Bank stock performance and bank regulation around the globe*

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Abstract

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Keywords: Bank stock performance, bank regulation, capital, implicit bailout guarantee.
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Abstract

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"Banks are somehow making gigatons of money despite onerous new regulations and capital requirements. Why, it's almost like they're not telling the truth when they warn, repeatedly, that these new rules will destroy their profits and the economy."
The Huffington Post, 07/16/2013

1 Introduction

Following the collapse of Lehman Brothers, excessive risk-taking caused by a "search for yield" (see Rajan, 2005) and the tendency of deposit-taking banks to earn more non-interest income through activities like, e.g., investment banking have been criticized for contributing to the severity of the recent financial crisis (see, e.g., Laeven and Levine, 2009; Brunnermeier et al., 2012).[1] Responding to these claims, many commentators have called for stricter bank regulation, bank supervision, and, in particular, for higher capital requirements (see, e.g., Kashyap et al., 2008; Acharya et al., 2014b; Calomiris and Herring, 2011; Hart and Zingales, 2011).[2] Perhaps most prominently, Ben Bernake argued in 2010 that "stronger regulation and supervision [...] would have been a more effective and surgical approach to constraining the housing bubble than a general increase in interest rates".[3] On the other side, banks have repeatedly and insistently contended that tougher capital requirements will ultimately decrease their profitability, thus in turn decreasing effective capital buffers (see Matutes and Vives, 2000). One the one hand, higher capital ratios entail a higher cost of capital for banks which in turn could be reflected in the stock performance of banks. On the other hand, banks which hold more capital should be able to grant more loans and increase their profits (conversely, of course, banks that are low on capital regularly decrease their lending to fulfill capital requirements). In summary, the expected effect of capital on bank performance is not clear ex ante.

In the aftermath of the financial crisis, several studies in the financial economics literature have

[1] The adverse side-effects of bank risk-taking on financial stability have also been addressed earlier by, e.g., Bernanke (1983), Keeley (1990) and Calomiris and Mason (1997).

[2] The diverse causes of and lessons from the recent financial crisis are also discussed by Brunnermeier (2009) and Gorton (2010).

[3] Joseph Stiglitz took the same line and argued that the lax regulation of U.S. banks prior to the Subprime crisis was to be blamed for contributing significantly to the build-up of systemic risk, see Stiglitz (2008).

tried to examine these claims more objectively and in more detail (see, e.g., Aiyar et al., 2012; Jiménez et al., 2014). Our paper contributes to the research on the relation between the different facets of bank regulation and supervision on the one hand and bank performance on the other hand using a large international dataset. We investigate in this paper how bank regulation and supervision can explain differences in the performance of banks around the world. In particular, we address the question whether higher capital, tougher supervision, incentives and capabilities for the private sector to monitor banks, and higher capital requirements have led to shrinking bank profits and losses in shareholder value.

The theoretical and empirical literature suggests several distinct channels through which the performance of banks might be related to bank regulation. With bank capital requirements at its core, the regulation of financial institutions aims at installing additional buffers against potential losses and at limiting the *risk-taking* of banks by reducing the incentives of shareholders and managers to take on more risks than socially optimal (see Kim and Santomero, 1994). At the same time, requirements to hold more bank capital might also prove counterproductive as banks might react to more stringent capital requirements by pursuing a riskier investment strategy (see Koehn and Santomero, 1980; Buser et al., 1981). Furthermore, Laeven and Levine (2009) show that the relation between bank risk-taking and bank regulation depends critically on each bank's ownership structure. Turning to the second facet of bank regulation, policy-makers could also attempt to limit bank risk-taking by introducing activity restrictions. For example, banks could be prohibited to engage in activities that are not related to deposit-taking and lending and that are deemed to be too risky by regulators (see Boyd et al., 1998). The empirical evidence on the effects of activity restrictions, however, is mixed with findings differing significantly over the past decades. For instance, Cornett et al. (2002) show in their study that Section 20 activities undertaken by banks after 1987 resulted in increased industry-adjusted operating cash flow return on assets with bank risk remaining unchanged. The argument that banks profit from less restrictions on their activities is also taken up by Barth et al. (2004) who argue that activity restrictions reduce competition, limit economies of scope, and may ultimately result in a loss in bank efficiency.

Further key aspects of a regulatory regime include entry requirements, the supervisory policy, and governance (see, e.g., Ellis et al., 2014).

As economic theory and empirical work provide conflicting results, our paper contributes significantly to this rich literature in banking. We address the need for a comprehensive analysis of the relation between bank regulation and bank performance and study the determinants of the buy-and-hold return for a large sample of international banks from 1999 to 2012. We concentrate on the banks' regulatory and supervisory environment and estimate panel regressions of the stock performance of banking firms on variables on a country's regulatory and supervisory system taken from the database of Barth et al. (2013a) while controlling for several idiosyncractic factors (e.g., bank size, Tier 1 capital, non-interest income, interconnectedness, and leverage).

We empirically test various hypotheses from the financial intermediation literature on the effects of bank capital, bank regulation, and supervision using a sample of 11,803 bank-year observations from 1,659 publicly listed international banks from 74 countries. Over our complete sample period, we find evidence in support of the view that higher bank capital decreases a bank's stock performance. However, we find strong evidence that higher Tier 1 capital ratios significantly increase banks' stock performance during times of a financial crisis. Moreover, we find evidence that investors value bank stocks based on their capitalization relative to their peer-groups rather than their absolute capitalization. Additionally, we observe that private monitoring, guidelines on asset diversification, and entry requirements into the banking sector are negatively related to the performance of banking firms. In contrast, we show that with the ability of supervisory authorities to discipline banks, their annual buy-and-hold returns increase. Also, better corporate governance yields better stock performance. Analyzing the effect of implicit government bailout guarantees, we find that banks that are more likely to receive government support realize an inferior stock performance. In particular, we find that both a bank's size and a bank's interconnectedness with the global financial sector are negatively related to its stock performance. Interestingly, while we do find that higher Tier 1 capital decreases performance, we find no convincing evidence that the extent to which banks generate non-interest income significantly influences a bank's performance.

Moreover, our analysis of a large sample of international banks yields insights to the influence of financial crises on the drivers of a banking firm's performance. For example, we find that while leverage is not a significant driver of bank performance over the whole sample, it plays a significant role during crisis periods.

The empirical work in this study is related to several recent papers on the factors that influence banks' performance. Our paper is most closely related to the recent study by Berger and Bouwman (2013) which is concerned with the effects of bank capital on both, survival rate and market share. The authors find that capital helps small banks to increase the probability of survival and their market share during crises and normal periods while medium and large banks only have higher survival rates and market shares during crises periods. However, their study is restricted to U.S. banks and focuses on survival rates and market shares. Our analysis on the other hand focuses on the effects of regulation on banks' stock performance for a large panel of international banks. Fahlenbrach et al. (2012) analyze the bank performance of 347 U.S. banks using stock return data for 1998 and 2006. The authors find that banks that performed poorly during the 1998 crisis also performed poorly during the financial crisis of 2006. As they further show, banking firms that relied more on short-term funding and had more leverage are more likely to perform poorly during both crises. However, the authors are only concerned with U.S. banks during 1998 and 2006 while our study exploits the variation in national bank regulation and supervision over the period from 1999 to 2012 to explore the determinants of banks' stock performance. Also, our study is related to Beltratti and Stulz (2012) who study the buy-and-hold stock returns of a sample of large international banks over the crisis period from July 2007 to December 2008. The authors find evidence that banks that rely on short-term financing had poor performance during the crisis. They show that better-performing banks had less leverage and lower returns immediately before the crisis. However, the authors restrict their study to large banks with total assets larger than $50bn and only consider the crisis period. In contrast, our paper studies both crises and non-crises periods for a large comprehensive panel of international banks. Hence, we also include smaller banks in our analyses. Demirgüç-Kunt et al. (2013) analyze the effect of different types of capital

ratios on bank stock returns and show that a higher capital position leads to stronger performance during the latest crisis. The authors find that this effect is particularly pronounced for large banks and stronger when higher quality forms of capital are considered. Finally, Fahlenbrach and Stulz (2011) study the connection between bank performance and CEO incentives before the crisis using a sample of 95 U.S. banks from 2006.

The paper proceeds as follows. In Section 2, we describe our data and discuss the expected influence of various idiosyncratic and regulatory variables on financial stability. In Section 3, we document our main findings on the drivers of systemic risk. Section 4 concludes.

2 Data

This section describes the construction of our sample and presents the choice of our main independent variables as well as descriptive statistics of our data.

2.1 Sample construction

Our initial sample consists of all 22,560 firms included in the active and dead-firm "banks" and "financial services" lists in *Thomson Reuters Financial Datastream*. To rule out the possibility that some commercial and investment banks are erroneously listed in the "financial services" instead of the "banks" category in *Datastream*, we build our initial sample using both lists. We then follow Fahlenbrach and Stulz (2011) and select all companies with SIC codes between 6000 and 6300 (i.e., we eliminate insurers, real estate operators, holding and investment offices as well as other non-bank companies in the financial service industry from our sample). Furthermore, we require a bank to have available accounting data in *Thomson Worldscope* to be included in our sample. Next, we omit a stock from our sample if it is identified in *Datastream* as a non-primary quote, if it is a secondary listing or if it is an American Depositary Receipt (ADR). Additionally, we exclude from our sample all OTC traded stocks and preference shares. Our final sample consists of 3,813 international banks for which we have at least one year of accounting data available. For

our sample banks, we need to have daily stock price data available in *Datastream*. Consequently, we remove another 45 banks from our sample, due to missing stock price data. In the following, we apply the filtering process proposed by Hou et al. (2011) and Karolyi et al. (2012).

