

5. Other Factors Affecting Volatility

To isolate the effect of disclosure on volatility, we must examine other factors that might be related to the cross-sectional variation in volatility. A list of potential bank-specific control variables was obtained from surveying the existing literature, cited above, and adapting the variable definitions, if necessary, to fit the case of banks. Table 2 presents summary statistics for all potential control variables as well as the dependent variable. Appendix Table A1 summarises the data sources and variable definitions for all variables obtained.

For a number of reasons, larger banks are likely to have a lower stock volatility than smaller banks. A measure of the bank's size (the logarithm of total assets) is therefore included. A further important determinant of volatility may be the bank's performance. One often cited reason for this is that bad news may result in higher volatility than good news.[9] To capture performance, both the cost-to-income ratio and the return on assets are included. Since one would expect better performance to be associated with lower volatility, one would expect a positive effect on volatility for the cost-to-income ratio and a negative effect for the return on assets. In addition, the dividend ratio may signal the quality of a bank and thus be associated with lower volatility.

The volatility of equity returns may be related both to investor uncertainty and to the underlying asset risk of the bank. We attempt to control for the latter and include the banks' beta as well as their loan growth as proxies for risk. Both variables are expected to increase volatility. We would therefore expect a positive coefficient on the bank's beta and its

loan growth. In addition, from the Modigliani-Miller theorems, for given asset risk, the volatility of equity returns ought to be higher the larger the banks' leverage is. We thus also include the leverage ratio and expect a positive sign. Finally, the ratio of loans to total assets controls for the composition of banks' assets and thus proxies for differences in the business mix of banks (for example, commercial versus investment).

In addition to the bank-specific control variables, all our regressions include a set of country dummy variables. Including dummy variables has the benefit of controlling for cross-country differences in factors that affect the stock volatility of the banking sector. Indeed, a common objection to country-level analysis is that it is very difficult for the researcher to control for all relevant differences across countries in an attempt to isolate the effect of the variable of interest. In the context of our study, clearly stock volatility may be affected by a large number of differences across countries. These include institutional differences regarding the companies traded (for example, corporate governance), differences with respect to the exchange (organization of the exchange, mix of investor types, and volume traded), and differences in the prospects of the economy in general and the banking sector in particular. Such cross-country differences are difficult to measure and may result in omitted-variable biases of unknown size and direction. Including dummy variables is an attempt to overcome these omitted-variable problems.

Apart from reducing omitted-variable biases related to factors other than transparency, the inclusion of dummy variables is a way of reducing biases arising from potential measurement error associated with the cross-country dimension of the disclosure index. In particular, countries can be shown to differ in the proportion of banks that are rated by major rating agencies. Countries may also differ in the amount of information provided to security analysts through press briefings and in the amount of information disclosed by the supervisors. As discussed above, a shortcoming of our disclosure index is that none of these differences is captured. Including dummy variables is a way to control for the cross-country variation in these missing dimensions of disclosure.

In Table 3, the first column shows a basic model that includes all the above-mentioned control variables. This regression—like all others—is based on the OLS method and uses the White-corrected variance-covariance matrix to adjust for heteroskedasticity.[10] It also includes a set of dummy variables, the coefficients of which are not shown. The results indicate that all of the control variables have the expected sign, but some are not statistically significant.

To improve the efficiency of our estimates, we test down from the most general model including all available control variables to a more parsimonious model where insignificant control variables are eliminated and control variables that turn out to be of statistical importance are retained. This approach strikes a balance between the problems of omitted-variable bias and the potential problem of inefficient estimates resulting from multicollinearity. The second standard deviation column of Table 3 shows our preferred model, which is derived by testing down from the model shown in the first column.

Table 3
Standard Deviation of Equity Returns Model

	Standard Deviation	
Dependent Variable	(1)	(2)
Log size	-0.0043***	-0.0045***
	(0.000)	(0.000)
Dividend ratio	-0.0018	
	(0.281)	
Cost-to-income ratio	0.0000	
	(0.659)	
Loan ratio	-0.0149***	-0.0196***
	(0.008)	(0.001)
Leverage ratio	0.0002**	0.0002**
	(0.012)	(0.035)
Beta	0.0262***	0.0261***
	(0.000)	(0.000)
Loan growth	0.0001	
	(0.101)	
Return on assets	-0.1765***	-0.1579***
	(0.002)	(0.000)
Constant	0.1007***	0.1101***
	(0.000)	(0.000)
Observations	507	560
R^2	0.678	0.733

Source: Authors' calculations.

