International propagation of the credit crisis*

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Original version: November 2010

This version: April 2011

* We thank participants at seminars at CORE/University of Louvain, the University of Luxembourg, and the University of Southern Denmark. This paper can be downloaded from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1712707.

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Abstract

In this study we examine the propagation of the recent crisis to banks outside the US. We develop a framework combining stock market and structural variables that can be used with both individual bank and country aggregate data. We find that the differential incidence of the crisis measured by share price impact is explained by prior correlation with the US banking sector, bank leverage and liability structure, the foreign assets of banks, and the importance of banking in the economy. We find that a simple measure of bank capital was a better predictor of crisis impact than the risk-weighted measure of Basel II, but do not find that banks were penalized for making aggressive use of Basel II rules. These results are robust to various specifications and whether we use country data or individual banks. Using this framework we test a number of hypotheses which have been put forward in other studies. We find that some results are sensitive to sample selection and test specification. We do not find evidence that the incidence of the crisis was associated with mortgage holdings, stock market returns prior to the crisis, or standards of governance. We do find that countries with higher prior GDP growth suffered less in the crisis. We discuss the implications of our results for bank regulation.

JEL Codes: F33, F36, G1, G15, G18, G21, G28, G32, G34.

Keywords: banking, financial institutions, capital structure, risk management, international finance, monetary economics, credit crisis, international transmission, contagion, financial regulation.

1. Introduction

The recent financial crisis has provided a natural experiment with which to test hypotheses about crisis origination, propagation, and incidence. This has led to a vigorous debate about the factors which caused some banks and countries to suffer more than others. As well as having implications for modelling crises, this debate has important practical implications for the design of regulation and economic management. Some studies even appear to show that features of banks and economies which are favorable in normal times led to worse outcomes during the crisis. Hence it is important to understand as completely as possible the mechanism which caused these relationships.

There have been two broad approaches to examining the impact of the crisis: using country aggregates and using individual banks. At an aggregate level Rose and Spiegel (2009, 2010) fail to find a relationship between cross-country variation in the impact of the crisis and variables measuring cross-country trade and financial linkages. Frankel and Savelos (2010), using more measures of crisis incidence and a different measurement period, obtain somewhat stronger results. In line with previous crises, they find that the level of central bank reserves and real exchange rate overvaluation are significant indicators of the cross-country impact of the crisis. In addition, lower past credit growth, larger current accounts and savings rates, and lower external and short-term debt were associated with lower crisis incidence, although these results are not robust across different crisis incidence measures and specifications. Lane and Milesi-Ferretti (2010) focus on the impact of the crisis on GDP and find that growth during the crisis was lower in countries with high GDP per capita, high pre-crisis growth, and larger current account deficits.

At an individual bank level Acharya, Pedersen, Philippon, and Richardson (2010) develop an approach based on pre-crisis stock price data. They propose a measure equal to the return on a bank stock in the worst 5% of weeks for the index return during the pre-crisis period. They combine this with a measure of leverage to give an indicator which explains a significant amount of the share price impact of the crisis on different US financial institutions. In contrast Beltratti and Stulz (2009) focus on structural variables which measure characteristics of the banks and of regulatory and

governance regimes, rather than share price variables. They examine the factors which explain the differential share price returns during the crisis for large banks from a number of countries, including the United States. They conclude that "Overall, our evidence shows that bank governance, regulation, and balance sheets before the crisis are all helpful in understanding bank performance during the crisis."

Other studies have examined specifically the role of multi-national banks in the transmission of the recent banking crisis. Some of these (Popov and Udell (2010), Navaretti et al. (2010), and Allen, Hryckiewicz, and Kowalewski (2010)) have looked at the general issue of whether foreign-owned banks serve as a stabilising influence and what causes them to adjust their activity in the host country. They show that the activities of the bank in the host country are affected by characteristics of the parent bank, such as its fragility, its losses on financial assets, and its reliance on interbank borrowing.

The above studies focus on the recent crisis. There is in addition a more general literature on the transmission of banking crises both domestically and cross-border. Of most direct relevance here is the body of work that views transmission as a consequence of linkages in financial institutions or investor portfolios.[1] For example, Allen and Gale (2000) show how financial crises can spread as a result of the impact on the interbank market of changing demands for liquidity. In this case, the degree to which particular regions are affected by a crisis in one region depends on the particular structure of the linkages between regions. Liquidity shocks can also work directly through financial markets if an increase in demand for liquidity obliges investors to reduce their exposure in a number of markets (e.g., Calvo (2005) and Yuan (2005)).

Such linkages imply that the extent to which a shock is transmitted to another region depends on the structure of the assets and liabilities of financial institutions or their shareholders. Moreover, the resulting financial contagion is characterized by shifts in the degree of comovement between bank values, so that the severity and pattern of a

[1] For a review of the literature on the transmission of financial crises, see Allen and Gale (2007).

crisis cannot be predicted simply from the comovement in non-crisis periods.[2] However, the role of international linkages in the recent crisis is unclear. Lane and Milesi-Ferretti (2010) find that measures of international linkages such as trade openness have little explanatory power with respect to differential crisis impact. Rose and Spiegel (2010)) reach the counterintuitive conclusion that "if anything, countries seem to have benefited slightly from American exposure."

In this study we contribute to this literature in three main ways. First, we use a combination of share price and structural variables to explain the impact of the crisis for non-US countries and banks. We find that a stock market measure of international linkages, the pre-crisis correlation of a foreign bank's share return with the US bank share return index, explains a significant amount of cross-country and cross-bank differences in crisis impact. In common with contagion studies, we also find that the relationship between share returns changed during the crisis and that the exposure of banks to the crisis is related to structural variables. The variables we find to be important measure the leverage, liability structure, international holdings, and size of a country's banking system. Hence both stock market and structural variables need to be combined to give a more complete specification of the relationships that caused differential crisis impacts. Omitting either could lead to misidentification of the causes.

Second, we test our hypotheses using data for both individual banks and country indexes. The framework we use is linear in the characteristics of individual banks, and therefore gives an aggregate measure of systemic risk that is consistent with the measures for individual banks. Hence it could be used to measure the contribution of individual banks to country-wide systemic risk. We find that the results for our main predictive variables are similar for both individual-bank and country-index data. However, we find that results for some other variables are sensitive to data availability and sample selection.

Third, we test a number of hypotheses that have been supported by other studies. For example, it has been suggested that high exposure to the crisis was associated with:

[2] There is a large empirical literature on the issue of whether correlations between markets increase during crisis periods. See, for example, Bennett and Kelleher (1988); King and Wadhwani (1990);

1. aggressive use of the Basel rules (IMF (2008);
2. high pre-crisis levels of GDP growth (Lane and Milesi-Ferretti (2010));
3. high pre-crisis share returns and good governance (Beltratti and Stulz (2009));
4. economic development (Lane and Milesi-Ferretti (2010);
5. low international linkages (Lane and Milesi-Ferretti (2010), Rose and Spiegel (2010)).

All these have important implications for policy but are in several cases counterintuitive. The different empirical approach and different sample of our study enables us to test the robustness of these propositions.

Our approach is most closely related to Beltratti and Stulz (2009) but it differs from theirs in several important respects. Our framework uses the knowledge that the crisis was transmitted from the US to other countries so we include a stock market measure of the linkage between banks and the US banking sector, which we find to be highly significant. Since our focus is on the performance of non-US banks, we collect a much broader sample of these banks and use both individual-bank and country-aggregate data. Our country sample consists of 50 non-US countries and our sample of individual banks includes 381 non-US firms. The combination of individual-bank and country data allows us to test whether the individual bank results are robust at the aggregate level.

Our study is related to Acharya et al (2010), in that we use a measure based on comovement between share prices as a primary variable. However, our interest is international propagation rather than domestic US impact, and we use correlation rather than their measure of extreme comovement. We examine which measure performs better in the international context of our study and find that the correlation is significantly better. We also combine the stock price measure with structural variables, and find that these improve the cross-sectional prediction relative to the stock market variable used alone.

2. Measuring the international propagation of the crisis

Wolf (2000), Forbes and Rigobon (2002), and Corsetti et al (2002).

A full test of Allen and Gale (2000) or similar models would require detailed information on the complex linkages between banks. Our interest is to develop a parsimonious representation in which the incidence of the crisis can be explained by a small number of observable variables. We derive our empirical approach from knowledge of the mechanism that led to the development of the crisis. This concerns the banking sector of a country and its links to the US banking sector. We do this because:

1. The crisis was primarily a banking-sector crisis which then spread to the remainder of the economy. So we look for transmission via the banking sectors of different countries.
2. The crisis originated in the US, so its propagation should depend on linkages with the US.

We consider a crisis emanating from country O concentrated in industry K. In this paper the country of origination is the US and the industry is the banking industry. We assume that the propagation of the crisis takes place via links between firms that are members of industry K in different countries. Initially, we describe these links by the relationship that exists in normal times between industry K in country j and industry K in country O. We measure this by the regression of equity index returns of industry K in country j on the industry stock index return in country O:

$$R_t^j = a^j + b^j R_t^O + e_t^j \qquad (1)$$

Where: $j = 1,..J,\ e_t^j \sim N(0,\sigma_j^2)$, $R_t^O \sim N(0,\sigma_O^2)$, R_t^j is the return on the stock index of industry K in country j in period t, and R_{Ot} is the return on the stock index of industry K in country O in period t. The key parameter in this regression is b^j, which measures the responsiveness of industry K in country j to industry K in the country of origin of the crisis. In normal times we have the standard expression for b^j:

$$b^j = \rho^j \sigma^j / \sigma^O \qquad (2)$$

where ρ^j is the correlation between R_t^j and R_t^O.

We assume that a crisis occurs in the period $(T, T+\tau)$. We model the propagation of the crisis by the relationship between the total return on the shares of industry K in different countries during this crisis period. If the crisis period were simply a scaled-up version of a normal period, the cross-sectional relationship between returns would be the one resulting from equation (1) with a constant term substituted for R_t^O:

$$R_C^j = a^j + \bar{R}b^j + e_C^j \qquad (3)$$

Where: R_C^j is the return on industry K in country j during the crisis period $(T, T+\tau)$, $\bar{R} = R_C^O$ is the return on industry K in country O during the crisis period, and $e_C^j \sim N(0, \sigma_j^2 \tau)$.