As noted first by Ince and Porter (2006), stock prices in *Datastream* suffer from several minor data errors. To correct for the confounding effect of these errors, we perform several screening procedures on the daily return of the banks' stock prices. First, we require a bank to have a minimum share price of $1 at the end of a month for the bank-month to be included in our sample. We treat as missing any return above 300 percent that is reversed within one month. In case the number of zero return days exceeds 80 percent of a given month, we follow Hou et al. (2011) and exclude the entire bank-month. Furthermore, we define non-trading days as those days on which 90 percent or more of the listed stocks have zero returns. All non-trading days are then excluded from our sample. Finally, as we are interested in the influence of regulatory capital on banks' stock performance, we exclude all banks with missing data on Tier 1 capital from our sample. In case we have no remaining bank-year for an individual bank, we exclude the bank from our sample. In total, we end up with a sample of 1,659 international banks from 74 countries for the time period 1999 to 2012. Table I shows the distribution of the 11,803 bank-years across each country.

[Place Table I about here]

2.2 Bank characteristics

Our analysis is concerned with the factors influencing stock performances of banks around the globe. Consequently, we use a bank's annual buy-and-hold stock return as dependent variable in our panel regressions.[4] In the following, we describe our independent variables. To begin with, we control for several idiosyncratic bank characteristics that are well-known to influence bank stock prices. Furthermore, for each nation in our sample, we collect a set of country-specific variables that proxy for a bank's regulatory environment and other macroeconomic factors.

[4] Note that the dependent variable is adjusted for cash dividends and stock splits.

First, we include information on a bank's regulatory capital as the main independent variable in our regressions. We use the variable Tier 1 capital which is defined as the ratio of Tier 1 capital to total risk weighted assets.[5] Tier 1 capital is the component of a bank's capital that has the highest quality and is therefore capable to absorb losses without affecting the day-to-day business of the bank and may thus improve overall bank performance. As already pointed out, regulators use capital requirements to limit the risk-taking of banks by having shareholders participate in the losses. For example, Cihák et al. (2012) find that crisis countries used lower actual capital ratios. Conversely, higher Tier 1 capital could induce less profitability of a bank, since it is the most costly form of capital that a bank can raise. Also, bank managers argue that more bank capital might lead banks to a riskier investment strategy. As a result, we do not have an undisputed expectation of the influence on banks' stock performance. By including Tier 1 capital in our regression analyses, we (indirectly) check for possible positive and negative effects of stricter capital requirements on a bank's stock performance.

As additional measures for a bank's capital, we include several other measures. First, we include the tangible common equity ratio defined as tangible equity divided by tangible assets. Moreover, we include the Tier 1 leverage ratio defined as Tier 1 capital divided by total assets and the Tier 2 leverage ratio defined as Tier 2 capital divided by total assets. In our main analysis, we focus on the effect of Tier 1 capital on bank performance as, e.g., Anginer and Demirgüç-Kunt (2014) show that Tier 2 capital has a destabilizing effect as it is less able to absorb losses.

Next, we control for differences in the size of a bank by taking the natural logarithm of a bank's total assets at the end of the fiscal year. The literature reveals ambiguous findings on the interplay of the size of a bank and its individual stock performance. Gandhi and Lustig (2015) find that, in contrast to non-financial firms, size is a priced factor in the cross-section of bank stock return, i.e., investors expect a discount when buying stocks of large banks as these are more systemically

[5] Das and Sy (2012) study the usefulness of risk weighted assets and argue that they do not predict market measures of risk. Additionally, Mariathasan and Merrouche (2013) find that risk weighted assets predict bank failure only when the risk of a crisis is very low. See, e.g., Gauthier et al. (2012); Hanson et al. (2011) for a more detailed discussion of the potential disadvantages associated with the use of risk weighted assets. Further studies concerning risk weighted assets include, e.g., Acharya et al. (2014a).

relevant and, due to implicit bailout guarantees, less risky than stocks of banks that are smaller. Irrespective of the banks' leverage, larger commercial bank stocks have significantly lower risk-adjusted returns than small- and medium-sized bank stocks. Underlining this finding, Aebi et al. (2012) show that bank size was negatively related to the stock performance of banks during the recent financial crisis. On the other hand, increased bank size might result in a higher market power and as a consequence increase stock performance. As a result, we have no clear prediction for the sign of the coefficient on bank size in our panel regressions.

In our analysis, we use several measures to control for different types of bank risk. To proxy for a bank's systematic risk and thus a bank stock's sensitivity to a given benchmark market index, we employ in our regressions the bank's beta. We calculate a bank's beta as the covariance between the returns on the bank's stock and the returns of the MSCI World index divided by the variance of the bank's stock returns. A higher beta denotes a positive correlation of the benchmark index and the stock's movements and should therefore reflect a good performance during good economic times and worse stock performance in financial crises. We also include the z-score measure proposed by Altman (1968) in our analysis to control for bank's risk.

To additionally control for the systemic risk of a bank, we use two measures for the exposure and contribution of an individual bank to systemic risk. To be precise, we employ three prominent measures of systemic risk from the literature: the Marginal Expected Shortfall (MES), SRISK, and a bank's ΔCoVaR. In our analysis, the MES of an individual bank's stock is calculated as the negative average stock return on the days the MSCI World Index experienced its 5% worst outcomes (see Acharya et al., 2010). In addition, the SRISK is the capital that a firm is expected to need conditional on a crisis, i.e., $SRISK = \mathrm{E}_{i,t}[CapitalShortfall_i \mid Crisis]$ proposed by Acharya et al. (2012). The authors argue that the measure merges size, leverage, interconnectedness and the comovement of the firm's assets with the total financial sector in a single measure. Adrian and Brunnermeier (2015) define the unconditional ΔCoVaR as the difference of the Value-at-risk (VaR) of a financial sector index conditional on the distress (in the 5% quantile) of a particular bank and the VaR of the sector index conditional on the median state of the bank.

Thus, the ΔCoVaR measure captures an individual bank's contribution to systemic risk. We would expect a bank's exposure to crises to be negatively associated with the bank's stock performance. At the same time, however, we also expect a bank's contribution to systemic risk to be negatively correlated with its stock performance as higher systemic importance increases the probability of a bailout (and thus reduces the risk premia in stock returns). Note that these three measures, even though they are associated with systemic risk, capture different aspects of systemic risk.

As a way of measuring firm value, we employ a bank's market-to-book ratio calculated as the market value of common equity divided by the book value of common equity. Fahlenbrach et al. (2012) for instance find evidence for a positive relation of a bank's buy-and-hold returns and the market-to-book ratio. Therefore, we would expect a positive impact of market-to-book ratio on a bank's stock performance. Next, we include in our analysis the variable return on assets (ROA) as a standard measure of a firm's profitability. Naturally, we would expect a positive relation between a bank's profitability and its stock performance. Finally, to control for differences in the banks' stocks, we employ the Amihud measure of an individual stock's illiquidity adjusted following the procedure proposed by Karolyi et al. (2012) as a further control variable (Liquidity).[6]

We include several variables to control for differences in the business model of a bank. First, we define the variable Loans as the ratio of a bank's total loans to total assets. When loans are higher, banks' regulatory capital is expected to be less impacted by increases in credit spreads, which could reduce the values of securities (see, e.g., Beltratti and Stulz, 2012). Additionally, we define the variable Loan loss provisions as the natural logarithm of a bank's expenses set aside as allowances for uncollectable or troubled loans divided by total loans. Uhde and Heimeshoff (2009) show that this proxy for a bank's quality of its loan portfolio is negatively related to the bank's performance.

Another bank-specific variable we consider in our main regressions is Deposits, which is calculated as total deposits divided by total liabilities. A higher value for Deposits indicates a less

[6] Note that, in contrast to the original Amihud measure, the adjusted Amihud measure proposed by Karolyi et al. (2012) is increasing in the stock's liquidity.

fragile funding of the bank, which could serve as a stabilizing factor for firm performance.[7] On the other hand, a bank that is mainly funded by deposits might be less active in non-traditional banking activities, which could limit possible streams of income. To investigate this hypothesis, we also include the ratio of non-interest income and total interest income in our main regressions. In a related study, Brunnermeier et al. (2012) empirically show that banks that generate higher non-interest income have a higher contribution to systemic risk than traditional banks. Next, we consider a bank's funding in our analyses by including the variable Debt maturity. The latter is the ratio of total long term debt (due in more than one year) to total debt. Fahlenbrach et al. (2012) find evidence that the poor performance of banks during the recent financial crisis was partly due to a stronger reliance on short-term funding. In our analyses, we expect the coefficient of debt maturity to enter our regressions with a positive sign (see also Adrian and Shin, 2010). Fahlenbrach et al. (2012) find empirical evidence that the leverage of a bank has a negative influence on a bank's stock return during the crisis period. Therefore, we add a proxy for a bank's leverage to our set of independent variables. In particular, we follow Acharya et al. (2010) and calculate the variable leverage as book value of assets minus book value of equity plus market value of equity, divided by market value of equity and expect it to enter our regressions with a negative coefficient.