Notes: Robust *p*-values are in parentheses. Estimation procedure is ordinary least squares with the White-corrected variance-covariance matrix that adjusts for heteroskedasticity. Both regressions also include country dummy variables. The model includes dummy variables whose coefficients are not shown.

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.

6. The Effect of Disclosure

Finally, we assess the effect of disclosure on volatility by including disclosure in the regression that includes all control variables shown in column 2 of Table 3 as well as a set of

country dummy variables. The results are shown in Table 4. It turns out that the composite measure of disclosure has a strong negative effect on volatility, which is significant at the 1 percent level.

We also attempt to analyse which of the subindexes might be most associated with reductions in volatility. As discussed above, the different disclosure subindexes are highly correlated with each other. To avoid multicollinearity between disclosure indexes, we introduce one subindex at a time into the preferred model (Table 4, column 2) to test for the effect of disclosure on the volatility of equity returns for other given factors. Almost all the subindexes show a negative coefficient and most are statistically significant. This finding confirms the hypothesis that banks that disclose more information have lower volatility of equity returns. However, it is difficult to draw firm conclusions as to which of the subindexes might be most important.

Finally, note that we find a disclosure effect despite the fact that numerous bank-specific variables likely to influence the amount of bank disclosure—such as bank size, risk, and performance—are included as controls. This inclusion should reduce the likelihood that the results suffer from endogeneity bias. We also tested for endogeneity more formally. The results of the Durbin-Wu-Hausman test[11] we conducted reject the endogeneity of the disclosure index in the volatility model.

Table 4
Standard Deviation of Equity Returns Model Including Disclosure Indexes and Country Dummy Variables

Item	Title	Regression with Dummy Variables
Disclosure	Composite disclosure index	-0.0096***
S1	Loans by maturity	-0.0043*
S2	Loans by type	-0.0089***
S3	Loans by counterparty	-0.0019
S4	Problem loans	-0.0043*
S5	Problem loans by type	-0.0105***
S6	Securities by type	-0.0041***
S7	Securities by holding purpose	-0.0063***
S8	Deposits by maturity	-0.0100***
S9	Deposits by type of customer	-0.0074***
S10	Money market funding	-0.0060**
S11	Long-term funding	-0.002
S12	Reserves	-0.0048**
S13	Capital	0.0005
S14	Contingent liabilities	-0.0051***
S15	Off-balance-sheet items	-0.0055***
S16	Noninterest income	-0.0082***
S17	Loan loss provisions	-0.0058***

Source: Authors' calculations.

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.

7. Conclusion

Outside investors may view information disclosure as useful because it can influence their investment decisions. For banks, however, it may be difficult ex ante to assess the value financial markets place on a given voluntary disclosure (Board of Governors of the Federal Reserve System 2000).

The evidence presented in this paper suggests that information disclosure may be useful to both investors and banks. In particular, we investigate the cross-sectional association between banks' long-run average stock price volatility and the long-run average level of disclosure that banks provide in their annual accounts. Controlling for a number of other factors, such as the size and risk of the bank, we find that banks that disclose more information on key items of disclosure show lower measures of stock volatility than do banks that disclose less information. This finding suggests that disclosure may be useful for investors. But it also suggests that there may be benefits for banks. In particular, lower stock volatility may result in a lower cost of capital and increase the effectiveness of stock-based compensation. Finally, our evidence suggests benefits of disclosure for supervisors that use market indicators of bank performance alongside supervisory information. In particular, a lower volatility of equity returns may reduce the likelihood that the stock price gives the wrong signal on the relative performance and risk of the bank.

However, the relative usefulness of particular items of disclosure remains difficult to assess empirically. In addition, disclosure has its costs. Investors, banks, and supervisors therefore need to weigh carefully the benefits as well as the costs when deciding how much information to disclose. In this respect, this paper does not attempt to provide a definite answer, but points to avenues of future research.