Equation (3) describes the cross-sectional relationship we would expect to hold in a non-crisis period. It is heteroskedastic, so we scale by the standard error of e^j to give:

$$r_C^j = \psi + \theta\rho^j + u^j \qquad (4)$$

Where: $r_C^j = R_C^j / \sigma^j$, $\theta = \bar{R} / \sigma^O$, $u^j \sim N(0, \tau)$. Equation (4) says that in non-crisis times the normalised return in country j, conditional on the return in country O, is proportional to its correlation with country O.

In a crisis period, however, the same relationship may not hold. We model the difference between a crisis period and a non-crisis period by making the parameter θ depend on other variables which measure the transmission mechanism of the crisis:

$$\theta^j = \theta(\underline{X}^j) \qquad (5)$$

Where $\underline{X}^j$ is a vector of variables which measure the vulnerability of country j to the crisis. The model then becomes:

$$r_C^j = \psi + \theta(\underline{X}^j)\rho^j + u^j \quad (6)$$

If the variables have an additive effect, equation (6) becomes:

$$r_C^j = \psi_0 + \psi_1 X_1^j + .. + \psi_n X_n^j + \psi_{n+1}\rho^j + u^j \quad (7)$$

Equation (7) is the specification we use in the study.

3. Data

We test our hypothesis with two data sets. The first consists of aggregate banking data for a sample of 50 countries. We then conduct a similar series of tests using data for a sample of nearly 400 individual banks. This provides a substantial increase in sample size but at the possible cost of more noisy data. The appendix lists the data definitions and sources.

Banks differ considerably in the presentation of their accounts. Therefore, any database of balance-sheet variables encounters an inevitable problem of consistency. This problem is likely to be particularly severe in a cross-country study and adds to the noise in the data for both our country-level tests and those for individual banks.

3.1 Country-Level Data

For the country-level tests we include all countries for which the following data are available: (1) Datastream bank industry equity return indices for the period January 2005 to March 2009; (2) IMF International Financial Statistics data covering banking-sector Total Assets, Foreign Claims, Demand Deposits, and Time Deposits for the end of 2006; (3) IMF aggregate capital ratios for the banking sector; (4) IMF aggregate Basel regulatory capital ratios for the banking sector. Our sample includes the 50

countries shown in Table 1. These cover 91% of world GDP excluding the US (using IMF data for 2009).

We measure the impact of the crisis, R_C^j, as the average weekly return on Datastream bank industry equity indices in the period 21 May 2007 to 9 March 2009, a period in which the U.S. index of bank returns fell by 79%.[3] We measure the independent variables from the period before the crisis. We use 2 years of weekly data from January 2005 to December 2006 to compute the correlation between a country's bank stock index and that of the US, ρ^j, and the standard deviation of each country's bank stock index return in non-crisis times, σ^j. We use the same data to calculate the extreme value measure suggested by Acharya et al. We leave a gap between this period of data measurement and the crisis period to ensure that our independent variables would have been known by May 2007 and to allow for uncertainty about the exact dating of the crisis. To measure banking variables (which are included in the vector of explanatory variables, $\underline{X}^j$) we use primarily IMF aggregate data for a country's banking sector at the end of 2006.[4] We use the data for "Other depository corporations", which are largely banks. This and other definitions, together with data sources for the country-level data are given in the appendix.

The banks included in the Datastream Indices all have publicly listed stock, whereas the IMF data include government-owned banks and cooperatives. If publicly owned banks have different characteristics, this may affect our results. The sample size in such a study is naturally limited. However, the excluded countries are generally tiny and it is not clear that they would add much extra information to the study.

Given the limited number of observations, we take care to use only a few independent variables and not to engage in data-mining. We select those variables that could play a significant role in the transmission mechanism of the crisis from the US banking sector to the banking sector of country j. Our hypothesised variables are:

[3] We also ran both the country and individual bank regressions with the *cumulative* return May 2007-March 2009 as the dependent variable. The results were qualitatively similar.
[4] Banking data for Taiwan are taken from the Central Bank's Website.

- Leverage of the banking sector, which we measure by a capital ratio;
- Fragility of the banking sector, which we measure by the proportion of bank liabilities that are not deposits. We hypothesise that these represent less permanent sources of funding;
- Fragility as measured also by the use of derivatives;
- International linkages not captured by the correlation with the US, which we measure by the proportion of foreign assets held by banks;
- The importance of the banking sector in the economy, which we measure by the ratio of bank assets to GDP.

We augment these variables with four supplementary measures that have been suggested in other studies as associated with crisis returns. These include two governance measures, the prior return on bank stocks, and the prior growth in GDP. Previous empirical studies suggest that these measures were negatively related to bank performance during the crisis.

The variable that presents the most difficulty in measurement is the fragility of the banking system. We estimate this in two ways. The first is the amount of less permanent sources of funding. We hypothesize that time deposits and, to a lesser extent, demand deposits are likely to represent more permanent sources of funding and involve fewer linkages to other banks. Other liabilities are likely to represent sources of funding that are more susceptible to early flight risk as a banking crisis emerges. Our second measure of fragility is the use of derivatives. We hypothesize that large derivatives positions are likely to make the banking system more fragile, both because of the implicit leverage that derivatives contain and because derivatives may serve to transmit risk internationally to other banks.

We were not able to locate a reliable country-level measure of the ratio of bank equity to total assets. For our country study we therefore use two other measures of leverage – (1) the ratio of capital to total assets, where capital includes both equity and subordinated long-term debt, and (2) the Basel ratio of Tier 1 + 2 capital to risk-weighted assets. Both measures were taken from IMF *Global Financial Stability Report.*

We include a measure of the size of the banking sector relative to GDP. A large banking sector is more likely to have international linkages. In addition, it may cause other problems in the economy as the crisis evolves. In this case the crisis could be accentuated by feedback between the banking sector and the other parts of the economy.

An OECD report argues that "the financial crisis can be to an important extent attributed to failures and weaknesses in corporate governance arrangements" (Kirkpatrick (2008)). Beltratti and Stulz (2009) test this assertion but in contrast to the OECD they find that banks with more shareholder-friendly boards performed *worse* during the crisis. We check whether this is also true for our sample. We use two country-level measures of corporate governance, both described in Djankov et al (2008) and reported in detail in Djankov et al (2005). The first is their anti-self-dealing index, which measures the degree of protection that each country provides against a specified tunnelling transaction. The second measure is their revised index of anti-director rights, which updates and extends La Porta et al. (1998). Both variables are available for 45 of our countries.

Finally, we examine two other measures that previous studies have found to be associated with crisis returns. The first is the return on the country's bank stocks during 2006 and the second is the average rate of GDP growth in the five years to 2006.

In our regressions we transform those balance-sheet ratios that we expect to have a positive association with returns by subtracting them from 1.0. Therefore, the predicted sign on the coefficient is negative for each of these independent variables.

Table 1 provides some summary data for the dependent variable. Of the 50 countries only China's banking sector experienced a positive return from May 2007 to March 2009. There are, however, some regional patterns in the data. European banks experienced unusually sharp falls in value, with Ireland, the most affected country, experiencing a mean weekly return of -2.6%. Emerging and developing economies generally fared better with a mean raw return of -0.6% per week, compared with a

mean return of -1.2% for advanced economies.[5] There is no relationship between the severity of the declines in prices and the prior variability of returns; some of the apparently most stable banking markets suffered the sharpest falls in value.

The distribution of the variables and their correlations are given in Tables 2 and 3. The simple correlations between the standardized return and our main independent variables (column 1) all have the predicted negative sign. The correlation between the standardized return and each of the governance variables is close to zero. However, the standardized return is quite strongly positively correlated with the prior growth in GDP.

3.2 Individual Bank Data

Our sample of individual banks consists of the components of the Datastream World Bank Index in 2010. Since this list is subject to potential survivorship bias, we supplemented it by merging it with the 200 largest banks by total assets in 2006, based on *The Banker's* 2007 listing of the top 1000 banks at the end of the previous year. We exclude those banks whose stocks were first listed after the start of 2005. The remaining sample includes companies that are not principally commercial banks. For example, some are bancassurance companies, investment banks, or asset managers. We exclude three cases where a bank also acts as the central bank, but otherwise do not attempt to make what would be inevitably judgmental exclusions. The result is a sample of 381 banks from 50 countries.[6] In contrast to our country-level data, the sample does not include banks from Bulgaria, or Slovenia, but does include banks from Bahrain and Iceland.

The returns and balance-sheet data for individual banks are taken from Datastream, and are supplemented by data from Osiris and the banks' annual reports. The dependent variable is the average weekly return on the bank stock from May 2007 to March 2009. We normalize this return by dividing by the standard deviation of returns in the period 2005-2006. Where a bank was acquired for stock we include the subsequent return on the stock of the acquiring company. Where a bank was

[5] We use the definitions in the IMF's *World Economic Outlook.*
[6] Of these banks 360 were members of the Datastream indices and 21 were added from *The Banker.*

nationalized or acquired for cash, we include the cash payment and assume a zero return in the subsequent weeks.[7]

Definitions of the independent variables are shown in the Appendix. The first group of variables in the table largely parallel those used in the country-level regressions. For individual banks we consider three measures of leverage -- the ratio of equity to total assets, the ratio of total capital to total assets, and the Basel Tier 1 + 2 capital adequacy ratio. Where available, we collect separate measures of demand and time deposits. However, many banks report only total deposits and therefore we use this measure as an alternative independent variable.

The amount of foreign loans is available for only a small proportion of our sample. Therefore, as in the country-level regressions, we use the country-average ratio of foreign loans to assets. We also use the same measure of the ratio of banking assets to GDP that we use in the country-level regressions.