2.3 Regulatory and macroeconomic environment

The focus of our empirical study lies on an analysis of the relation between the regulation of domestic banking sectors and an individual bank's stock performance. In particular, we investigate whether differences in stock performance can be explained by differences in the bank's country-specific regulatory environment. We obtain data on the regulatory environments from the database of Barth et al. (2013a) that is based on four surveys performed between 1999 to 2012 on the regulation and supervision of banks in 180 countries. Unfortunately, not every variable is available for every year of our full sample period from 1999 to 2012. Nevertheless, we update missing

[7] A low value for Deposits indicates high overnight money market funding and hence, fragile funding. A a consequence, Basel III integrates a ratio for stable funding.

data points with the most recent data since adjustments of the regulatory and supervisory environment are relatively rare and result from a relatively slow political process (see Barth et al., 2004; Anginer et al., 2014b). First, we employ a measure of the degree to which official supervisory authorities are allowed to actively prevent or correct instances of corporate wrongdoing by banks. The index of the official supervisory power ranges from zero to 14, where higher values denote greater power of the authorities. One could argue that more powerful regulators are able to prevent excessive risk-taking by banks before and during crises. At the same time, however, more powerful supervisors could also limit banks in their range of investment opportunities. Therefore, we have no expectation regarding the sign of the coefficient in our regressions.

As our next step, we take advantage of a variable that proxies for differences across countries in the way firms are restricted in their engagement in banking activities or are ostracized from banking markets. For example, Ongena et al. (2013) find that the lower the barriers to entry and the tighter the restrictions on bank activities in domestic markets are, the more they are associated with lower banking standards in domestic and foreign markets. Additionally, empirical investigations show that the risk-taking of banks is sensitive to domestic regulation and restrictions on (foreign) market entry and bank activities (see, e.g., Barth et al., 2004; Laeven and Levine, 2009; Buch and DeLong, 2008). We start with the variable Activity Restrictions taken from the database of Barth et al. (2013a). The index of the overall restrictions on banking activities measures to which extent a bank is allowed to engage in securities, insurance or real estate activities. The variable ranges from three to twelve, twelve denoting the greatest restrictiveness. Ellis et al. (2014) identify key planks of any well-defined regulatory regime, one of which are entry requirements. As a consequence, we also control for differences in entry requirements in a country by employing an index of the legal requirements that need to be fulfilled before a banking license is issued. The entry requirements index ranges from zero to eight, where eight denotes the greatest stringency. Next, we consider the private monitoring index and diversification index from the database of Barth et al. (2013a). The former describes the incentives and capabilities that are provided by regulatory and supervisory authorities to encourage the private monitoring of banks. Cihák et al. (2012) find ev-

idence that the private sector in crisis countries had weaker incentives to monitor banking firms' risks. Additionally, Caprio Jr. et al. (2014) find that higher levels of private monitoring negatively impinge the probability of a crisis. Thus, we expect that a small score of the index (which ranges from 0 to 12) is associated with weaker stock performance. The diversification index proxies for a country's guidelines for asset diversification and loan giving abroad. Higher guidelines on diversification lead to a more balanced investment portfolio. However, diversification does not necessarily increase value for shareholders. Also, one might argue that more diversification leads to the lack of a core business. This line of argumentation is also supported by the rich literature on mergers (see, e.g., DeYoung et al., 2009). Additionally, Mercieca et al. (2007) find no evidence in support of beneficial effects of direct diversification on bank performance. Finally, we control for the stringency of capital regulation on the banking system. The capital regulatory index captures whether capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined. It ranges from zero to ten, where ten indicates the highest degree of stringency of capital regulation. Barth et al. (2013a) show that capital requirements have been adjusted to greater stringency over the last decade. Unfortunately, the capital regulatory index is not available for all countries in our sample for the whole sample period.

To control for the overall economic conditions and possible business cycle fluctuations in each country, we obtain data from the World Bank's World Development Indicator (WDI) database on the annual growth rate of the real gross domestic product (in %) and the inflation rate. We suspect that a bank's opportunities for investments are correlated with different business cycles. These opportunities might arise in times of economic growth and, consequently, have a positive effect on the overall performance of a bank. For example, Demirgüç-Kunt and Detragiache (1998) find evidence that both a low GDP growth and a high inflation rate increase the likelihood of systemic banking sector problems which could worsen a bank's stock performance due to spillover effects.

Finally, to control for the competition in a given country's banking sector, we employ the Herfindahl-Hirschman Index computed as the sum of the squared market shares of a country's

domestic and foreign banks. Anginer et al. (2014a) find a positive relation between bank competition and systemic stability as greater competition encourages banks to take on more diversified risks, hence making the banking system as a whole less fragile to shocks. Consequently, we expect an ambiguous effect of competition on banks' stock performances. On the one hand, competition should decrease the profit margins of banks, leading to less pronounced buy-and-hold returns. However, on the other hand, following the argumentation of Anginer et al. (2014a), competition protects investors from an otherwise higher exposure to systemic risk, thus leading to a better bank stock performance.

2.4 Additional variables controlling for possible government bailouts

It could be argued that a bank's interconnectedness rather than its size drives its systemic risk and thus the probability of a potential bailout by the government in a scenario of market stress.[8] Consequently, a bank's stock performance could also be affected by the bank's degree of interconnectedness with the financial sector as investors price implicit bailout guarantees for too-interconnected-to-fail banks. To control for this, we employ our variable Interconnectedness which is defined as the number of in- and outgoing granger causalities of the banks' stock returns as proposed by Billio et al. (2012). As before for bank size, we expect an ambiguous influence of interconnectedness on the banks' stock performance.

Next, Bertray et al. (2013) show that bank shareholders differentiate between a bank's absolute size and its systemic size. Thus, while we check for size and systemic relevance of a bank, it is crucial to include an indicator of systemic relevance relative to the local economic environment in our regressions. Therefore, we define the variable Systemic size as the ratio of a bank's total liabilities to national GDP. As Bertray et al. (2013) show that growing to a size that is systemic is not in the interest of a bank's shareholders, we expect a negative influence of systemic size on banks' stock performance.

[8] For the importance of the interconnectedness of financial institutions for global financial stability, see, e.g., Black et al. (2012), Arnold et al. (2012) and Billio et al. (2012).

Another key plank of a well-defined regulatory regime is governance (see Ellis et al., 2014). Hence, in our further analyses, we additionally include an index that measures the quality of corporate governance in a given country. As Santos (2001) notes, capital standards may be an important instrument to implement the optimal governance of banks because they can be used to define the threshold for the transfer of control from shareholders to regulators. Ideally, a good governance environment should be the basis of a smooth bank business operation and should therefore be reflected in the annual stock performance. Ellis et al. (2014) argue that this aspect of a regulatory regime is often neglected. We calculate two versions of a corporate governance index, employing the Worldwide Governance Indicators provided by the World Bank. The simpler version is calculated as the arithmetic mean of the six constituent variables. Additionally, we consolidate the six factors using a principal component analysis to account for possible commonalities in the variables (see also Barth et al., 2013b). Aebi et al. (2012) study bank performance during the financial crisis 2007/2008 and find evidence that better corporate governance is related to better performance.

2.5 Bank stock performance

In the first step of our empirical study, we analyze several descriptive statistics of our sample banks' stock performance, the bank-specific explanatory variables as well as our controls regarding the banks' regulatory environment. Figure 1 plots the time evolution of the mean, 10%-, and 90%-quantile of the sample banks' buy-and-hold returns across our full sample.

[Place Figure 1 about here.]

Average stock performance peaked in the year 2003 during which banks even in the 10% quantile of stock performance experienced a stock performance of above 10%. As expected, overall stock performance dropped in the years of the financial crisis with its minimum in the year 2008. Here, the top-performing bank stocks achieved an annual return of 8.4% on average. A similar result holds for the year 2011. Interestingly, the 90%-percentile of the annual buy-and-hold returns had its peak in 2009, directly after the crisis years, whereas the bottom percentiles remain relatively

low. These first findings show that bank stocks performed quite differently both before, during, and after the financial crisis, thus underlining the importance of our main research question. In Figure 2, we further investigate this differential stock performance of banks in our sample by comparing the stock performance of banks in six selected countries.

[Place Figure 2 about here.]

Note that while the U.S. banking sector's average stock performance began to rise from 1999 to 2003, the 90%-quantile of the stock performance of Japanese banks declined, and the opposite trend can be observed for the period from 2003 to 2005. This is likely linked to the patterns in GDP of these two countries. Moreover, for all of the six countries, we find a sudden and steep drop in the average bank's stock performance in 2008 with only slightly positive buy-and-hold returns in the 90%-quantile in the U.S. and Japan. After the crisis, the bank stocks recovered to a certain amount with some banks in the United Kingdom and Germany having annual buy-and-hold returns of above 50%. In contrast, banks in India and Malaysia had extremely high stock returns both before and after 2008, with banks in the top 90%-percentile of annual buy-and-hold returns being well above 100%.

Next, we comment on several descriptive statistics for our dependent and independent variables presented in Table II that are later used in our panel regressions.

[Place Table II about here.]

From Table II, we can see that all our variables exhibit significant variation, both across time and across banks. First, we can see that banks in our sample differ considerably with respect to their respective business model and funding strategy. In particular, the variables Loans and Non-interest income as well as Leverage and Debt Maturity show significant variation in our panel data set. On average, the variable Loans decreases steadily across all banks in our sample (from 65% to 61%) while Non-interest income increases significantly. However, Non-interest income shows a significant spike in 2009 and 2010. Also, the debt maturity of banks increases, on average,

across all banks in our sample, as does leverage. However, the average leverage of banks exhibits a significant drop between 2005 and 2007.