Appendix

Table A1
Descriptions of Data Sources and Variables

Data Source	Variable	Description
BankScope	Disclosure	Disclosure index, as described in the appendix box
	S1-S17	Disclosure subindexes, as described in the appendix box
	Dividend ratio	Dividend ratio
	Cost-to-income ratio	Cost-to-income ratio
	Leverage ratio	Leverage ratio
	Loan growth	Loan growth
	Loan ratio	Loan ratio
	Return on assets	Return on assets
	Log size	Logarithm of total assets
Bloomberg	Standard deviation	Standard deviation of weekly equity returns
	Beta	Beta, all underlying data from Bloomberg

Table A2

Disclosure Indexes by Country

Mean

Country	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	Disclosure
Argentina	0.71	0.71	0.00	0.36	0.00	1.43	0.63	0.71	0.71	0.71	0.38	0.71	0.59	0.54	0.54	0.71	0.71	0.48
Australia	0.00	0.94	0.00	0.90	0.89	1.80	0.85	0.90	0.92	0.88	0.94	0.94	2.56	0.93	0.93	0.00	0.94	0.73
Austria	0.07	0.54	0.00	0.00	0.00	1.22	0.00	0.61	0.61	0.00	0.61	0.07	0.44	0.60	0.53	0.61	0.04	0.28
Belgium	0.56	0.13	0.00	0.09	0.00	1.13	0.25	0.44	0.56	0.38	0.56	0.00	0.38	0.19	0.19	0.56	0.38	0.28
Brazil	0.78	0.75	0.00	0.74	0.74	1.56	0.78	0.78	0.78	0.78	0.76	0.75	0.48	0.57	0.57	0.75	0.75	0.59
Canada	0.53	0.26	0.16	0.54	0.03	1.38	0.79	0.26	0.60	0.61	0.26	0.30	1.53	0.75	0.75	0.00	0.73	0.45
Chile	0.71	0.74	0.00	0.67	0.71	1.47	0.00	0.74	0.74	0.69	0.74	0.07	0.65	0.07	0.07	0.72	0.72	0.45
Finland	0.79	0.00	0.00	0.63	0.08	1.58	0.00	0.79	0.79	0.79	0.79	0.00	2.25	0.75	0.75	0.79	0.79	0.55
France	0.00	0.89	0.10	0.34	0.02	1.77	0.00	0.85	0.86	0.74	0.63	0.16	1.01	0.82	0.82	0.88	0.88	0.51
Germany	0.08	0.72	0.00	0.00	0.00	1.60	0.08	0.08	0.80	0.30	0.80	0.06	0.34	0.79	0.79	0.80	0.10	0.35
Hong Kong	0.51	0.95	0.34	0.72	0.05	1.90	0.48	0.96	0.67	0.96	0.87	0.88	0.99	0.88	0.88	0.82	0.82	0.65
Indonesia	0.87	0.37	0.00	0.23	0.23	1.67	0.84	0.89	0.72	0.88	0.88	0.22	0.68	0.87	0.87	0.89	0.87	0.57