In addition to our principal independent variables, we also examine four other balance sheet variables that may provide information about the bank's exposure to the crisis. The first is the ratio of the bank's short-term debt to total assets. Thus instead of measuring fragility by the proportion of bank funding that is *not* provided by deposits, we use the proportion that is funded by short-term debt. We predict that a bank that relies on short-term wholesale funding will be more susceptible to the crisis.[8]

Second, real-estate loans have been a common source of banking crises (Herring and Wachter (1999) and Reinhart and Rogoff (2008)) and more specifically played a leading role in the 2007 crisis. To the extent that banks were exposed to the US real-estate market or that there was contagion across countries in real-estate markets, we expect banks with a high real-estate exposure to be more sensitive to the crisis in the US. Datastream provides data on the level of mortgage loans for a substantial subsample of our banks, but data on holdings of mortgage-backed securities are

[7] This assumption is largely immaterial. Payments for banks that were rescued by acquisition or nationalization were generally either zero or very small.
[8] Osiris provides a measure of money-market funding. This is available for a smaller sample and does not offer any improvement over the Datastream measure.

available for just a small subsample. We therefore look only at the ratio of mortgage loans to total assets.

Finally, a bank's involvement in the interbank market may serve as a proxy for its international linkages. We therefore also collect data on interbank loans (an asset), and loans due to other banks (a liability).

We again augment these measures with three supplementary variables that previous studies suggest may be associated with bank performance during the crisis. These are a measure of corporate governance, for which we use the Corporate Governance Quotient (CGQ®), the average weekly return on the bank stock in 2006, and the growth in country GDP over the five years ending in 2006.

As in the case of the country data, we restate the independent balance-sheet variables, so that the predicted coefficient on each is negative. Tables 4 and 5 summarize the distributions of the variables used in the individual bank regressions and their pairwise correlations. The pervasive nature of the crisis is illustrated by the fact that the mean return was negative for over 90% of the observations, with a mean weekly return of -0.7%. Again there was a substantial difference between the performance of banks in emerging and developing economies and those in advanced economies. In the former case the mean weekly raw return was -.4% and in the latter case it was -.9%.

The simple correlations between the standardized return and the main independent variables all have the predicted negative sign. Both the governance variable and the prior stock return are weakly negatively correlated with the standardized crisis return, while the growth in GDP continues to be quite strongly positively correlated. In the case of the independent variables, there is a high correlation between the three measures of bank capital and, not surprisingly, between total deposits and time deposits. There is a strong negative correlation between short-term debt and total deposits.

The correlation between returns on the bank and the US banking index seeks to pick up linkages between banks that are not captured by other independent variables such

as the relative amount of interbank activity or the size of the banking sector. The weak association between these balance-sheet variables and the return correlation suggests that the former may not be adequate proxies of bank linkages.

4. The role of correlation and leverage

4.1 Can pre-crisis correlation explain the propagation of the crisis?

Equation (4) says that the prior correlation with the US banking sector should help to predict the impact of the crisis. Therefore, we first test whether the relationships that hold in normal times can explain the cross-sectional impact of the crisis. The first column of Table 6 shows the regression of the standardized crisis return variable on the pre-crisis correlation with the US banking sector. Panel A is for the country sample, Panel B for the full sample of individual banks, and Panel C for the restricted sample of individual banks for which we have all three measures of leverage. The adjusted R^2's are .27, .23, and .21, suggesting that the impact of the US credit crisis on other countries was related to the pre-existing correlation between their banking sectors.

The fact that this is an incomplete explanation is not surprising. Even in a domestic context in normal times this regression would not explain a large part of the cross-sectional dispersion of returns.[9] Moreover, if contagion depends on the particular structure of interbank linkages, then the pattern of comovement during a crisis period may differ from that in the pre-crisis period. We, therefore, tested whether the correlations with the US bank index are stable between the two periods. In the case of 9 countries, or 18% of the sample, we can reject at the 5% level the hypothesis of no change in the underlying correlations.

Figure 1 plots the normalized return against the correlation for the country sample. In the raw data the average return on the bank indexes for emerging markets was higher

[9] The regression is similar to a cross-sectional regression of ex post returns on betas. The independent variable is measured with error, which can lead to an errors-in-variables problem. This is the reason that it is common to form portfolios of stocks before using betas in tests of other cross-sectional relationships. In the case of the country-level regressions our correlation measure is based on a

than for advanced economies. This difference is reduced, but not eliminated, when we allow for the differing correlations with the US index. However, we show later that it almost entirely disappears once we allow for differences in the structure of the countries' banking systems.

4.3 Bank capital and crisis propagation

Many regulatory recommendations focus on the role of bank capital in preventing banking crises. Therefore, we examine the ability of bank capital measures to explain the cross-country impact. We include the bank capital measure in a regression of the form:

$$r_C^j = a + b_1 \rho^j + b_2 (1 - capitalmeasure) + u^j \qquad (9)$$

The term $(1 - capitalmeasure)$ converts the capital measure to a measure of leverage of the banking system, rather than its soundness.

As in the case of our country regressions we examine both the ratio of book capital including subordinated and hybrid debt to total assets and the Basel capital adequacy ratio. In addition, in the case of the individual banks we measure the ratio of book equity capital (common stock plus preferred) to total assets.

The Basel measure of leverage uses risk-weighted assets as the denominator and therefore captures the asset characteristics of the different banks. It seeks to take account of the relative riskiness of the assets of the different banks, and in principle should be a more accurate measure of the ability of the banks to withstand shocks.

Table 6 shows the results of regressing the standardized returns on both the correlation with the index and the capital measure for three samples: countries, individual banks, and those individual banks for which we have all three leverage measures. The last of these provides a horse race between the three measures using an identical sample.

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portfolio rather than individual stocks, so our test should suffer less from errors-in-variables bias than

All the leverage variables in Table 6 have the expected sign. The horse race in Panel 6C suggests that in the case of the individual banks, the equity ratio is somewhat more informative, and, given the much larger sample size provided by this measure, we employ it in subsequent regressions.

Panel 6C also shows, using a common sample, that the complex risk-weighting in the asset calculation of the Basel II measure does not offer any improvement over the other ratios in explaining the effect of the crisis on bank returns. This result is robust in tests that include other variables in the regression. The finding lends force to criticisms of the ability of the Basel measure to indicate the exposure of a country's banking system. Since the Basel measure must capture some of the risk characteristics of different assets, its poor performance in explaining crisis exposure suggests that banks have been adept at taking advantage of its loopholes, making it less informative as a measure of crisis risk than a simple equity ratio.

A more extreme hypothesis has been suggested in IMF (2008).[10] This suggests that banks which made aggressive use of the Basel rules were punished by the capital markets in the crisis. The final column in Panels A and B tests this hypothesis. It includes the difference between the Basel ratio and the simple leverage measure, as well as the leverage measure itself. If banks were punished for making aggressive use of the Basel rules, we expect this coefficient to be significantly negative, but it is not. Thus we conclude that the Basel risk adjustments were not informative regarding crisis risk, rather than that banks were actively punished for taking advantage of these rules.

5. Country-level results

In this section we describe our country-level results with the expanded regression, and then we look in the next section at how well these results are confirmed by the sample of individual banks.

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tests that use individual stocks.

[10] See the discussion of Figure 1.17.

5.1 Banking sector fragility, balance sheet measures of international linkages, and the importance of banking in the economy

We test whether adding other measures to the country-level regression improves our ability to understand the international impact of the crisis. We include the fragility of the banking system, measured by the proportions of bank liabilities financed with demand deposits and time deposits. Although the correlation measure explains part of the international propagation of the crisis, it is possible that it does not capture all dimensions of the international exposure of a country's banking sector. So we also include the ratio of total bank assets to GDP, as a measure of the importance of banking in the economy. Finally, we include the proportion of foreign assets in the aggregate balance sheet. Table 7 shows the results of including these variables in an additive regression using the capital ratio as the measure of leverage. All the variables, except ASSETS/GDP, are scaled to be in the range [0,1] and all are constructed to have an expected coefficient less than zero.

In the first two columns of Table 7 all the coefficients are negative as predicted, and the equation with all the added variables (column 2) explains 57% of the cross-sectional variation in the normalised returns. The most significant variables are the prior correlation with the US, the capital variable, the level of time deposits, and the relative size of the banking sector. By contrast, the demand deposit variable and the proportion of foreign assets play little role. With the inclusion of the additional explanatory variables the regional patterns in the residuals largely disappear.[11] Thus the difference between the performance of banks in advanced and emerging economies can be almost entirely explained by simple measures of their liability structure and their importance in the economy.

The second column in Table 7 incorporates all those variables that we hypothesised would be related to subsequent returns. For ease of reference we call it our *principal* country-level regression.

[11] The average residual standardized return is -.03 for advanced economies, and +.03 for emerging and developing economies. The equivalent values for the standardized returns themselves were -.54 and -.16.

The prior correlation with US bank stocks serves as a proxy for bank linkages that are not captured by our other independent variables. In the third column of Table 7 we omit this variable to see whether the remaining independent variables are able to take up the slack. The removal of the correlation variable provides little help for our other measures of bank linkages, namely the relative size of the banking sector and the level of foreign claims. The adjusted $\overline{R}^2$ of this reduced regression is lower, but remains respectable at .51.

5.2 The role of derivatives

The data available to measure the derivatives' usage by different countries' banking sectors are of lower quality than the data for our other variables. BIS data on aggregate derivatives usage measure only the market value of positions with positive value for each of the countries in our sample. This could greatly underestimate the exposure arising from derivative positions, which is likely to depend more on the gross face value of positions both long and short, rather than on the net market value of long positions.

We use instead data that measure the total amount of counterparty derivative exposure, as defined by BIS, for the combined long positions held by banks in 24 major countries. The BIS reports how much of these aggregate derivative positions are held against counterparties in each country.[12] We use these total amounts and deflate them by the aggregate bank assets for each country.

The fourth column of Table 7 shows the result when the derivatives variable is included. Although the variable has the correct sign in the bivariate regression, it no longer does so when the other variables are included. The coefficient is insignificant and the $\overline{R}^2$ is unchanged. Hence with the available data we are unable to find an influence of derivative usage on the impact of the crisis. It may well be, however, that

[12] This is reported in Table 9B of BIS, International Financial Statistics.

such a relationship does exist and is masked by the poor quality of the available data for this purpose.