Even more interestingly, the amount of regulatory capital also shows significant variation, both across time and banks. For example, several banks from the United States feature high Tier 1 capital ratios, whereas 143 banks from different countries show regulatory capital ratios below 1% over our entire sample period. However, from 1999 to 2012, we observe a significant upward trend in average Tier 1 capital ratios.[9]

As far as the Interconnectedness between banks is concerned, we find that the ten most interconnected banks from our sample are all from the United States. We find average values of our measure of a bank's interconnectedness to have increased from 1999 to 2012. This is in line with Engle et al. (2014), who argue that the degree of interconnectedness between banks has increased as a result of rising globalization. Note however, that the we observe the highest degree of interconnectedness in 2000. Finally, we also find significant time variation in the variables on the banks' regulatory environment.

In Table III, we present the Pearson correlations between the independent variables used in our regression analyses.

[Place Table III about here.]

As can be seen from the estimates in Table III, most variables are not significantly correlated with each other. Not surprisingly, we observe very high correlation between the Tier 1 capital ratio and the Tier 1 leverage ratio (.995) as well as the tangible equity ratio (.816). Similarly, the correlation between the Tier 1 leverage ratio and the tangible equity ratio is very high, while the Tier 2 leverage ratio does not exhibit very high correlations with the other capital measures. Moreover, several of our regulatory variables exhibit stronger correlations with the macroeconomic controls. Consequently, these variables are not used jointly in the regressions presented in the next section to minimize the risk of multicollinearity biasing our findings.

[9] These findings are also underlined by Cohen and Scatigna (2014) who confirm that capital ratios have increased steadily since the financial crisis and analyze different channels of adjustment.

In the upcoming sections, we try to explain the found differences in the stock performance of banks by estimating panel regressions in which we employ both our country-specific variables on bank regulation and the idiosyncratic bank characteristics.

3 The influence of regulation on stock performance

In this section, we present the results of our analyses on the determinants of banks' stock performance. We begin by analyzing whether stricter regulation, e.g., in the form of higher regulatory capital requirements leads to a decrease in stock performance. Next, we investigate whether bank stock performance is significantly affected by regulators via implicit bailout guarantees. Finally, we take a closer look at the determinants of banks' stock performance during times of financial crises.

3.1 Does stricter bank regulation lead to worse stock performance?

For the analysis of the determinants of a bank's stock performance, we estimate panel regressions with time-fixed and bank-fixed effects. The standard errors are clustered at the bank level.[10] More formally, we will estimate regressions of the following form:

$$\begin{aligned}\text{Buy-and-hold return}_{i,t} = \beta_1 \cdot \text{Bank capital}_{i,t-1} + \beta_{\text{Bank controls}} \cdot X_{i,t-1} \\ + \beta_{\text{Regulatory}} \cdot Y_{i,t-1} + \beta_{\text{Country controls}} \cdot Z_{i,t-1} + u_i + v_t + \epsilon_{i,t}\end{aligned}$$

We run several regressions to identify the determinants of a bank's stock performance. In all our regressions, we use the banks' yearly log buy-and-hold returns as our dependent variable. First, we regress a banks's stock performance on a set of bank-specific variables. We control for any unobserved variables with time-fixed and bank-fixed effects. We do not include country-fixed effects due to multicollinearity. In further regressions, we include additional control variables

[10] As the residuals are not correlated across both time and banks, this procedure is valid. For further comments see, e.g., Thompson (2011) or Beck and De Jonghe (2013).

on the banks' regulatory and macroeconomic environment to determine which country-specific factors drive the stock performance of banks. We lag all our explanatory variables by one year to mitigate the problem that our dependent variables and some of our independent variables could be determined simultaneously.

In additional analyses, we exploit the multilevel structure of our data. To be specific, we aim to distinguish where the effects we observe arise, at the country level and at the individual firm level. This allows us to understand the country- and firm-level determinants while at the same time controlling for nesting effects and endogeneity. We follow Martin et al. (2007) and Li et al. (2011) and employ a hierarchical nested form of the general linear model. This not only allows us to dismantle the country- and the firm-level effects of the explanatory variables, but also considers that banks within a country are more similar to each other and weights the precision of the bank-level data according to different sample sizes across countries. We follow Li et al. (2011) and perform some data manipulation before running the HLM estimations. More precisely, we center all independent variables by its overall mean, estimate country-level mean values, and finally calculate within-country firm-level deviations by subtracting the country-level means from the centered variables. Then, we include both the firm-level deviations as well as the country-level means in our models.

[Place Table IV about here]

In our baseline regressions in Table IV, we use the banks' yearly log buy-and-hold return as the dependent variable. The results of our baseline panel regressions show that a bank's Tier 1 capital ratio is negatively related to the bank's stock performance. This result is statistically significant at the 1% level. At least for our full sample, however, this result is only marginally economically significant as a one standard deviation increase in Tier 1 capital yields a decrease in a bank's annual stock return of just 0.2% (0.003×0.6787311). This finding contributes to the on-going discussion of the regulation of banks' equity capital. On the one hand, Tier 1 capital represents a bank's capital of the highest quality. Consequently, public opinion and regulators repeatedly call for tougher capital regulations. In a recent paper, Bostandzic et al. (2014) find that higher

Tier 1 capital decreases both the exposure and contribution of individual banks to systemic risk. On the other hand, bank managers argue that higher capital requirements negatively affect bank performance. Blum (1999) shows that increasing capital requirements could also lead to increased risk-taking. Our result supports the conjecture that stock investors view higher capital ratios as being detrimental to a bank's ability to generate profits. However, this result is economically of marginal magnitude. We attribute this finding to the fact that while investors might consider high capital ratios undesirable in normal times, investors could, at the same time, favor stocks or highly capitalized banks during a financial crisis. Berger and Bouwman (2013) find empirical results in support of this line of argumentation as they show that capital helps banks to increase the probability of survival and their market share during crises periods. On average, however, we show for our full sample that high ratios of regulatory capital are seen critically by stock investors. We can confirm the results with our hierarchical model. The estimates provide evidence that the result is driven by firm deviations and does not arise at the country level.

To further analyze the relation between bank capital and bank performance, we perform some additional analyses. First, we estimate our baseline model using different capital measures. We include the Tier 1 leverage ratio and the Tier 2 leverage ratio in alternative models and estimate these using the HLM approach (Table IV, Models (2) and (3)). Model (2) is in line with our findings so far. A higher Tier 1 capital ratio is associated with lower bank stock performance. Note that in the context of the leverage ratio, this results seems to arise at the country level which could be driven by the different implementation levels of capital requirements and the calculation of risk-weighted assets in the countries in our sample.[11] Le Leslé and Avramova (2012) report evidence of differences in the calculation of risk-weighted assets across (and within) regulatory regimes. Moreover, the authors observe decreasing risk-weights over time most prominently among European banks, who were granted more flexibility than those under US-regulation (see also Mariathasan and Merrouche, 2013). These documented differences in risk-weighted assets

[11] Note that this result may also be a consequence of the smaller sample as we do not have data on the additional capital measures available for our complete sample. Additional evidence for that reasoning is also brought forward by the results in Table V, Model (3).

are not only the result of bank-specific characteristics such as the calculation of RWA, the banks' business model or risk profile, but also arise due to different supervisory practices. The latter did arise primarily due to divergences in the implementation of Basel II by domestic supervisors (Le Leslé and Avramova, 2012). In contrast to the Tier 1 capital ratio, or the Tier 1 leverage ratio, we observe a positive relation between the Tier 2 leverage ratio and the bank stock performance. Again, this result seems to arise at the country level. We attribute this finding to the fact that Tier 2 capital is less costly than Tier 1 capital. Next, we employ the Tangible equity ratio to capture a bank's capital. The results shown Column (4) of Table IV confirm our finding that higher capital is related to lower bank stock performance.

In our next step, we split our sample into halves based on the banks' Tier 1 capital ratio in a given bank-year. The top half consists of all banks that feature Tier 1 capital ratios above the mean while the bottom half consists of all banks whose Tier 1 capital ratio is below the average. Our conjecture is that stock market investors favor banks that are not undercapitalized but divest from banks that hold too much capital relative to their competitors within a regulatory regime. We then run separate panel regressions for each subsample using time-fixed and bank-fixed effects as well as clustered robust standard errors (at the bank level) to test this conjecture. The results of our additional panel regressions are shown in Table IV, Columns (5) to (6).

We observe that Tier 1 capital ratios are negatively associated with annual buy-and-hold returns for banks that feature above-average regulatory capital ratios. At the same time, this result disappears for banks that demonstrate below-average capital ratios. Consequently, our results indicate that our finding of a negative relation between Tier 1 capital and banks' stock performance is mainly driven by banks with high Tier 1 capital ratios. At the same time, we find no evidence that below-average capital ratios increase bank performance. Another interesting result from the regressions based on subsamples is that a bank's stock performance is not related to its MES or Beta if the bank is highly capitalized (Model (5)). In this scenario, the default probability decreases and, consequently, different types of risk are no longer relevant for investors. However, as capital ratios decrease, both, MES and Beta, are negatively associated with banks' stock performance (Model

(6)).