Ireland	0.72	0.00	0.00	0.50	0.50	1.44	0.72	0.72	0.72	0.72	0.72	0.72	1.94	0.59	0.59	0.72	0.72	0.57
Israel	0.93	0.73	0.00	0.60	0.00	1.81	0.45	0.93	0.93	0.00	0.92	0.91	1.84	0.83	0.83	0.75	0.84	0.63
Italy	0.58	0.84	0.00	0.35	0.00	1.69	0.84	0.84	0.84	0.82	0.79	0.16	1.63	0.82	0.82	0.84	0.83	0.61
Japan	0.00	0.87	0.00	0.72	0.81	1.72	0.87	0.87	0.83	0.87	0.57	0.45	0.98	0.87	0.87	0.87	0.86	0.62
Korea, Republic of	0.86	0.80	0.35	0.16	0.01	1.35	0.79	0.54	0.54	0.79	0.78	0.81	1.54	0.29	0.29	0.88	0.54	0.54
Malaysia	0.53	0.65	0.00	0.43	0.35	1.42	0.67	0.65	0.65	0.58	0.71	0.65	0.69	0.63	0.63	0.49	0.49	0.49
Netherlands	0.10	0.73	0.42	0.08	0.00	1.71	0.00	0.73	0.77	0.77	0.83	0.00	0.77	0.50	0.50	0.73	0.67	0.44
Norway	0.00	0.88	0.00	0.68	0.66	1.75	0.09	0.88	0.88	0.79	0.88	0.88	2.48	0.87	0.87	0.88	0.88	0.68
Poland	0.76	0.00	0.00	0.53	0.06	1.39	0.71	0.77	0.76	0.57	0.72	0.47	0.91	0.58	0.76	0.76	0.74	0.50
Portugal	0.96	0.00	0.00	0.73	0.82	1.93	0.00	0.96	0.96	0.96	0.96	0.21	1.36	0.88	0.88	0.96	0.96	0.65
Singapore	0.84	0.45	0.18	0.39	0.39	1.68	0.39	0.00	0.79	0.75	0.80	0.39	1.04	0.82	0.82	0.75	0.54	0.52
Spain	0.00	0.94	0.71	0.60	0.09	1.92	0.00	0.95	0.96	0.74	0.96	0.17	1.80	0.96	0.96	0.96	0.96	0.65
Sweden	0.85	0.00	0.00	0.73	0.83	1.65	0.60	0.70	0.85	0.80	0.85	0.18	2.48	0.75	0.75	0.85	0.85	0.65
Switzerland	0.68	0.66	0.00	0.06	0.02	1.34	0.70	0.63	0.70	0.45	0.78	0.05	0.23	0.50	0.50	0.80	0.48	0.41
Taiwan	0.86	0.00	0.00	0.62	0.67	1.74	0.85	0.81	0.85	0.00	0.79	0.16	0.98	0.75	0.75	0.88	0.86	0.55
Thailand	0.00	0.58	0.00	0.32	0.32	1.10	0.48	0.00	0.58	0.39	0.58	0.09	0.66	0.58	0.58	0.58	0.58	0.35
Turkey	0.55	0.35	0.00	0.46	0.50	1.07	0.17	0.44	0.50	0.38	0.49	0.10	0.13	0.53	0.53	0.55	0.54	0.35
United Kingdom	0.31	0.66	0.09	0.56	0.52	1.67	0.21	0.86	0.88	0.72	0.87	0.59	1.55	0.51	0.51	0.85	0.88	0.58
United States	0.00	0.90	0.82	0.87	0.13	1.74	0.90	0.04	0.10	0.90	0.87	0.87	2.62	0.83	0.83	0.85	0.90	0.67