5.3 Other Variables

The final two columns of Table 7 introduce the four additional variables that have been suggested as associated with differential bank returns. The simple correlations reported in Table 5 suggested that prior GDP growth was significantly and positively associated with subsequent crisis returns. In the multiple regression this relationship almost entirely disappears. Thus, once we allow for country differences in correlations with US bank returns and balance-sheet structure, GDP growth and prior stock returns have little to contribute.

In Table 7 the coefficients on the two governance variables have the opposite sign and neither is significant.[13] Again, it remains possible that returns are truly related to specific characteristics of corporate governance that are not picked up by our general indexes. However, given the lack of any strong priors as to which characteristics could matter, any exploration of this possibility would involve a substantial risk of data mining.

6. Individual bank results

We now examine whether similar relationships hold at the level of individual banks. The main results are contained in Table 8.[14]

6.1 Measures of the comovement between individual bank returns and the US bank index

The first column of Table 8 shows the relationship between the standardized return during the crisis and the prior correlation with the US banking index. Despite the significant measurement error in the independent variable, the coefficient is highly

[13] Since the two governance measures are quite highly correlated, we also added them separately into the regression. The coefficients continued to have different signs and to be insignificant.

significant and the variable explains almost a quarter of the variance in subsequent returns. The ability of past correlation estimates to explain subsequent returns may be reduced by possible instability in the correlations between the pre-crisis and crisis periods. Therefore, we again test the hypothesis of no change in the underlying correlations and reject the hypothesis for 16% of our sample at the 5% significance level.

6.2 Regression of returns on the correlations and balance-sheet variables

The remaining columns of Table 8 summarize the results from progressively introducing the balance-sheet variables. Since some items of data are available for only a subset of banks, the samples vary between regressions. To facilitate comparison between regressions, the final row in the table shows the $\overline{R}^2$ when regression (3) is rerun using the same subset of data.

The second column of the table includes the ratio of equity to assets, the two deposit variables and the two country-level variables. All the coefficients have the predicted sign and all except the foreign claims measure are significant at the 5% level or better. The coefficients on the two deposit variables are broadly similar, and this suggests that we can usefully increase the sample size by replacing them with total deposits. Regression (3) shows that, when we do this, the $\overline{R}^2$ increases to .46. All the coefficients continue to have the predicted sign and all except foreign claims are significant at the 1% level. Regression (3) corresponds most closely to our principal country-level regression. For ease of reference, we term it the *principal* individual-bank regression.

As in the case of the country analysis, the standardized returns are considerably higher for banks in emerging countries. However, almost all this difference is explained by our independent variables. The relatively strong performance of emerging-country

[14] Given the varying sample sizes, one should be cautious when drawing comparisons between different columns in Table 8.

banks is the result of their relative independence from the US banking market and their more robust financial structure.[15]

In line with our country regressions, we test whether omission of the correlation variable results in more emphasis being placed on the remaining independent variables. Column (4) of Table 8 shows that, with the exception of the foreign claims variable, the coefficients are somewhat larger in magnitude and more significant. However, these effects are relatively modest. The adjusted $\overline{R}^2$ of this reduced regression is .40.

The simple correlation between standardized return and the short-term debt ratio was strongly negative, suggesting that this variable should add to the explanatory power of the equation. However, for most banks deposits and short-term debt together constitute a high fraction of a bank's funding. Including both variables would come close to over-identifying the regression. Therefore, in column (5) of Table 8 we substitute short-term debt for total deposits. The coefficient on short-term debt is negative as predicted and strongly significant, but the coefficient on the equity ratio is no longer significant and the $\overline{R}^2$ is reduced.

The last three columns of Table 8 repeat our principal regression with the addition of the remaining balance-sheet variables and the three measures suggested by previous empirical research. Missing data are a problem in these regressions and therefore we introduce the variables to maintain as far as possible the sample size. Regression (6) includes the two interbank measures, the prior stock return, and the growth in GDP. Only the last is significant, but it is quite highly correlated with the measure of bank claims as a proportion of GDP, which now ceases to be significant.

[15] The average residual standardized return is -.01 for advanced economies, and +.02 for emerging and developing economies. The equivalent values for the standardized returns themselves were -.28 and -.11.
The average residual for advanced economies is -.01, and that for emerging and developing economies is .02, which is insignificant.

Regression (7) omits the two interbank variables, but includes instead the level of mortgages. The coefficient on mortgage loans is significant but, contrary to predictions, positive.

The final column of Table 8 shows the results of adding to our principal regression the Corporate Governance Quotient (CGQ®). The coefficients on the correlation with the US banking index and on the balance-sheet variables remain negative and for the most part significantly so. In contrast to the Beltratti and Stulz (2009) study, the coefficient on the governance variable is positive though not significant. The $\overline{R}^2$ is increased at .55. However, this is simply due to the changed sample. The final row shows that an almost identical $\overline{R}^2$ is obtained when our principal regression is re-run using the same sample.

7. A Measure of Extreme Comovement

If the comovement between banks differs during periods of turbulence, then simple measures of correlation during normal periods may not be the best predictor of comovement during the crisis. Acharya, Pedersen, Philippon, and Richardson (2010) propose a measure equal to the return on a bank stock in the worst 5% of weeks for the index return during the pre-crisis period.[16] Therefore, we check whether this stock market measure of exposure to the crisis performs better than the correlation.

Translated to the current context, we measure this as the average standardized bank return in the 5% of weeks that the US bank stock index gave the worst returns in the period prior to the crisis (the "bad-weeks return"). Panel A of Table 9 compares the effect of using this variable instead of the Pearson correlation coefficient in the country regression. Columns 1 and 2 show the results for a simple regression of the standardized return on the measures of comovement, Columns 3 and 4 incorporate additional explanatory variables, while Column 5 includes both measures of comovement in the one regression. Panel B provides a similar set of comparisons for individual banks.[17]

[16] For similar studies that have focused on extreme values to measure contagion, see Bae et al (2003) and Gropp and Moerman (2003).

[17] Note that a high value for the bad-weeks-return variable implies a *low* correlation with the US index.

Regardless of whether we use country-level or individual-bank data, the simple regression of standardized return on the bad-weeks return gives a lower adjusted R^2, indicating that this variable captures less information relevant to the international transmission of the crisis than the simple correlation measure. Columns 3 and 4 in each panel shows that this relatively poor performance carries over when we add other variables to the analysis, and Column 5 shows that tr of the correlation coefficient continues to have greater explanatory power when both variables are included in the regression..

The relatively poor performance of the bad weeks' return variable differs from the result that Acharya et al find in a test of the domestic US impact across different financial institutions.[18] Their variable is derived from the worst days for the US bank stock index in the period June 2006 to June 2007. We use weekly rather than daily data because time-differences between stock exchanges make daily data unreliable in international studies. In our context, the failure of the bad-weeks variable to predict the cross-sectional impact of the crisis indicates that the bad weeks that happened during generally good times did not contain useful information about the behaviour in a crisis. So there must have been a difference between the international linkages that operated during those "bad weeks in good times" and those that operated during the crisis. The success of this variable in a domestic US context compared with its failure internationally illustrates the potential danger of extrapolating US results to the international context.

8. Robustness

The coefficients on our principal variables uniformly have the predicted sign and are generally highly significant. The exception is the measure of the relative importance of foreign claims, but even in this case the coefficient is consistently negative and for the most part hovers on the borders of significance. The size of each coefficient generally varies little with changes in model specification and sample size.

We perform two robustness checks. The first is to test for thin-trading bias and the second is to check the sensitivity of our model to variations in the period over which the returns are measured.

8.1 Thin trading

For some of our country indexes thin trading may have biased our estimates of the prior standard deviation and the correlation with the US bank index. To test for the possible effect of thin trading, we repeated our principal regressions using bi-weekly returns to estimate the correlation. In the country regression, the $\overline{R}^2$ improved from .57 to .60. All the coefficients had the predicted sign and all except the coefficients on foreign assets and demand deposits remained significant at the 5% level or better.

Thin trading is equally a potential problem in our individual bank sample, where some of the banks have a large majority shareholder. As a result, the free float is small and the shares suffer from thin trading. As in the case of the country-level regressions, we repeated our analysis using bi-weekly returns. The results were little changed. For the main regression, all the coefficients were negative and all except the coefficient on foreign assets were significant at the 5% level or better. The R^2 was reduced from .38 to .34. We also assessed the potential thin-trading bias by omitting the 11 banks where there were (arbitrarily) 30 or more weekly returns of zero. The results were almost identical.

8.2 Bank Returns during the rebound

By October 2010 the US banking index had rebounded by two-thirds, though it was still nearly 60% below its 2007 high. We examined how far our principal variables could explain the variation in country banking returns during the entire period May 2007 to October 2010 that included both the slump and partial rebound. The result for the country variables is shown in Table 10.

This extension to our forecasting period places much higher demands on our data. For example, by 2010 many large banks had been nationalized or acquired, so that the

components of the Datastream index were substantially different from four years earlier. The regression now explains about one third of the cross-sectional dispersion in bank index returns. All the coefficients have the predicted sign and the time-deposit and bank-capital variables are significant at the 1% level. It is possible that the decline in the performance of the regression is due to measurement problems or it could be that once the crisis was over the variables which predict impact at the height of the crisis had become less important. We leave this as an issue for further study.

9. Conclusions

We have shown that the cross-sectional incidence of the crisis was related to:

- The pre-existing correlation of the banking sector with the US;
- The equity ratio measured relative to an unadjusted balance sheet;
- The fragility of financing as measured primarily by the proportion of assets funded by deposits;
- Banking assets as a proportion of GDP

These results were strongly significant and robust to changes in sample and model specification. In addition, there was consistent but less significant evidence that bank exposure to the crisis was related to the proportion of foreign claims.