Next, we try to shed more light on the question whether the capitalization of banks relative to their competitors is priced by stock market investors. Irrespective of the overall capital requirements that affect all banks in a given country, investors could favor the stocks of those banks that hold more (or less) capital than the average competitor. To this end, we introduce the new variable *Capital Requirement Deviation* which we define in the following way. First, we calculate the mean of the variable Tier 1 capital for all banks with the same realization of the Capital Regulatory Index, or, more exactly, for all banks that face a similar capital stringency. In a second step, we calculate the differences between the individual banks' Tier 1 capital and the respective mean values for each bank. Hence, our variable Capital Requirement Deviation captures the extent to which a bank's capital deviates from the average of peers in the same CRI group, i.e., the average value of regulatory capital of banks within the same group of capital stringency.[12] We then repeat our baseline regression and additionally include the new variable Capital Requirement Deviation (Model (7)). We find a statistically significant (5% level) negative influence of the Capital Requirement Deviation on a bank's stock performance. At the same time, the previously observed influence of the variable Tier 1 capital disappears. The results on our other idiosyncratic bank characteristics remain qualitatively unchanged. Our results are thus strongly supportive of the notion that investors indeed value bank stocks based on their relative rather than their absolute capitalization. Banks that had more Tier 1 capital relative to their peers working under a similar capital stringency had significantly lower annual buy-and-hold returns. This result supports the argumentation of Calem and Rob (1999). The authors argue that the relationship between bank capital and risk is U-shaped.

[Place Table V about here.]

Turning to the relation between different risk measures and a banks stock performance, we find that a bank's exposure to systemic risk is associated with a lower stock performance (Table

[12] Note that the Pearson correlation between the variables Tier 1 capital and the Capital Requirement Deviation is 38%.

IV, Model (1)). The result is also economically significant as a one standard deviation increase in our proxy for a bank's systemic risk exposure (MES) yields a decrease of the annual stock return of -3.7% (0.171×0.2172). This result is line with our intuition as a bank with a higher systemic risk exposure is hit harder in the event of a system-wide crash. The hierarchical analysis provides evidence that this result emerges at the country level. We can confirm the results with the SRISK measure (Table V, Model (2)). In Model (1) of Table V, we substitute the MES by the bank's estimate of ΔCoVaR as a measure of its contribution to systemic fragility. In contrast to our previous finding, a bank's contribution to systemic risk does not have any statistically significant impact on the institution's stock performance in our panel regressions. However, our hierarchical model shows a statistically significant coefficient at the country level. Finally, we include the z-score proposed by Altman (1968) as an alternative measure for (bankruptcy) risk (Table V, Model (3)). As expected, we observe a significantly positive coefficient (higher values of the z-score indicate less bankruptcy risk).

Taking a look at our control variables, our analyses provide additional evidence that supports the notion that size is negatively correlated with bank performance. As banking firms increase in size, so does their systemic importance and the implicit probability of a government bailout in case of default. These findings are in line with the results of Gandhi and Lustig (2015) who argue that size is a priced factor in the cross-section of bank stock returns due to implicit bailout guarantees. Furthermore, our findings are in support of Demirgüç-Kunt and Huizinga (2013) who argue that for large banks downsizing or splitting up might increase their value. However, we cannot confirm these finding using the hierarchical model. In additional, unreported regressions, we exclude the largest and the smallest banks from our sample, respectively, which does not change our main findings on the relation between bank capital bank bank stock performance.

Additional results also show that high-valued stocks yield a lower buy-and-hold return than stocks with low valuation. This result is statistically significant at the 1% level, economically significant, and large, as a one standard deviation increase yields a decrease in performance of -56.3%. Further along, we control for differences in the banks' lagged performance and find evidence for

reversal in the banks' returns. To be specific, we find that a bank's performance is negatively influenced by its lagged performance. Similar findings are reported by Beltratti and Stulz (2012). Not surprisingly, banks that earn a high return on their assets also have a better annual stock performance. This effect is of large economic importance. A one standard deviation increase in return on assets implies an increase in the annual log buy-and-hold return of 36%. We also control for differences in the banks' stock liquidity. Underlining the findings of Han and Lesmond (2011), we find that an individual stock's illiquidity is negatively associated with its performance. Turning to a bank's business model, we find that by taking deposits, banks increase their annual buy-and-hold stock return in our sample period (see also Beltratti and Stulz, 2012) while giving loans decreases the annual stock return. We trace this back to the fact that loans are associated with a small profit margin and thus, banks with a large loan portfolio are realizing a decreased performance. Of major importance is the quality of the loan portfolio measured by loan loss provisions. As the quality of the loan portfolio decreases, so does the annual buy-and-hold return of the banking firm. The economic importance of this influence is large. Furthermore, banks with more deposits have a less fragile funding structure than, for example, banks that invest in overnight money market funds. As a result, deposits are associated with better stock performances. In a more broad approach, we control for the business model of a bank using industry fixed effects. This approach allows us to distinguish between, e.g. universal banks or bank holding companies. The results presented in the Appendix (Table II, Model (1)) show that these differences do not influence our main results. Estimating (unreported) subsample regressions for the different industry groups we observe that our main results are especially driven by Commercial Banks, Investment Companies, Securities Brokerage Firms, and Miscellaneous Financial Firms. On the other hand, holding commercial banks exhibit a slightly positive coefficient and for Savings & Loan Holding Companies we do not observe a coefficient different from zero. Similarly, we control for different accounting standards employing an accounting fixed effect (Table II, Model (2)). The results show that this additional control does not influence our main results. Surprisingly, neither a firm's degree of leverage nor its non-interest income has significant influence on the buy-and-hold returns in our large comprehen-

sive panel. Also the amount of short-term funding measured by debt maturity has no significant influence on the performance. We can confirm these findings with the hierarchical approach.

[Place Table VI about here.]

Turning to the influence of the regulatory and supervisory environment on a bank's annual buy-and-hold return, we add several variables that describe the banks' regulatory and supervisory environment to our models (Table VI). We start by adding one regulatory variable at a time while in Models (6) and (7), we include more than one regulatory variable at the same time. As mentioned earlier, some of our regulatory variables are highly correlated both with each other and with our macroeconomic control variables. For example, the index of the Official Supervisory Power and the Diversification Index are negatively correlated with a correlation of -54%. As a consequence, we can only include one of these two variables in our regressions at a time. Additionally, we observe a strong negative correlation between variables that proxy for the supervisory environment of a country and country-specific controls such as GDP growth, inflation, and the Herfindahl-Hirschman index. To minimize multicollinearity problems, we do not use highly correlated variables simultaneously in a regression. In additional unreported regressions, we include the country control variables instead of our regulatory variables. The results on the idiosyncratic bank characteristics remain qualitatively unchanged.[13]

We find evidence that higher incentives for a better private monitoring are associated with a lower stock performance of banks (Table VI, Model (1)). We argue that increased capabilities for the private sector to monitor banks are linked to additional efforts for the banking firms. Consequently, these additional cost lead to a worse stock performance. Another possible explanation for this result is that with more incentives for the private sector to monitor banks, banks are more cautious with their investment strategies and consequently earn lower profits. Next, higher values of the Diversification index that captures the guidelines for asset diversification are also associated with a lower stock performance (Table VI, Model (2)). Our results show that more asset diversifi-

[13] We do not report the additional results as the focus of our paper is on the influence of the regulatory and supervisory environment on banking performance.

cation leads to a poorer stock performance of banks in our full sample. We argue that with stricter guidelines for asset diversification, banking firms lack a core business. At the same time, banks have better diversified asset portfolios. Consequently, our findings support both lines of argumentation as with stricter guidelines for diversification, the stock performance of banks decreases. In contrast, higher Activity Restrictions are associated with better stock performance. We argue that banks that are not allowed to engage in non-traditional banking activities focus on their core business and as a result earn higher profits in this area. Moreover, we find that with more supervisory power, the stock performance of banks increases. With increasing power of supervisors, banking problems are recognized earlier and corrected more promptly. Finally, we find evidence that additional legal entry requirements to obtain a banking license lead to a lower stock performance of banks in a given country. Ongena et al. (2013) argue that lower barriers to entry are associated with lower bank lending standards abroad. Hence, investors could be more cautious which in turn leads to smaller annual buy-and-hold returns. In the final two regressions of Table VI (Models (6) and (7)), we include several variables that proxy for our sample countries' regulatory environments simultaneously and confirm our findings from the previous regressions. In additional unreported results, we include a dummy variable that captures the existence of a deposit insurance scheme in a given country. However, we find no convincing evidence of any influence of the variable on the annual stock performance of banks.

Also, we study the influence of capital requirements captured by the Capital Regulatory Index introduced by Barth et al. (2013a) on a bank's stock performance. However, we do not find any convincing evidence that the annual buy-and-hold return is related to the stringency of capital requirements. Hence, we conclude that investors rather base their investment decisions on idiosyncratic bank characteristics than on country-level characteristics. Additionally, the Capital Regulatory Index captures capital stringency, but is not directly based on a required minimum capital ratio. In contrast, the variable Tier 1 capital captures a bank's actual amount of regulatory capital within a single (realized) ratio.

3.2 Implicit bailout guarantees and bank stock performance

In additional analyses, we are interested in the relation between a bank's stock performance and possible implicit bailout guarantees. The results from our main regressions in Table IV provide some evidence on the relation between a bank's size on its stock performance. More precisely, we find that with increasing size measured by the logarithm of a bank's total assets, the annual buy-and-hold return of banking firms decreases. Also, we find evidence that an increased exposure to systemic risk measured by a bank's MES or SRISK is associated with a declining stock performance. To further analyze the relation between a bank's stock performance and implicit bailout guarantees, we now turn to several additional regressions in which we focus on indicators of systemic risk and possible bailout guarantees. Again, to detect the determinants of a bank's stock performance, we estimate panel regressions with time-fixed and bank-fixed effects using standard errors clustered at the bank level. The results of our additional panel regressions are shown in Tables VII and VIII.