Source: Authors' calculations.

Table A3

Disclosure Indexes by Country

Standard Deviation

Country	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	Dis-closure
Argentina	0.27	0.27	0.00	0.24	0.00	0.27	0.26	0.26	0.27	0.27	0.27	0.28	0.27	0.81	0.34	0.34	0.27	0.19
Australia	0.00	0.07	0.00	0.15	0.18	0.15	0.00	0.29	0.15	0.12	0.17	0.07	0.07	0.87	0.07	0.07	0.00	0.09
Austria	0.14	0.35	0.00	0.00	0.00	0.25	0.00	0.00	0.25	0.25	0.00	0.25	0.14	0.65	0.22	0.34	0.25	0.11
Belgium	0.13	0.25	0.00	0.19	0.00	0.13	0.06	0.29	0.13	0.13	0.25	0.13	0.00	0.75	0.24	0.24	0.13	0.06
Brazil	0.25	0.28	0.00	0.27	0.27	0.25	0.00	0.25	0.25	0.25	0.25	0.28	0.27	0.53	0.32	0.32	0.27	0.21
Canada	0.45	0.41	0.25	0.35	0.05	0.34	0.12	0.26	0.41	0.36	0.38	0.41	0.37	0.90	0.34	0.34	0.00	0.18
Chile	0.30	0.23	0.00	0.27	0.30	0.23	0.31	0.00	0.23	0.23	0.30	0.23	0.11	0.40	0.17	0.17	0.30	0.16
Finland	0.36	0.00	0.00	0.25	0.07	0.36	0.00	0.00	0.36	0.36	0.36	0.36	0.00	0.99	0.33	0.33	0.36	0.25
France	0.00	0.26	0.29	0.35	0.05	0.26	0.00	0.00	0.32	0.27	0.42	0.44	0.29	1.07	0.34	0.34	0.26	0.19
Germany	0.21	0.38	0.00	0.02	0.00	0.28	0.26	0.21	0.21	0.26	0.28	0.26	0.19	0.58	0.28	0.28	0.26	0.11
Hong Kong	0.18	0.14	0.38	0.26	0.06	0.16	0.16	0.36	0.10	0.23	0.10	0.14	0.23	0.52	0.20	0.20	0.36	0.11
Indonesia	0.22	0.41	0.00	0.16	0.16	0.28	0.37	0.23	0.22	0.34	0.22	0.22	0.07	0.44	0.23	0.23	0.22	0.15
Ireland	0.33	0.00	0.00	0.58	0.58	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	1.11	0.49	0.49	0.33	0.32
Israel	0.15	0.38	0.00	0.18	0.00	0.27	0.15	0.32	0.15	0.15	0.00	0.15	0.16	1.03	0.31	0.31	0.26	0.15
Italy	0.19	0.26	0.00	0.12	0.00	0.26	0.00	0.26	0.26	0.26	0.29	0.27	0.11	0.84	0.25	0.25	0.26	0.18
Japan	0.00	0.26	0.00	0.25	0.31	0.27	0.41	0.27	0.26	0.28	0.25	0.41	0.11	0.63	0.27	0.27	0.26	0.17
Korea, Republic of	0.23	0.22	0.27	0.13	0.03	0.23	0.30	0.24	0.29	0.27	0.26	0.24	0.24	1.13	0.22	0.22	0.23	0.15
Malaysia	0.37	0.29	0.00	0.32	0.31	0.21	0.29	0.25	0.29	0.29	0.34	0.21	0.29	1.05	0.27	0.27	0.42	0.24
Netherlands	0.26	0.39	0.40	0.20	0.00	0.17	0.39	0.00	0.39	0.30	0.28	0.19	0.00	1.21	0.47	0.47	0.39	0.20
Norway	0.00	0.20	0.00	0.34	0.36	0.20	0.00	0.22	0.20	0.20	0.24	0.20	0.20	0.71	0.22	0.22	0.20	0.17
Poland	0.26	0.00	0.00	0.27	0.06	0.25	0.26	0.25	0.25	0.26	0.27	0.27	0.24	0.37	0.35	0.26	0.26	0.16
Portugal	0.09	0.00	0.00	0.17	0.23	0.09	0.10	0.00	0.09	0.09	0.09	0.09	0.09	1.00	0.13	0.13	0.09	0.10
Singapore	0.30	0.20	0.37	0.20	0.20	0.30	0.34	0.20	0.00	0.37	0.43	0.29	0.20	0.71	0.29	0.29	0.43	0.21
Spain	0.00	0.15	0.45	0.39	0.06	0.13	0.13	0.00	0.13	0.13	0.27	0.13	0.12	1.28	0.13	0.13	0.13	0.14
Sweden	0.34	0.00	0.00	0.27	0.33	0.33	0.41	0.55	0.41	0.34	0.33	0.34	0.11	0.98	0.35	0.35	0.34	0.27
Switzerland	0.34	0.41	0.00	0.14	0.06	0.38	0.41	0.38	0.37	0.37	0.33	0.29	0.08	0.51	0.45	0.45	0.29	0.19
Taiwan	0.23	0.00	0.00	0.28	0.33	0.22	0.40	0.24	0.30	0.25	0.00	0.29	0.12	0.62	0.29	0.29	0.22	0.16
Thailand	0.00	0.33	0.00	0.15	0.15	0.37	0.35	0.26	0.00	0.33	0.26	0.33	0.13	0.47	0.33	0.33	0.33	0.20
Turkey	0.26	0.25	0.00	0.21	0.26	0.25	0.26	0.21	0.27	0.25	0.29	0.30	0.13	0.30	0.23	0.23	0.26	0.16
United Kingdom	0.43	0.45	0.25	0.41	0.48	0.29	0.33	0.35	0.24	0.23	0.38	0.23	0.33	1.15	0.44	0.44	0.28	0.18
United States	0.00	0.21	0.34	0.27	0.15	0.26	0.00	0.21	0.16	0.05	0.22	0.26	0.27	0.80	0.33	0.33	0.28	0.18

Source: Authors' calculations.