We have shown that the significant leverage ratio was that measured relative to the unadjusted balance sheet rather than Basel risk-weighted assets, but that banks were not penalized for taking advantage of Basel rules. We have also shown that the most informative measure of exposure derived from past returns was the correlation, not the "bad weeks return" variable. We find that both stock market and structural variables should be combined to give a more complete specification of the relationships which caused differential crisis impacts. Omitting either could lead to misidentification of the causes. Our results are robust to using individual bank and country index data. The framework is linear in the characteristics of individual banks and therefore gives an aggregate measure of systemic risk which is consistent with the measures for

individual banks. However, we find that results for some other variables are sensitive to data availability and sample selection. We detect no evidence that crisis impact was related to the quality of governance, or the prior share return. There is some evidence of a connection with the prior growth in GDP, though this may well be a result of multicollinearity, in particular the association between GDP growth and the relative importance of the banking sector.

Our results are economically significant. This is most simply illustrated by the bivariate analysis in Table 10, which shows the effect of our principal explanatory variables on the returns of individual banks. The table groups the banks into quartiles based on the magnitude of each variable and shows the mean weekly bank return for each quartile. With one modest exception the average decline in the value of the first quartile banks (those with the lowest ratios) is less than half that of banks in the fourth quartile.

Our results illustrate the value of using the international impact of the crisis as a natural experiment to test the robustness of empirical results found using US data. Since recent international policy recommendations such as those in Acharya, Cooley, Richardson, and Walter (2010), Financial Economists Roundtable (2010), Kane (2010), Squam Lake Group (2010), and Scott (2010) are based either explicitly or implicitly on assumptions about empirical relationships it is important that their empirical foundations be robust to this type of analysis.

We also show the importance of deriving the empirical test of the propagation mechanism from an understanding of the specific mechanism that operated. Our results are not intended to be a model of the propagation of all international financial crises. We derived the test from knowledge that the crisis was primarily a banking-sector crisis which then spread to the remainder of the economy and that the crisis originated in the US, so its propagation should depend on linkages with the US. Future crises will not necessarily share these characteristics. However, regressions that omitted the correlation variable continued to have strong explanatory power.[19]

[19] The correct specification of market index is likely to be important. We reran our principal regression for the individual banks using the correlation with the world stock market index rather than

The implications of our results for controlling future risks depend on which features of the recent crisis are likely to operate in a similar way in future crises. Policymakers can influence four of the variables which we find to be important, -- capital ratios, how banks are financed, international transactions between banks, and to a lesser extent the size of the banking sector. They do not have direct control over the correlation with other banking sectors, but they do have influence over the international linkages between banks.

Our results show that the important balance sheet variables to regulate in order to protect a country's banking system are the amount of the banking sector that is financed with liabilities other than capital and deposits. This is potentially much simpler than the Basel approach. We do not find that the refinement and sophistication of the Basel risk-adjusted ratio helps to explain the cross-country impact of the crisis in our test.

Since it was the differential impact of the banking crisis in different countries that led to broader differences in their economic performance during the crisis, our findings could be extended to attempt to measure the impact on other economic variables, such as GDP. To do that it would be necessary to embed our model of banking sector linkages in an extended model which includes the linkage between the banking sector and aggregate economic activity.

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the US banking index. The results were very similar to the regression with no correlation measure at all.

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Figure 1: The relationship between crisis returns and prior correlation with the US banking sector

The figure shows the relationship between the normalised return during the crisis and the prior correlation with the US banking sector for the country sample. Raw crisis returns are average percentage weekly returns in the period May 2007 to March 2009. Standard deviations (percent per week) are calculated using weekly data for the calendar years 2005-2006. The standardized return is calculated as the ratio of the raw crisis return to the standard deviation. Correlation is the correlation of the bank industry index with the bank industry index for the US using weekly data from January 2005 to December 2006.

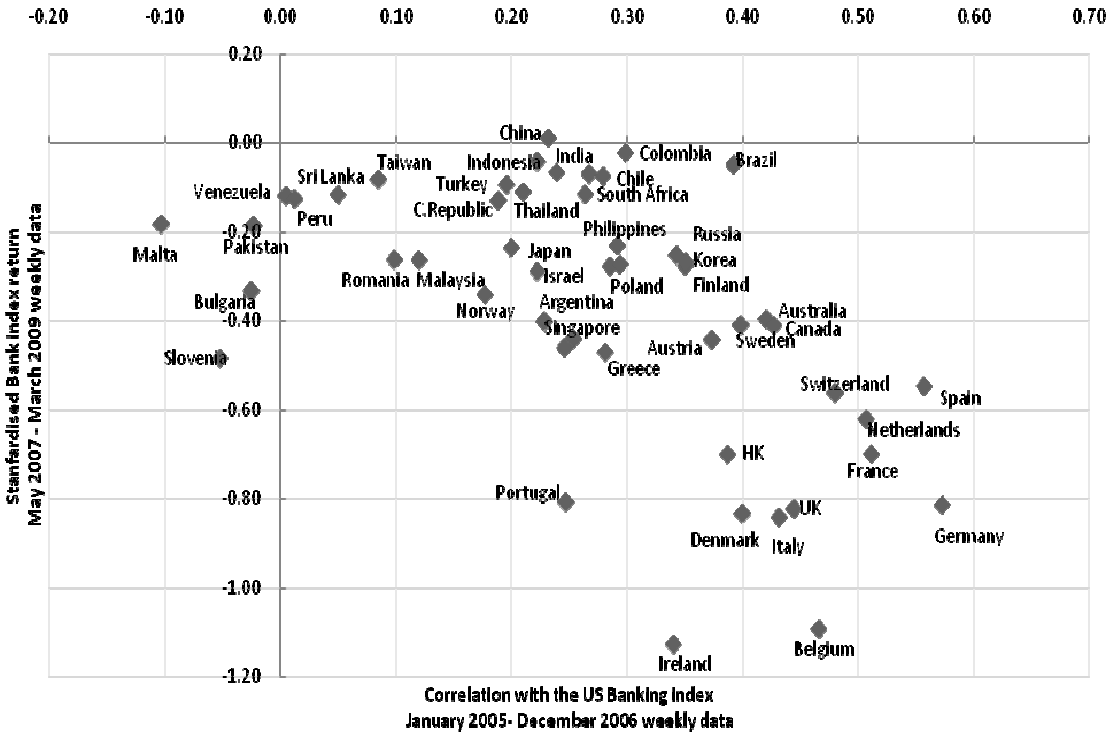

Table 1
The country sample

The table shows the country sample. Raw crisis returns are average percentage weekly returns in the period May 2007 to March 2009. Standard deviations (percent per week) are calculated using weekly data for the calendar years 2005-2006. The standardized return is calculated as the ratio of the raw crisis return to the standard deviation. All returns are for Datastream country banking sector stock indices.

Country	Mean crisis return	Std. dev. 2005-6	Standar-dized return	Country	Mean crisis return	Std.dev. 2005-6	Standar-dized return
Argentina	-1.19	2.96	-0.403	Korea	-0.91	3.41	-0.268
Australia	-0.62	1.56	-0.396	Malaysia	-0.39	1.49	-0.263
Austria	-1.39	3.16	-0.441	Malta	-0.61	3.31	-0.183
Belgium	-2.27	2.09	-1.088	Mexico	-0.27	3.52	-0.076
Brazil	-0.18	3.56	-0.050	Netherlands	-1.32	2.13	-0.620
Bulgaria	-1.92	5.77	-0.333	Norway	-0.95	2.78	-0.341
Canada	-0.59	1.45	-0.410	Pakistan	-0.99	5.33	-0.186
Chile	-0.13	1.83	-0.071	Peru	-0.49	3.90	-0.127
China	0.03	3.36	0.010	Philippines	-0.64	2.77	-0.231
Colombia	-0.11	4.73	-0.024	Poland	-0.95	3.46	-0.273
Cyprus	-1.65	3.60	-0.460	Portugal	-1.28	1.59	-0.804
Czech	-0.55	4.20	-0.130	Romania	-1.56	5.94	-0.262
Denmark	-1.65	1.97	-0.833	Russia	-1.40	5.50	-0.254
Finland	-0.86	3.11	-0.276	Singapore	-0.86	1.95	-0.440
France	-1.49	2.14	-0.697	Slovenia	-1.05	2.18	-0.483
Germany	-1.62	2.00	-0.811	S Africa	-0.46	3.99	-0.116
Greece	-1.49	3.17	-0.470	Spain	-1.01	1.84	-0.547
Hong Kong	-1.00	1.43	-0.698	Sri Lanka	-0.34	2.90	-0.117
Hungary	-1.54	5.56	-0.278	Sweden	-1.01	2.47	-0.409
India	-0.29	4.22	-0.068	Switzerland	-1.28	2.29	-0.560
Indonesia	-0.16	3.57	-0.043	Taiwan	-0.28	3.36	-0.083
Ireland	-2.60	2.31	-1.122	Thailand	-0.37	3.36	-0.111
Israel	-0.87	3.02	-0.289	Turkey	-0.46	4.87	-0.095
Italy	-1.44	1.71	-0.838	UK	-1.36	1.66	-0.821
Japan	-0.85	3.57	-0.237	Venezuela	-0.35	2.95	-0.120

Table 2
Summary statistics for the country sample

The table shows summary statistics for the country sample. All returns are for Datastream country banking sector stock indices. Raw crisis returns are average percentage weekly returns in the period May 2007 to March 2009. Standard deviations (percent per week) are calculated using weekly data for the calendar years 2005-2006. The standardized return is calculated as the ratio of the raw crisis return to the standard deviation. Correlation is the correlation of the bank industry index with the US bank industry index using weekly data from January 2005 to December 2006. Bad weeks return is the return of the country index in the 5% of weeks in 2005-2006 during which the US bank index had the worst returns. This is standardized by the standard deviation of returns. Equity ratio is (1-Book Value(Equity))/Total Assets). Capital ratio is (1 - Book Value(Equity + Sub debt))/Total Assets). Basel ratio is (1-Basel risk-weighted capital ratio). Demand deposits is (1-Demand deposits/Total assets). Time deposits is (1-Time deposits/Total assets). Total deposits is (1-Total deposits/Total assets). Bank claims/GDP is the ratio of total bank assets to GDP. Foreign claims is the ratio of total foreign claims held by banks to total bank assets. Derivatives is the ratio of value of derivative positions to total bank assets. Anti-director rights and self-dealing are Djankov et al's indices. Return in 2006 is the average weekly return in 2006. GDP growth is the rate of growth in percent over the period 2001-2006. Unless otherwise indicated all independent variables are measured at the end of 2006. Data sources are given in the Appendix.