[Place Table VII about here]

In our models (1) through (5) in Table VII, we run regressions that are very similar to our baseline regressions. In contrast to the regressions in the previous section, however, we also include our proxy for an individual bank's interconnectedness with the financial sector in the regressions. Just like with bank size, we expect more interconnected banks to be more systemically important (see also Chan-Lau, 2010) and thus provide weaker stock performance. Our results provide strong evidence that more interconnected banks realize a smaller annual buy-and-hold stock return than other banks. The results are statistically (at the 5% level) and economically significant. Again, we find support for the notion that investors view more interconnected banks to have an increased probability of receiving a government bailout (see also Bertray et al., 2013).

Next, we analyze in more detail the question whether different indicators of systemic risk also drive banks' stock performance. One could argue that the sheer size of a banking firm as it is captured by the logarithm of a bank's total assets is not the best indicator to measure whether the

institution is too-big-to-fail. For example, Bertray et al. (2013) propose to use the systemic size of an institution rather than its total assets as a proxy for systemic relevance. The authors use the ratio of liabilities over GDP to identify systemically important banks. Table VIII shows the results of our analyses in which we employ systemic size as an alternative proxy for the systemic importance of a bank.

[Place Table VIII about here]

In models (1) through (8), we replace the variable Total assets by the variable Systemic size. Interestingly, we cannot find any statistical evidence that the Systemic size of a banking firm has influence on the stock performance of the institution. Our other results remain qualitatively unchanged. This result underlines the findings by Bertray et al. (2013) who argue that investors distinguish between banks' absolute size and systemic size. However, the variable systemic size also captures the costs of a bailout for the government. Hence, the variable systemic size additionally measures the degree to which a country is affected by a possible bailout of a banking firm in case of financial distress. As a consequence, the systemic size of a bank captures two contra-directional features. Accordingly, the variable does not significantly influence the annual buy-and-hold return of a bank

In models (3) and (4), we additionally include a variable that measures the quality of the corporate governance of a given country. The variables are calculated using the Worldwide Governance Indicators provided by the World Bank. The variable Governance is an arithmetic mean of the six indicators on Corporate Governance provided by the World bank. However, a better index of Corporate Governance might consist of some underlying commonality found in the six indicators. Consequently, we perform a principal component analysis to extract the common factor of the individual indicators and include the variable Governance (pca) in an additional regression. Regardless of the calculation method of the index we include to measure the quality of the corporate governance in a country, we find evidence for the notion that better corporate governance yields better stock performance. Consequently, we find evidence that supports the hypothesis that a bet-

ter corporate governance environment allows banks to run their business more soundly and solidly, which in turn results in higher annual buy-and-hold returns.

3.3 Bank's stock performance during crises times

Our analyses so far have revealed strong correlations between bank capital and bank stock performance. As mentioned above, however, these effects could differ significantly during times of financial crisis. As a result, we now turn to an in-depth analysis of the factors that drive a bank's performance during turbulent times. Complementing the main regressions discussed in the previous subsections, we also investigate the robustness of our results during crisis- and non-crisis times, respectively. To identify periods of financial crisis, we rely on the database on systemic banking crises provided by Laeven and Valencia (2012). We then perform several regressions in which we employ the same set of variables as in Table IV but additionally include a dummy variable that takes on the value one if a country experienced a financial crisis in a given year, and zero otherwise. Moreover, we include several interaction terms with our crisis dummy to test the differential effect of several explanatory variables on bank performance during and outside of crises. Again, we estimate panel regressions of the annual buy-and-hold return with clustered robust standard errors (at the bank level) as well as time-fixed and bank-fixed effects. The results are presented in Table IX.

[Place Table IX about here.]

The estimated models in Table IX provide evidence on the effect of turbulent times on a bank's performance. The results show that during crisis periods, a higher Tier 1 capital ratio significantly increased a bank's stock performance (Model (1)). The result is economically significant and large. A one standard deviation increase in Tier 1 capital yields an increase in the dependent variable of 84%. Thus, while a higher Tier 1 capital yields only a marginal decrease in stock performance during calm times, during turbulent times, a higher Tier 1 capital ratio induces a significantly better stock performance. This result supports the argumentation that Tier 1 capital

shields banks from adverse effects spilling over from the financial sector to individual institutions. Also, this result is in line with the argumentation of Berger and Bouwman (2013) that banks with more capital also have a higher probability of survival, a possibly higher market share, and thus a better stock performance. At the same time, this result is consistent with Beltratti and Stulz (2012) and Demirgüç-Kunt et al. (2013) who show the positive influence of Tier 1 capital during the financial crisis. The result is confirmed in Model (2), where we replace the risk-adjusted capital ratio with the leverage ratio. Similar to Model (1), we observe a negative relation during non-crisis periods, but a strong positive relation during crisis periods. In Model (3), we study the relation between the Tier 2 leverage ratio and bank stock performance during crisis times. We observe a negative relation between the Tier 2 leverage ratio and the bank stock performance during crisis times. In line with the argumentation brought forward by Anginer and Demirgüç-Kunt (2014), we attribute this finding to the fact that Tier 2 capital has a destabilizing effect as it is less able to absorb losses. Thus, Tier 2 capital is associated with higher performance during calm periods, but not during crisis periods. Overall and in line with previous findings in the literature (Beltratti and Stulz, 2012; Demirgüç-Kunt et al., 2013), we find that capital is relevant for bank performance during crisis times, and higher quality forms of capital are more relevant.

Further along, we find that while leverage does not have a significant influence on a bank's stock performance over the whole sample period, during crisis times, more highly levered banks realize a significantly lower return than other banks. The economic significance of this result is large (66.5% decrease in our dependent variable for a one standard deviation increase in leverage). This finding is also underlined by Fahlenbrach et al. (2012) who confirm that the leverage of a bank had a negative influence on the bank's stock performance during the financial crisis. One possible explanation for this finding could be that banks with higher leverage also had a more fragile funding and were thus more vulnerable during the recent crisis. However, we find no statistical evidence that a bank's debt maturity is significantly related to a bank's annual buy-and-hold return.

While we find some evidence for our full sample that banks with more loans in their portfolio realize smaller annual buy-and-hold stock returns, this effect is even more pronounced during crises

times. We find strong empirical evidence (significant at the 1% level) that banks with more loans have significantly lower stock returns during a crisis. The result is also economically significant and in line with the results of Cihák et al. (2012) who find that for the global financial crisis, countries had less stringent regulations on the treatment of bad loans. Also, the finding underlines the argumentation of Engle et al. (2014) who argue that leverage is more serious when the economy is weak.

Finally, we analyze the relation between the interconnectedness of a bank with other banking firms during times of a financial crisis. We show that during crisis times, a bank's stock performance decreases significantly as its interconnectedness increases. Again, this result is significantly more pronounced during crisis times than for the complete sample period. In line with our intuition, this evidence highlights the importance of interconnectedness among financial institutions during crises. As interbank linkages are to some degree unknown, for highly interconnected firms the risk of contagion increases during crises periods. To be specific, only direct linkages to other banks are known, while information about linkages of higher degrees are rare. As a result, with increasing interconnectedness a bank's stock performance decreases.

3.4 Additional regressions

In additional analyses, we study the differences between countries included in our sample. We classify the countries of origin of our sample banks into different categories. To be specific, we build the following subsamples: G7-countries, G7-countries excluding the U.S., the U.S., and non G7-countries. We perform additional (unreported) panel regressions in these subcategories focusing on bank capital, and observe inconclusive results. For example, we find that the influence of risk-adjusted Tier 1 capital ratio on stock performance is mainly driven by US banks. We observe negative coefficients for the other subsamples, but not statistically significant different from zero. In contrast, the results involving the Tier 1 leverage ratio are mainly driven by G7 excluding the U.S. banks, and the tangible equity ratio result arises from looking at non-G7 banks. We argue that the different capital measures reflect the different implementation statuses of the reg-

ulatory requirements in the countries in our sample as noted by (Le Leslé and Avramova, 2012; Mariathasan and Merrouche, 2013). For example, banks with the same Tier 1 leverage ratio that are located in different countries may exhibit different Tier 1 capital ratios due to different implementation statuses of regulatory regimes and different calculation methods for risk-weighted assets.

Our sample includes banks from different bank groups. Generally, such differences are captured with bank-level fixed effects. Nevertheless, we construct dummy variables from Datastream that account for different types of banks ("industry group dummies"). We estimate one model including these regressions in our main analysis and find no significant differences in our results. Moreover, we estimate (unreported) some subsample models focusing on different industry groups. Unfortunately, we do not have sufficient observations for each group to provide all results. But, we do find the negative relation between Tier 1 capital and bank stock performance for several industry groups.

4 Conclusion

In this paper, we investigate the effects of bank capital, bank regulation, and supervision on banks' stock performance. We analyze a comprehensive panel of international banks over the period of 1999-2012 with 11,803 bank-year observations from 1,659 banks in 74 countries. We employ panel regressions to study the determinants of each bank's annual buy-and-hold return using bank-specific as well as country-specific and regulatory explanatory variables.

The key result of our empirical study is that higher regulatory capital is negatively related to the banks' stock performance over our complete sample period from 1999 to 2012. However, during turbulent times, higher regulatory capital significantly increases a bank's annual stock performance. In addition, we find evidence that supports the notion that implicit government bailout guarantees decrease bank stock performance. To be specific both, a bank's size measured by its total assets and a bank's interconnectedness with other banking firms, are related to weaker stock

performance. Furthermore, we find evidence that better supervision and corporate governance are beneficial to bank stock performance. At the same time, schemes supporting the private monitoring of banks are negatively related to annual buy-and-hold returns.