Table A4
Correlation Matrix, Disclosure Indexes

	Disclosure	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
Disclosure	1.00																	
S1	0.05	1.00																
S2	0.60	-0.45	1.00															
S3	0.40	-0.39	0.40	1.00														
S4	0.75	-0.20	0.41	0.54	1.00													
S5	0.38	0.01	0.09	-0.31	0.47	1.00												
S6	0.85	0.05	0.58	0.28	0.49	0.24	1.00											
S7	0.62	0.02	0.33	0.35	0.57	0.25	0.39	1.00										
S8	0.30	0.41	0.01	-0.55	-0.02	0.50	0.26	-0.02	1.00									
S9	0.25	0.41	0.04	-0.60	-0.16	0.41	0.38	-0.17	0.77	1.00								
S10	0.74	-0.17	0.60	0.41	0.60	0.24	0.57	0.51	0.11	0.01	1.00							
S11	0.63	0.08	0.43	0.37	0.32	-0.02	0.63	0.24	0.04	0.17	0.36	1.00						
S12	0.65	-0.16	0.48	0.62	0.69	0.06	0.40	0.55	-0.19	-0.33	0.55	0.42	1.00					
S13	0.61	-0.23	0.39	0.69	0.63	-0.06	0.43	0.44	-0.22	-0.31	0.54	0.44	0.68	1.00				
S14	0.77	-0.09	0.48	0.32	0.49	0.15	0.75	0.38	0.12	0.28	0.48	0.52	0.40	0.41	1.00			
S15	0.77	-0.07	0.46	0.32	0.49	0.15	0.76	0.38	0.13	0.29	0.48	0.52	0.40	0.41	0.99	1.00		
S16	0.70	0.07	0.48	0.22	0.37	0.20	0.72	0.32	0.23	0.30	0.46	0.54	0.28	0.29	0.56	0.56	1.00	
S17	0.87	0.08	0.42	0.33	0.71	0.35	0.67	0.59	0.33	0.16	0.69	0.44	0.57	0.58	0.56	0.56	0.56	1.00
Average correlation (X,Y), X≠Y	0.58	-0.04	0.37	0.21	0.43	0.21	0.54	0.32	0.15	0.07	0.51	0.48	0.47	0.42	0.70	0.56	0.56	0.37

Source: Authors' calculations.

Disclosure Indexes

We construct bank-level indexes of disclosure representing whether a bank discloses one or more sources of risk (interest rate risk, credit risk, liquidity risk, market risk) in the BankScope database. These indexes thus measure the level of detail that banks provide on seventeen dimensions of accounting information in their published accounts. The table lists the indexes used in more detail.

For all indexes, zero was assigned if there was no entry in any of the corresponding categories and 1 otherwise, except for the index for securities by type and the capital index. For the securities by type index, zero was assigned if there was no entry for any of the categories, 1 if there was only an entry for the coarse breakdown, and 2 if there was an entry for the detailed breakdown. For the capital index, zero was assigned if there was no entry in any of the categories, 1 if there was one entry only, 2 if there were two entries, and 3 if there were three or four entries. Note that whenever a bank provides information on three of these items, one can infer the fourth. Providing three items was therefore viewed as informationally equivalent to providing four items.

Aggregating the information of the seventeen indexes, we also construct a composite disclosure index. The composite index is defined as $DISC = \frac{1}{21}\sum_{i=1}^{17} s_i$.