Variable	Number of obs.	Mean	Std. Dev.	Median	Maximum	Minimum
Raw crisis return	50	-0.366	0.285	-0.278	0.010	-1.127
Standardized crisis return	50	-0.009	0.006	-0.009	0.000	-0.026
Correlation	50	0.269	0.163	0.273	0.572	-0.103
Standardized bad weeks return	50	-0.403	0.427	-0.424	0.583	-1.187
1 - Equity ratio	45	0.898	0.046	0.902	0.999	0.778
1 - Capital ratio	49	0.921	0.028	0.927	0.970	0.850
1 - Basel ratio	50	0.866	0.031	0.874	0.951	0.780
1 - Demand deposits	48	0.814	0.118	0.847	0.979	0.335
1 - Time deposits	48	0.646	0.174	0.652	0.961	0.254
1 - Total deposits	48	0.460	0.180	0.434	0.858	0.039
Bank claims/GDP	48	1.824	1.494	1.407	6.828	0.362
Foreign claims	48	0.373	0.175	0.335	0.777	0.005
Derivatives	47	0.017	0.013	0.012	0.052	0.000
Antidirector rights	47	0.347	0.113	0.350	0.500	0.000
Self-dealing	47	0.501	0.232	0.460	1.000	0.090
Return in 2006	50	0.006	0.004	0.005	0.018	-0.002
GDP growth	50	9.495	6.845	7.837	34.678	0.385

Table 3
Correlation Matrix for the country sample
The table provides the matrix of Pearson correlation coefficients for our country sample. Variables are as defined in Table 2.

		1	2	3	4	5	6	7	8	9	10
Standardized crisis return	1	1.00	0.83	-0.54	0.36	-0.41	-0.45	-0.26	-0.21	-0.42	-0.54
Raw crisis return	2	0.83	1.00	-0.31	0.27	-0.39	-0.37	-0.16	-0.14	-0.48	-0.56
Correlation	3	-0.54	-0.31	1.00	-0.55	0.36	0.40	0.22	0.35	0.11	0.34
Standardized bad weeks return	4	0.36	0.27	-0.55	1.00	-0.29	-0.17	-0.03	-0.26	0.02	-0.15
1 - Equity ratio	5	-0.41	-0.39	0.36	-0.29	1.00	0.57	0.38	0.05	0.16	0.18
1 – Capital ratio	6	-0.45	-0.37	0.40	-0.17	0.57	1.00	0.69	-0.09	0.13	0.07
1 - Basel ratio	7	-0.26	-0.16	0.22	-0.03	0.38	0.69	1.00	-0.21	0.10	-0.04
1 - Demand deposits	8	-0.21	-0.14	0.35	-0.26	0.05	-0.09	-0.21	1.00	-0.29	0.38
1 -Time deposits	9	-0.42	-0.48	0.11	0.02	0.16	0.13	0.10	-0.29	1.00	0.78
1 - Total deposits	10	-0.54	-0.56	0.34	-0.15	0.18	0.07	-0.04	0.38	0.78	1.00
Bank claims/GDP	11	-0.57	-0.44	0.22	0.01	0.49	0.21	0.07	0.37	0.28	0.51
Foreign claims	12	-0.29	-0.41	-0.15	0.20	0.07	-0.16	-0.18	0.12	0.31	0.38
Derivatives	13	-0.39	-0.24	0.42	-0.18	0.31	0.37	0.16	0.18	0.27	0.39
Anti-director rights	14	0.02	0.07	0.03	0.20	0.01	-0.11	-0.19	0.44	-0.27	0.03
Self-dealing	15	-0.07	0.11	-0.07	0.09	0.09	-0.01	0.11	0.33	-0.42	-0.19
Return in 2006	16	0.18	-0.04	-0.21	0.30	-0.06	-0.21	0.00	-0.24	0.06	-0.10
GDP growth	17	0.49	0.30	-0.41	0.22	-0.29	-0.45	-0.36	-0.33	-0.08	-0.29

Note: Sample sizes may differ among cells

Table 3 (Continued)
Correlation Matrix
The table provides the matrix of Pearson correlation coefficients for our country sample Variables are as defined in Table 2.

		11	12	13	14	15	16	17
Standardized crisis return	1	-0.57	-0.29	-0.39	-0.02	0.07	0.18	0.49
Raw crisis return	2	-0.44	-0.41	-0.24	-0.07	-0.11	-0.04	0.30
Correlation	3	0.22	-0.15	0.42	-0.03	0.07	-0.21	-0.41
Standardized bad weeks return	4	0.01	0.20	-0.18	0.20	0.09	0.30	0.22
Equity ratio	5	0.49	0.07	0.31	-0.01	-0.09	-0.06	-0.29
Capital ratio	6	0.21	-0.16	0.37	0.11	0.01	-0.21	-0.45
Basel ratio	7	0.07	-0.18	0.16	0.19	-0.11	0.00	-0.36
Demand deposits	8	0.37	0.12	0.18	-0.44	-0.33	-0.24	-0.33
Time deposits	9	0.28	0.31	0.27	0.27	0.42	0.06	-0.08
Total deposits	10	0.51	0.38	0.39	-0.03	0.19	-0.10	-0.29
Bank claims/GDP	11	1.00	0.55	0.29	-0.15	-0.30	-0.15	-0.50
Foreign claims	12	0.55	1.00	0.18	-0.02	-0.11	0.29	0.01
Derivatives	13	0.29	0.18	1.00	-0.13	-0.14	-0.20	-0.41
Anti-director rights	14	0.15	0.02	0.13	1.00	0.54	-0.26	-0.16
Self-dealing	15	0.30	0.11	0.14	0.54	1.00	-0.20	-0.12
Return in 2006	16	-0.15	0.29	-0.20	0.26	0.20	1.00	0.48
GDP Growth	17	-0.50	0.01	-0.41	0.16	0.12	0.48	1.00

Table 4
Summary statistics for the individual bank sample

The table shows summary statistics for the country sample. All returns are from Datastream. Raw crisis returns are average percentage weekly returns in the period May 2007 to March 2009. Standard deviations (percent per week) are calculated using weekly data for the calendar years 2005-2006. The standardized return is calculated as the ratio of the raw crisis return to the standard deviation. Correlation is the correlation of the bank return with the return on the US bank industry index using weekly data from January 2005 to December 2006. Bad weeks return is the return of the bank equity in the 5% of weeks in 2005-2006 during which the US bank index had the worst returns. This is standardized by the standard deviation of returns. Equity ratio is (1-Book Value of Equity))/Total Assets). Capital ratio is (1-Book Value(Equity + Sub debt + Hybrid debt))/Total Assets). Basel ratio is (1-Basel risk-weighted capital ratio). Demand deposits is (1-Demand deposits/Total assets). Time deposits is (1-Time deposits/Total assets). Total deposits is (1-Total deposits/Total assets). Bank claims/GDP is the ratio of total bank assets to GDP. Foreign claims is the ratio of total foreign claims held by banks to total bank assets. Short-term debt is the ratio of short-term debt liabilities to total bank assets. Interbank loans is the ratio of interbank assets to total bank assets. Due other banks is the ratio of interbank funding to total bank assets. Mortgages is the ratio of real estate mortgages to total bank assets. Governance is the CGQ index. Return in 2006 is the average weekly return in 2006. GDP growth is the rate of growth in percent over the period 2001-2006. Unless otherwise indicated all independent variables are measured at the end of 2006. Data sources are given in the Appendix.

Variable	Number of obs.	Mean	Std. Dev.	Median	Maximum	Minimum
Raw crisis return	381	-0.007	0.007	-0.006	0.007	-0.032
Standardized crisis return	381	-0.212	0.233	-0.156	0.271	-1.211
Correlation	381	0.160	0.136	0.163	0.580	-0.160
Standardized bad weeks return	380	-0.978	1.948	-0.982	4.131	-5.525
1 - Equity ratio	361	0.921	0.074	0.937	0.988	0.198
1 - Capital ratio	273	0.904	0.067	0.913	0.982	0.194
1 - Basel ratio	289	0.872	0.041	0.881	0.963	0.644
1 - Demand deposits	256	0.815	0.141	0.853	1.000	0.389
1 - Time deposits	264	0.628	0.225	0.630	1.000	0.146
1 - Total deposits	358	0.365	0.213	0.335	1.000	0.059
Bank claims/GDP	368	1.921	1.272	1.784	6.815	0.361
Foreign claims	368	0.312	0.174	0.271	0.777	0.005
Short-term debt	355	0.108	0.895	0.076	0.592	0.000
Interbank loans	331	0.072	0.085	0.050	0.628	0.000
Due to other banks	322	0.093	0.079	0.080	0.550	0.000
Mortgages	234	0.175	0.193	0.102	0.815	0.000
Governance (CGQ)	118	52.040	28.956	51.365	99.950	0.790
Return in 2006	382	0.004	0.006	0.004	0.031	-0.012
GDP growth	385	8.113	7.847	6.315	34.678	0.385

Table 5
Correlation Matrix for the individual bank sample
The table provides the matrix of Pearson correlation coefficients for our individual bank sample. Variables are as defined in Table 4.