The implications of our results are twofold. First, while higher bank capital indeed decreases overall bank performance, this result is of marginal magnitude. However, as higher Tier 1 capital ratios significantly increase performance during crisis times, regulation appears to be on the right track, increasing regulatory capital requirements around the world since the recent financial crisis. Finally, we confirm in our panel setup that size and systemic relevance of banks negatively influence banks' stock performance. In line with earlier findings in the literature, bank stock returns are significantly lower for larger and systemically more important banks that are more likely to receive a government bailout.

Although we find higher capital to be beneficial during times of crisis, we do not address the question how high capital requirements should ideally be. We intend to tackle this question in future research.

Appendix

Appendix I: Variable definitions and data sources.

The appendix presents definitions as well as data sources for all dependent and independent variables that are used in the empirical study. The bank characteristics were retrieved from the *Thomson Reuters Financial Datastream* and *Thomson Worldscope* databases. The country control variables are taken from the World Bank's World Development Indicator (WDI) database. Data on the banks' regulatory environment are taken from Barth et al. (2006) and Barth et al. (2013a).

Variable name	*Definition*	*Data source*
Dependent variables		
Buy-and-hold return	Log annual buy-and-hold stock returns computed from the first and last trading day in a year.	Datastream, own. calc.
Bank characteristics		
Beta	Beta of a stock calculated as the ratio of the covariance of the stock's return and the MSCI World Index return and the variance of the stock's returns in one year.	Datastream, own calc.
Z-score	Natural logarithm of the z-score. The z-score is calculated as the sum of a bank's equity ratio and annual return on assets divided by the standard deviation of daily stock returns in that year.	Worldscope, Datastream, own calc.
MES	Annual Marginal Expected Shortfall as defined by Acharya et al. (2010) as the average return on an individual bank's stock on the days the *World Datastream Bank* index experienced its 5% worst outcomes.	Datastream, own calc.
ΔCoVaR	Unconditional ΔCoVaR as defined by Adrian and Brunnermeier (2015), measured as the difference of the Value-at-risk (VaR) of a financial sector index conditional on the distress of a particular insurer and the VaR of the sector index conditional on the median state of the insurer.	Datastream, own calc.
Total assets	Natural logarithm of a bank's total assets at fiscal year end.	Worldscope (WC02999).
SRISK	Annual SRISK as defined by Brownlees and Engle (2015) as $SRISK = k \cdot \text{DEBT}_{i,t}(1-k) \cdot \left(1 - \text{LRMES}_{i,t}\right) \cdot \text{EQUITY}_{i,t}$, where $\text{LRMES}_{i,t}$ is $1 - \exp(-18 \cdot \text{MES}_{i,t})$. The variable used is $SRISK_+ = (SRISK; 0)_+$ with $k = 8\%$.	Datastream, Worldscope, own calc.
Market-to-book	Market value of common equity divided by book value of common equity.	Worldscope (WC07210 and WC03501).
Leverage	Book value of assets minus book value of equity plus market value of equity, divided by market value of equity (see Acharya et al., 2010).	Worldscope (WC02999, WC03501, WC08001), own calc.
Non-interest income	Non-interest income divided by total interest income.	Worldscope (WC01021 and WC01016).
Loans	Ratio of total loans to total assets.	Worldscope (WC02271 and WC02999).
Loan loss provisions	Natural logarithm of expenses set aside as an allowance for uncollectable or troubled loans divided by total loans.	Worldscope (WC01271 and WC02271).
Debt maturity	Total long-term debt (due in more than one year) divided by total debt.	Worldscope (WC03251 and WC03255).
Deposits	Total deposits divided by total liabilities.	Worldscope (WC03019 and WC03351).
Return on assets	Pre-tax return of the insurer on its total assets.	Worldscope (WC08326).
Systemic size	Ratio of a bank's total liabilities to national GDP.	Worldscope (WC03351), WDI database.
Liquidity	Mean value of the Amihud measure of an individual stock's illiquidity adjusted following the procedure proposed by Karolyi et al. (2012). The adjusted Amihud measure is defined as $-\ln\left(1 + \frac{\lvert R_{i,t}\rvert}{P_{i,t}VO_{i,t}}\right)$ where $R_{i,t}$ is the return, $P_{i,t}$ is the price, and $VO_{i,t}$ is the trading volume of stock i on day t.	Datastream, own calc.
Interconnectedness	Number of in- and outgoing granger causalities as introduced in Billio et al. (2012).	own calc.
Industry groups	Dummy variables constructed from *Datastream* that indicate the type of a bank (commercial/investment bank, holding, etc.).	Worldscope (WC06011)
Reporting standards	Dummy variables constructed from *Datastream* that indicate which reporting standards a bank is following (IFRS, US GAAP, local, etc.).	Worldscope (WC07536)

Appendix I: Variable definitions and data sources (continued).

Variable name	*Definition*	*Data source*
Bank capital		
Tier 1 capital ratio	Ratio of Tier 1 Capital to total risk-weighted assets.	Worldscope (WC18156,WC18157).
Tangible equity ratio	Total common equity minus total intangibles and preferred stock divided by total assets minus total net intangible other assets.	Worldscope (WC02300,WC03451, WC02649,WC07230,WC02649).
Tier 1 leverage ratio	Tier-1-capital divided by total assets.	Worldscope (WC18228,WC02300).
Tier 2 leverage ratio	Tier-2-capital divided by total assets.	Worldscope (WC18229,WC02300).
Capital Requirement Deviation	Captures to which degree a banking firm's capital deviates from group average.	own calc.
Regulatory environment		
Activity Restrictions	Index of the overall restrictions on banking activities that measures the extent to which a bank can engage in securities, insurance, and real estate activities. Index ranges from 3 to 12. Higher scores denote greater restrictiveness.	Barth et al. (2006, 2013a).
Capital Regulatory Index	Index of the stringency of capital regulations in the banking system, capturing whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined. Index ranges from 0 to 10. Higher values denote greater stringency.	Barth et al. (2006, 2013a).
Official Supervisory Power	Index of the extent to which supervisory authorities have the authority to discipline banks by taking specific actions to prevent and correct problems. Index ranges from 0 to 14. Higher scores denote greater power.	Barth et al. (2006, 2013a).
Diversification index	Index of the guidelines for asset diversification. Index ranges from 0 to 2. Higher scores denote more diversification.	Barth et al. (2006, 2013a).
Entry requirements	Index of the legal requirements that need to be fulfilled before issuance of the banking license. Index ranges from 0 to 8. Higher scores denote greater stringency.	Barth et al. (2006, 2013a).
Private monitoring index	Index of the incentives and capabilities provided by regulatory and supervisory authorities to encourage the private monitoring of banks. Index ranges from 0 to 12. Higher scores indicate greater regulatory empowerment of the monitoring of banks by private investors.	Barth et al. (2006, 2013a).
Deposit insurance funds-to-total bank assets	The size of the deposit insurance fund relative to total bank assets.	Barth et al. (2006, 2013a).
Corporate governance	Consolidated index of the six Worldwide Governance Indicators by averaging.	World Bank, own calc.
Corporate governance (pca)	Consolidated index of the six Worldwide Governance Indicators by using principal component analysis.	World Bank, own calc.
Country characteristics		
GDP growth	Annual real GDP growth rate (in %).	WDI database.
Inflation	Log of the annual change of the GDP deflator.	WDI database
HHI	Herfindahl-Hirschman Index computed as the sum of the squared market shares of a country's domestic and foreign banks.	WDI database.
Crisis dummy	Dummy variable that equals one if a financial crisis is identified by Laeven and Valencia (2012) in a country for a given year, and zero otherwise.	Laeven and Valencia (2012).

Appendix II: Additional regressions of a bank's stock performance.

The regressions estimate the relation between stock performance and bank characteristics over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	Model (1) HLM				Model (2) HLM			
	firm dev.		country mean		firm dev.		country mean	
Lagged return	-0.015		-0.101	***	-0.024		-0.108	***
	(0.020)		(0.025)		(0.021)		(0.025)	
MES	-0.003		-0.730	***	-0.014		-0.664	***
	(0.044)		(0.137)		(0.044)		(0.140)	
Beta	0.035		-0.237	*	0.018		-0.109	
	(0.052)		(0.130)		(0.051)		(0.134)	
Total assets	0.001		-0.009	*	-0.002		-0.018	***
	(0.003)		(0.005)		(0.003)		(0.006)	
Market-to-book	-0.037	***	-0.041	***	-0.034	***	-0.037	***
	(0.006)		(0.006)		(0.005)		(0.006)	
Leverage	-0.000		-0.000		-0.000		-0.000	
	(0.000)		(0.001)		(0.000)		(0.001)	
Non-interest income	0.003		0.004		-0.003		-0.003	
	(0.009)		(0.009)		(0.009)		(0.009)	
Loans	-0.131	***	-0.149	*	-0.153	***	-0.134	*
	(0.035)		(0.079)		(0.034)		(0.078)	
Loan loss provisions	-2.224	***	-2.207	***	-2.334	***	-2.316	***
	(0.668)		(0.668)		(0.666)		(0.665)	
Debt maturity	-0.017		-0.150	***	-0.022		-0.079	
	(0.014)		(0.044)		(0.014)		(0.054)	
Deposits	0.162	***	0.048		0.145	***	0.053	
	(0.038)		(0.035)		(0.037)		(0.040)	
Return on assets	0.036	***	0.036	***	0.036	***	0.036	***
	(0.005)		(0.005)		(0.005)		(0.005)	
Tier-1-capital	-0.003	***	0.004		-0.003	***	0.017	
	(0.000)		(0.027)		(0.000)		(0.019)	
Liquidity	-4.276	***	-4.594	***	-4.341	***	-4.380	***
	(1.205)		(1.530)		(1.203)		(1.537)	
Constant			-0.199	*			0.075	**
			(0.118)				(0.037)	
Bank FE			Yes				Yes	
Industry FE			Yes				No	
Accounting FE			No				Yes	
N			10032				10025	

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Figures and Tables

Figure 1: Time evolution of bank stock performances

The figure shows the time evolution of the annual buy-and-hold returns across our full international sample of banks. We report the 90%-quantiles (black bars) and the 10%-quantiles (green bars) as well as the mean values (red areas) of annual buy-and-hold returns.