Information	Subindex	Categories
Assets		
Loans	S1: Loans by maturity	Less than three months, three to six months, six months to one year, one to five years, more than five years
	S2: Loans by type[a]	Loans to municipalities/government, mortgages, HP/lease, other loans
	S3: Loans by counterparty[a]	Loans to group companies, loans to other corporates, loans to banks
	S4: Problem loans	Total problem loans
	S5: Problem loans by type	Overdue/restructured/other nonperforming
Other earning assets	S6: Securities by type	Detailed breakdown: Treasury bills, other bills, bonds, CDs, equity investments, other investments Coarse breakdown: government securities, other listed securities, nonlisted securities
	S7: Securities by holding purpose	Investment securities, trading securities
Liabilities		
Deposits	S8: Deposits by maturity	Demand, savings, less than three months, three to six months, six months to one year, one to five years, more than five years
	S9: Deposits by type of customer	Bank deposits, municipal/government
Other funding	S10: Money market funding	Total money market funding
	S11: Long-term funding	Convertible bonds, mortgage bonds, other bonds, subordinated debt, hybrid capital
Memo lines		
	S12: Reserves	Loan loss reserves (memo)
	S13: Capital	Total capital ratio, tier 1 ratio, total capital, tier 1 capital
	S14: Contingent liabilities	Total contingent liabilities
	S15: Off-balance-sheet items	Off-balance-sheet items
Income statement		
	S16: Noninterest income	Net commission income, net fee income, net trading income
	S17: Loan loss provisions	Loan loss provisions

Source: Authors' calculations.

[a]The categories chosen reflect the presentation in the BankScope database.

Endnotes

1. In a companion paper (Baumann and Nier 2003), the question of whether bank disclosure might have behavioural implications is addressed. In particular, we analyse whether bank disclosure might mitigate incentives to engage in excessive risk taking. Although the results of this study point to a potential benefit from a public policy perspective, they beg the question of whether disclosure might have any (private) benefits for the banks themselves, as well as for financial markets.

2. The countries selected for our analysis are Austria, Australia, Argentina, Belgium, Brazil, Canada, Chile, Finland, France, Germany, Hong Kong, Indonesia, Ireland, Israel, Italy, Japan, the Republic of Korea, Malaysia, the Netherlands, Norway, Poland, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Kingdom, and the United States.

3. Anecdotal evidence confirms this line of reasoning. In 2002, Abbey National, a U.K. bank, posted a large loss arising from its wholesale activities. Rumours about the extent of the problem resulted in investor uncertainty and prompted Abbey to release detailed disclosures about its wholesale book.

4. These authors develop an interesting extension of the CIFAR index that captures other dimensions of disclosure, such as analyst following. Again, however, this index is only available at the country level.

5. The published accounts as represented in BankScope do not include qualitative information or those items that are disclosed in a nonuniform way. For instance, many banks publish value at risk (VAR) numbers relating to their market risk in annual accounts. However, there is no standard governing the presentation of this information. The key assumptions underlying the VAR calculations, such as investment horizon and confidence level, are not uniform across banks. As a result, the numbers are not comparable across banks and the information is not recorded in the BankScope database. See Hoggarth, Jackson, and Nier (2003) for further discussion.

6. The index "securities by type" is not a zero/1 dummy, but takes the value of 2 if banks disclose a detailed breakdown, the value of 1 if banks disclose a coarse breakdown, and zero if they disclose neither of the two. This avoids penalising banks that provide the detailed breakdown but do not provide the coarse breakdown. All other indexes are zero/1 with the further exception of the capital index, which ranges from zero to 3. See the appendix box for more detail.

7. The across-country standard deviation is defined as the across-country standard deviation of within-country mean disclosure, based on time averages for each bank. The within-country standard deviation is defined as the across-country mean of the within-country standard deviation of disclosure, based on time averages of disclosure for each bank.

8. There are three main exceptions to this. The subindex for whether a bank discloses loans by maturity is negatively correlated with other indexes. Likewise, the disclosure of information on deposits (by type of customer or by maturity) does not seem to be much higher when a lot of information on other items on bank balance sheets is disclosed.

9. The "leverage effect" posits that a stock price decline raises a bank's leverage, resulting in an increase in the volatility of stock returns (Black 1976).

10. The Cook-Weisberg test for heteroskedasticity rejects the null hypothesis of constant variance.

11. As described in Davidson and MacKinnon (1993).

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