		1	2	3	4	5	6	7	8	9	10
Standardized crisis return	1	1.00	0.90	-0.48	0.33	-0.19	-0.16	-0.15	-0.04	-0.35	-0.53
Raw crisis return	2	0.90	1.00	-0.38	0.30	-0.14	-0.12	-0.14	-0.08	-0.30	-0.48
Correlation	3	-0.48	-0.38	1.00	-0.59	0.18	0.12	0.10	0.09	0.22	0.31
1 – Standardized bad weeks return	4	0.33	0.30	-0.59	1.00	-0.02	-0.01	0.08	-0.17	-0.11	-0.33
1 - Equity ratio	5	-0.19	-0.14	0.18	-0.02	1.00	0.96	0.63	0.00	-0.10	-0.20
1 - Capital ratio	6	-0.16	-0.12	0.12	-0.01	0.96	1.00	0.59	0.02	-0.02	-0.17
1 - Basel ratio	7	-0.15	-0.14	0.10	0.08	0.63	0.59	1.00	-0.20	0.25	-0.04
1 - Demand deposits	8	-0.04	-0.08	0.09	-0.17	0.00	0.02	-0.20	1.00	-0.40	0.17
1 - Time deposits	9	-0.35	-0.30	0.22	-0.11	-0.10	-0.02	0.25	-0.40	1.00	0.71
1 - Total deposits	10	-0.53	-0.48	0.31	-0.33	-0.20	-0.17	-0.04	0.17	0.71	1.00
Bank claims/GDP	11	-0.26	-0.16	0.16	0.08	0.29	0.22	0.23	0.03	0.07	0.02
Foreign claims	12	-0.19	-0.18	-0.07	-0.03	-0.01	-0.03	-0.14	-0.08	-0.08	0.23
Short-term debt	13	-0.45	-0.40	0.25	0.21	0.13	0.12	0.13	0.15	0.44	0.71
Interbank loans	14	-0.14	-0.11	0.01	-0.13	-0.14	-0.17	-0.19	-0.04	-0.07	0.10
Due to other banks	15	-0.09	-0.07	-0.02	-0.07	-0.18	-0.12	-0.21	-0.03	0.00	0.15
Mortgages	16	-0.16	-0.08	0.01	-0.04	0.16	0.13	0.15	-0.14	0.17	0.32
Governance (CGQ)	17	-0.09	-0.11	0.26	-0.21	0.27	0.21	0.10	0.06	0.08	0.17
Return in 2006	18	-0.05	-0.10	-0.08	0.06	-0.11	-0.11	-0.20	-0.28	-0.05	0.14
GDP growth	19	0.25	0.20	-0.22	-0.01	-0.25	-0.30	-0.30	-0.07	-0.13	0.01

Note: Sample sizes may differ among cells

Table 5 (Continued)
Correlation Matrix

The table provides the matrix of Pearson correlation coefficients for our individual bank sample. Variables are as defined in Table 4.

		11	12	13	14	15	16	17	18	19
Standardized crisis return	1	-0.26	-0.19	-0.45	-0.14	-0.09	-0.16	-0.09	-0.05	0.25
Raw crisis return	2	-0.16	-0.18	-0.40	-0.11	-0.07	-0.08	-0.11	-0.10	0.20
Correlation	3	0.16	-0.07	0.25	0.01	-0.02	0.01	0.26	-0.08	-0.22
Standardized bad weeks return	4	0.08	-0.03	0.21	-0.13	-0.07	-0.04	-0.21	0.06	-0.01
1 - Equity ratio	5	0.29	-0.01	0.13	-0.14	-0.18	0.16	0.27	-0.11	-0.25
1 - Capital ratio	6	0.22	-0.03	0.12	-0.17	-0.12	0.13	0.21	-0.11	-0.30
1 - Basel ratio	7	0.23	-0.14	0.13	-0.19	-0.21	0.15	0.10	-0.20	-0.30
1 - Demand deposits	8	0.03	-0.08	0.15	-0.04	-0.03	-0.14	0.06	-0.28	-0.07
1 - Time deposits	9	0.07	-0.08	0.44	-0.07	0.00	0.17	0.08	-0.05	-0.13
1 - Total deposits	10	0.02	0.23	0.71	0.10	0.15	0.32	0.17	0.14	0.01
Bank claims/GDP	11	1.00	0.36	0.14	0.11	0.10	0.45	0.09	-0.20	-0.51
Foreign claims	12	0.36	1.00	0.21	0.43	0.35	0.39	0.07	0.44	0.26
Short-term debt	13	0.14	0.21	1.00	0.19	0.21	0.14	0.09	0.12	-0.05
Interbank loans	14	0.11	0.43	0.19	1.00	0.79	0.03	0.02	0.25	-0.02
Due other banks	15	0.10	0.35	0.21	0.79	1.00	-0.08	0.07	0.30	0.06
Mortgages	16	0.45	0.39	0.14	0.03	-0.08	1.00	0.11	0.06	-0.15
Governance	17	0.09	0.07	0.09	0.02	0.07	0.11	1.00	0.03	0.10
Return in 2006	18	-0.20	0.44	0.12	0.25	0.30	0.06	0.03	1.00	0.43
GDP growth	19	-0.51	0.26	-0.05	-0.02	0.06	-0.15	0.10	0.43	1.00

Table 6
Comparison of different leverage measures

This table presents regressions of the standardized crisis return using three different leverage measures. Panel A is for the country bank indices, Panel B for individual banks, and Panel C for individual banks using a common sample for all regressions. Equity ratio is the ratio of the book value of equity to bank assets. Capital ratio is the ratio of the book value of (equity + subordinated debt) to bank assets. Basel ratio is the Basel II risk-weighted capital ratio. Basel-Equity is the difference between the Basel and equity ratios. All other variables are as defined in the Appendix. Standardized crisis return is the average weekly return over the period May 2007 to March 2009 divided by the weekly standard deviation in 2005-2006. The independent variables are measured at the end of 2006. Estimation is by OLS. The table also reports the adjusted R-square and number of observations. T-statistics are given in parentheses.

Panel 6A: Country regressions

Dependent variable: *Standardized crisis return*

	(1)	(2)	(3)	(4)
Constant	-.11*	2.48**	1.04	2.40*
	(-1.69)	(2.11)	(1.07)	(1.99)
Correlation	-.94***	-.74***	-.88***	-0.74***
	(-4.41)	(-3.30)	(-4.05)	(-3.23)
1 - Capital ratio		-2.87**		-2.75**
		(-2.20)		(-2.04)
1 - Basel ratio			-1.35	
			(-1.19)	
Basel-Capital				-.60
Ratio				(-.40)
Adjusted R^2	.27	.33	.28	.32
N	50	49	48	49

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Panel 6B: Individual bank regressions

Dependent variable: *Standardized crisis return*

	(1)	(2)	(3)	(4)	(5)
Constant	-.08***	.22	.25	0.44	.87***
	(-5.00)	(1.65)	(1.45)	(1.65)	(2.81)
Correlation	-.82***	-.80***	-.85***	-.82***	-.77***
	(-10.68)	(-9.88)	(-9.16)	(-8.59)	(-7.97)
1 - Equity ratio		-.33**			-1.04***
		(-2.24)			(-3.01)
1 - Capital ratio			-.38**		
			(-1.97)		
1 - Basel ratio				-0.60**	
				(-1.97)	
Basel-Equity					-.04
ratio					(-.10)
Adjusted R^2	.23	.24	.25	.22	.23
N	381	361	273	289	287

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 6 (continued)

Panel 6C: Individual bank regressions (common sample)

Dependent variable: *Standardized crisis return*

	(1)	(2)	(3)	(4)
Constant	-.09***	1.98***	.61	.47
	(-3.67)	(4.04)	(1.37)	(1.42)
Correlation	-.84***	-.70***	-.79***	-.81***
	(-7.82)	(-7.78)	(-6.99)	(-7.52)
1 - Equity ratio		-2.25***		
		(-7.03)		
1 - Capital ratio			-.79	
			(-1.58)	
1 - Basel ratio				-.65*
				(-1.71)
Adjusted R^2	.21	.27	.22	.22
N	223	223	223	223

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 7
Country-level determinants of crisis returns

This table presents regressions of the standardized crisis return for the country bank indices on country-level variables, as defined in the Appendix. The standardized return is the average weekly return over the period May 2007 to March 2009 divided by the weekly standard deviation in 2005-2006. All the independent variables are measured at the end of 2006, with the exception of the correlation with the US index, which is estimated from weekly data for 2005-2006, and the rate of GDP growth, which is measured over the period 2001-2006. Estimation is by OLS. The table also reports the adjusted R-square and number of observations. T-statistics are given in parentheses.

Dependent variable: *Standardized crisis return*

	(1)	(2)	(3)	(4)	(5)
Constant	2.48**	2.99**	4.32***	3.20**	1.83
	(2.11)	(2.54)	(3.76)	(2.56)	(1.32)
Correlation coefficient	-.74***	-.58***		-.57**	-.63**
	(-3.30)	(-2.69)		(-2.55)	(-2.32)
1 - Capital ratio	-2.87**	-2.83**	-4.04***	-3.12**	-1.58
	(-2.20)	(-2.43)	(-3.51)	(-2.54)	(-1.16)
1 - Demand deposits		-.18	-.57*	-.15	-.09
		(-.57)	(-1.87)	(-.44)	(-.26)
1 - Time deposits		-.39*	-.54**	-.37*	-.46**
		(-2.00)	(-2.66)	(-1.78)	(-2.05)
Bank claims/GDP		-.05*	-.06*	-.06**	-.06
		(-1.94)	(-1.95)	(-2.09)	(-1.55)
Foreign claims		-.27	-.14	-.29	-.31
		(-1.29)	(-.61)	(-1.30)	(-1.28)
Derivatives				1.37	
				(.52)	
Return in 2006					.10
					(.01)
GDP growth					.00
					(.65)
Anti-director rights					.16
					(.47)
Self-dealing					-.16
					(-.93)
Adjusted R^2	.33	.57	.51	.57	.60
N	49	47	47	46	45

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 8
Firm-level determinants of crisis returns

This table presents regressions of the standardized crisis return for individual banks on firm-level variables, as defined in Table 4. The standardized return is the average weekly return over the period May 2007 to March 2009 divided by the weekly standard deviation in 2005-2006. All the independent variables are measured at the end of 2006, with the exception of the correlation with the US index, which is estimated from weekly data for 2005-2006, and the rate of GDP growth, which is measured over the period 2001-2006. Estimation is by OLS. The table also reports the adjusted R-square and number of observations. T-statistics are given in parentheses.

Dependent variable: *Standardized crisis return*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-.08***	.80***	.77***	.94***	.24*	.99***	.77***	1.53*
	(-5.00)	(3.46)	(5.34)	(6.31)	(1.87)	(4.32)	(4.28)	(1.91)
Correlation	-.82***	-.57***	-.49***		-.66***	-.48***	-.45***	-.21
	(-10.68)	(-6.06)	(-6.26)		(-8.44)	(-5.35)	(-4.72)	(-1.24)
1 - Equity ratio		-.45**	-.70***	-.92***	-.20	-.97***	-.79***	-1.56*
		(-2.19)	(-4.49)	(-5.75)	(-1.40)	(-4.00)	(-4.12)	(-1.79)
1 - Demand deposits		-.27***						
		(-2.68)						
1 - Time deposits		-.34***						
		(-5.02)						
1 - Total deposits			-.49***	-.62***		-.49***	-.56***	-.64***
			(-9.92)	(-12.78)		(-8.57)	(-8.50)	(-6.45)
Bank claims/GDP		-.03**	-.02***	-.04***	-.02**	-.01	.01	-.03
		(-2.51)	(-2.69)	(-3.83)	(-2.16)	(-.86)	(.35)	(-1.38)
Foreign claims		-.09	-.12*	-.06	-.18***	-.20**	-.17*	-.15
		(-.90)	(-1.95)	(-.95)	(-2.77)	(-2.13)	(-1.83)	(-1.07)
Short-term debt					-.67***			
					(-6.50)			
Interbank loans						.08		
						(.33)		
Due other banks						-.05		
						(-.21)		
Mortgages							.15**	
							(2.10)	
Return in 2006						-2.73	-2.32	
						(-1.13)	(-.99)	
GDP growth						.51**	.59**	
						(2.49)	(2.57)	
Governance								.00
								(1.23)
Adjusted R^2	.23	.38	.46	.40	.39	.49	.49	.55
N	381	237	343	343	342	275	223	115
Comparable adjusted R^2 for regression (3)	--	.43	--	.46	.46	.49	.47	.55

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 9 Regression of the standardized return during the crisis period on alternative measures of comovement during the crisis

Panel A shows regressions of the standardized crisis return for the country bank indices on country-level variables, as defined in the Appendix. Panel B shows similar regressions for standardized returns for individual banks. In columns 1 and 3 the prior comovement is measured by the Pearson correlation coefficient between bank returns and the US index, which is estimated from weekly data for 2005-2006. In columns 2 and 4 it is measured by the average standardized return in the 5% of weeks where the US bank stock index gave the worst returns in the period prior to the crisis (the "bad weeks return"). Column 5 includes both measures of comovement in the same regression. The other independent variables are measured at the end of 2006. Estimation is by OLS. The table also reports the adjusted R-square and number of observations. T-statistics are given in parentheses.

Panel 9A: Country regressions

Dependent variable: *Standardized crisis return*					
	(1)	(2)	(3)	(4)	(5)
Constant	-.11*	-.27***	2.99**	3.67***	2.92**
	(-1.69)	(-5.13)	(2.54)	(3.31)	(2.52)
Correlation	-.94***		-.58***		-.42*
coefficient	(-4.41)		(-2.69)		(-1.79)
Standardized bad		.24**		.19**	.12
weeks return		(2.65)		(2.53)	(1.59)
1 - Capital ratio			-2.83*	-3.52***	-2.81**
			(-2.43)	(-3.19)	(-2.46)
1 - Demand deposits			-.18	-.29	-.10
			(-.57)	(-.93)	(-.31)
1 - Time deposits			-.39**	-.46**	-.38*
			(-2.00)	(-2.41)	(-1.99)
Bank claims/GDP			-.05*	-.06**	-.06**
			(-1.94)	(-2.24)	(-2.13)
Foreign claims			-.27	-.22	-.29
			(-1.29)	(-1.04)	(-1.39)
Adjusted R^2	.27	.11	.57	.57	.59
N	50	50	47	47	47

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Panel 9B: Individual bank regressions

Dependent variable: *Standardized crisis return*					
	(1)	(2)	(3)	(4)	(5)
Constant	-.08***	-.17***	.77***	.88***	.77***
	(5.00)	(-13.76)	(5.34)	(5.96)	(5.33)
Correlation	-.82***		-.49***		-.47***
coefficient	(-10.68)		(-6.26)		(-4.88)
Standardized bad		.04***		.02***	.00
weeks return		(6.76)		(3.78)	(.38)
1 - Equity ratio			-.70***	-.85***	-.70***
			(-4.49)	(-5.40)	(-4.48)
1 - Total deposits			-.49***	-.55***	-.49***
			(-9.92)	(-10.83)	(-9.73)
Bank claims/GDP			-.02***	-.04***	-.03***
			(-2.69)	(-4.13)	(-2.70)*
Foreign claims			-.12*	-.06	-.12*
			(-1.95)	(-.89)	(-1.88)
Adjusted R^2	.23	.11	.46	.42	.46
N	381	379	343	342	342

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 10
Country-level determinants of crisis returns including the recovery

This table presents regressions of the standardized crisis return including recovery for the country bank indices on country-level variables, as defined in Table 2. The standardized return including recovery is the average weekly return over the period May 2007 to October 2010 divided by the weekly standard deviation in 2005-2006. All the independent variables are measured at the end of 2006, with the exception of the correlation with the US index, which is estimated from weekly data for 2005-2006. Estimation is by OLS. The table also reports the adjusted R-square and number of observations. T-statistics are given in parentheses.

Dependent variable: *Standardized crisis return including recovery*

	(1)
Constant	1.60**
	(2.25)
Correlation	-.01
	(-.05)
Equity ratio	-1.46**
	(-2.08)
Demand deposits	-.03
	(-.13)
Time deposits	-.34***
	(-2.86)
Bank claims/GDP	-.00
	(-.27)
Foreign claims	-.04
	(-.29)
Adjusted R^2	.27
N	47

*, **, and ***, significant at the 10, 5, and 1 percent level respectively.

Table 11

Economic significance of key measures

The table shows mean weekly returns 2007-2009 for individual banks grouped into quartiles by the magnitude of their prior correlation with the US market and by key balance-sheet ratios. Correlation with the US is the correlation of the bank return with the return on the bank industry index for the US using weekly data from January 2005 to December 2006.

	Correlation with US	(1 - equity capital)/assets	(1 – total deposits)/assets	Short-term debt/assets
Quartile 1	-.44%	-.55%	-.36%	-.47%
Quartile 2	-.62	-.63	-.56	-.49
Quartile 3	-.64	-.62	-.66	-75
Quartile 4	-1.14	-1.02	-1.21	-1.12

Appendix

Variable definitions and data sources

The bank balance sheet data in IMF *International Financial Statistics* refer to Other Depository Corporations (defined as resident financial corporations (except the central bank) and quasi-corporations that are mainly engaged in financial intermediation and that issue liabilities included in the national definition of broad money).

Panel A: Country level variables

Variable	Description	Source of data
Raw crisis return	Average percentage weekly return in the period May 2007 to March 2009	Datastream country banking sector stock indices
Standardized crisis return	Ratio of the raw crisis return to standard deviation. Standard deviations (percent per week) calculated using weekly data for calendar years 2005-2006	Datastream country banking sector stock indices
Correlation	Correlation of bank industry with bank industry index for the US using weekly data from January 2005 to December 2006	Datastream country banking sector stock indices
Bad weeks return	Standardized return of the country index in the 5% of weeks in 2005-2006 during which the US bank index had the worst returns.	Datastream country banking sector stock indices
Capital ratio	1-Book Value(Equity + Sub debt)/Total Assets	IMF *Global Financial Stability Report*
Basel ratio	1-Basel risk-weighted capital ratio	IMF *Global Financial Stability Report*
Demand deposits	1-Demand deposits/Total assets	IMF *International Financial Statistics*, country tables
Time deposits	1-Time deposits/Total assets	IMF *International Financial Statistics*, country tables
Total deposits	1-Total deposits/Total assets	IMF *International Financial Statistics*, country tables
Bank claims/GDP	Ratio of total bank assets to GDP	IMF *International Financial Statistics*, country tables
Foreign claims	Ratio of total foreign claims held by banks to total bank assets	IMF *International Financial Statistics*, country tables
Derivatives	Ratio of value of derivative positions to total bank assets	BIS *Consolidated Banking Statistics,* Table 9C
Anti-director rights	Djankov et al's index of self-dealing	Djankov et al (2005), Table XII
Self-dealing	Djankov et al's revised index of anti-directors' rights	Djankov et al (2005), Table III
Return in 2006	Average weekly share return in 2006	Datastream country banking sector stock indices
GDP growth	GDP growth in local currency 2001-2006	IMF *International Financial Statistics*

Panel B: Individual bank variables

Variable	Description	Source of data
Raw crisis return	As country variable measured for individual bank	Datastream
Standardized crisis return	As country variable measured for individual bank	Datastream
Correlation	As country variable measured for individual bank	Datastream
Bad weeks return	As country variable measured for individual bank	Datastream
Equity ratio	As country variable measured for individual bank	Datastream
Capital ratio	As country variable measured for individual bank	Osiris
Basel ratio	As country variable measured for individual bank	Datastream, *The Banker*, company annual reports, and Osiris
Demand deposits	As country variable measured for individual bank	Datastream
Time deposits	As country variable measured for individual bank	Datastream
Total deposits	As country variable measured for individual bank	Datastream
Bank claims/GDP	As country variable	IMF *International Financial Statistics*, country tables
Foreign claims	As country variable	IMF *International Financial Statistics*, country tables
Short-term debt	Short-Term Debt/Total Assets for individual bank	Datastream
Interbank loans	Interbank Loans/Total Assets for individual bank	Datastream
Due other banks	Interbank Liabilities/Total Assets for individual bank	Osiris
Mortgages	Mortgage Loans/Total Assets for individual bank	Datastream
Governance	CGQ governance index for individual bank	Bloomberg
Return in 2006	As country variable measured for individual bank	Datastream
GDP growth	As country variable	IMF *International Financial Statistics*