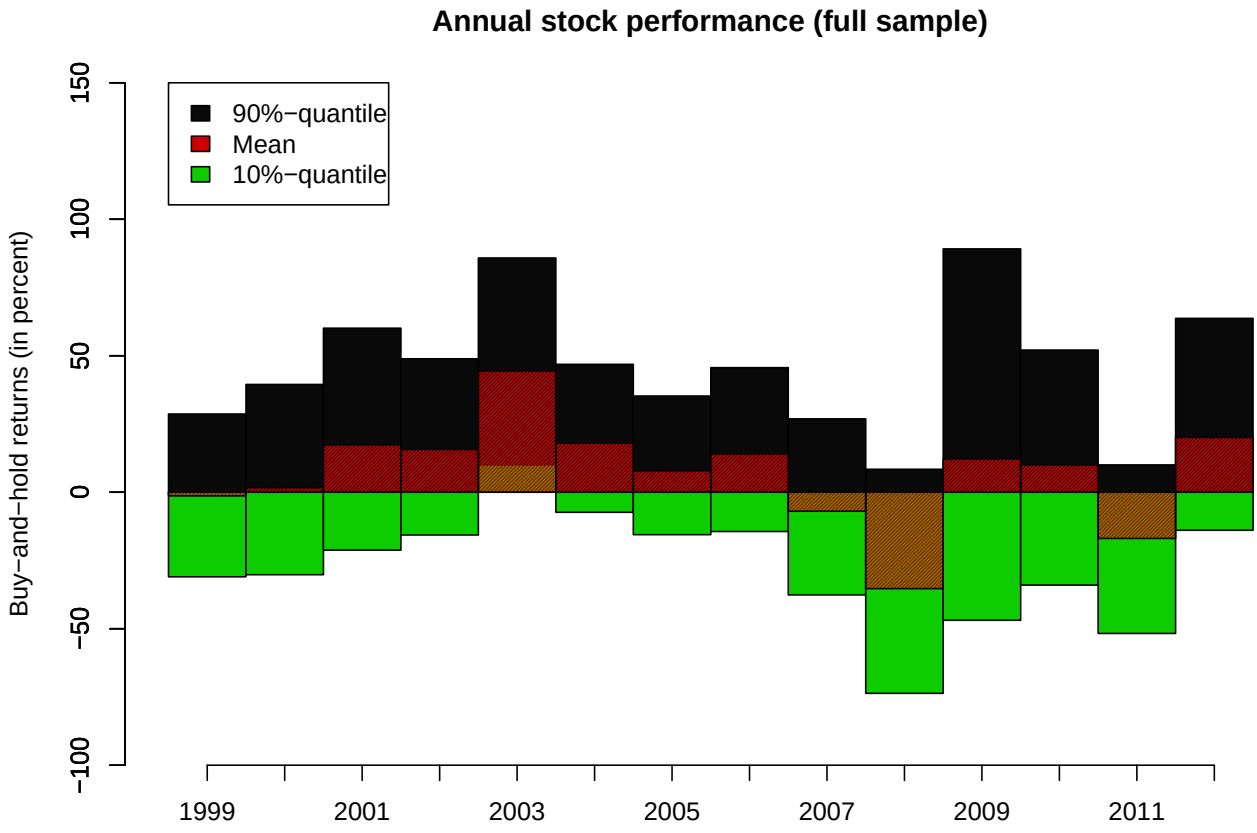

Figure 2: Time evolution of banks' stock performances by country

The figure shows the time evolution of the annual buy-and-hold returns across our full international sample of banks. We report the 10%- (green area) and 90%-percentiles (black bars) of annual buy-and-hold returns in a given country.

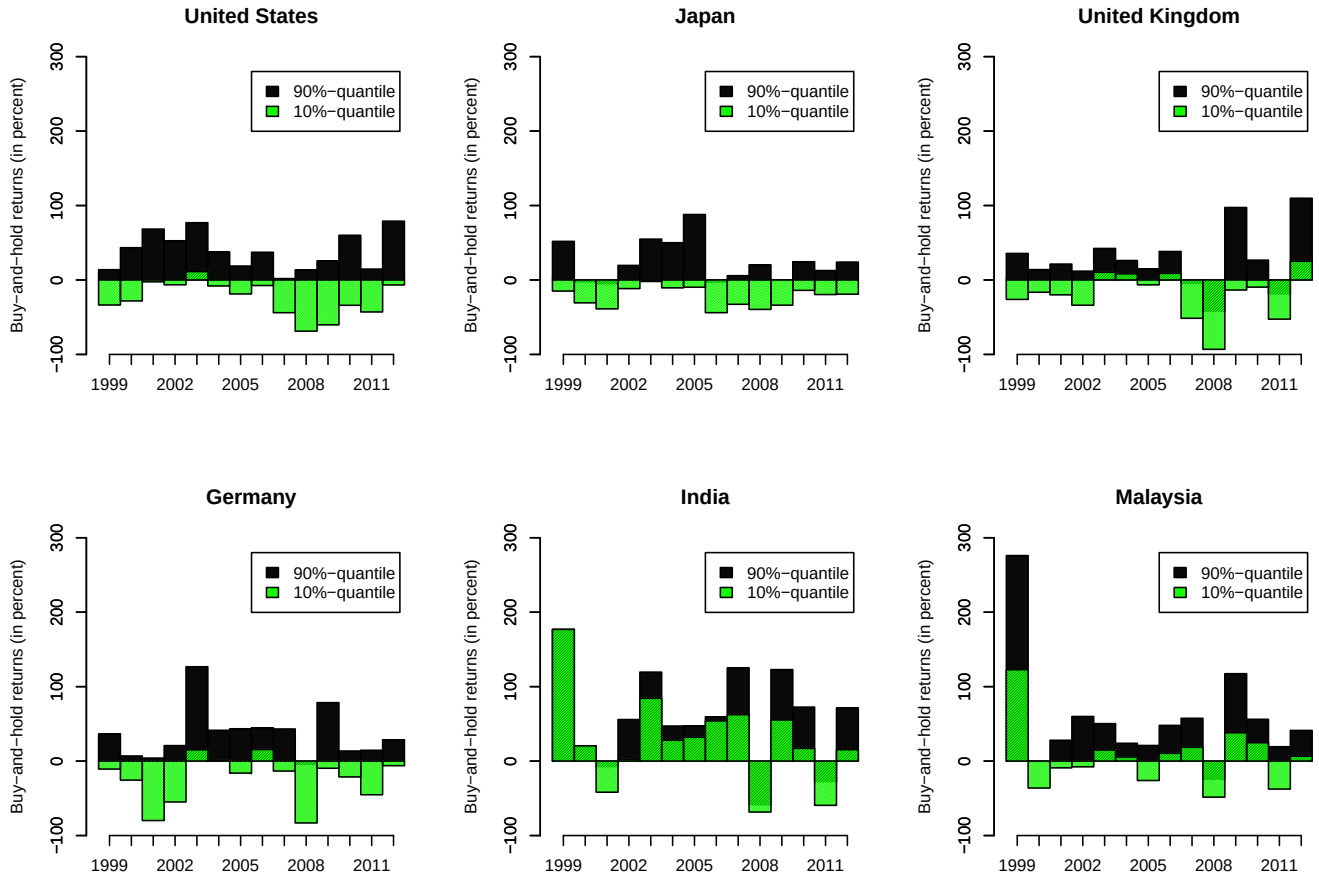

Table I: Distribution of bank years

The table shows the distribution of the 11,803 bank years from 1999 to 2012 among the countries in our sample. The international sample consists of 1,659 banks and is constructed as documented in Section 2 and by applying several filters as introduced by Ince and Porter (2006) and Hou et al. (2011).

Country	No. of bank-years	Country	No. of bank-years
Abu Dhabi	28	Lebanon	3
Argentina	7	Lithuania	7
Australia	80	Luxembourg	5
Austria	98	Macedonia	4
Bahrain	10	Malaysia	128
Bangladesh	21	Malta	1
Belgium	25	Mauritius	3
Botswana	1	Mexico	2
Brazil	11	Namibia	2
Bulgaria	3	Netherlands	35
Canada	97	Norway	281
Chile	7	Oman	21
China	69	Pakistan	30
Colombia	1	Peru	3
Croatia	4	Philippines	50
Cyprus	11	Poland	40
Czech Republic	9	Portugal	52
Denmark	441	Qatar	54
Dubai	13	Romania	2
Egypt	13	Russian Federation	32
Finland	32	Saudi Arabia	80
France	111	Serbia	3
Germany	167	Singapore	48
Greece	63	Slovakia	10
Hong Kong	97	Slovenia	3
Hungary	12	South Africa	62
Iceland	7	South Korea	9
India	80	Spain	118
Indonesia	25	Sri Lanka	21
Ireland	26	Sweden	63
Israel	79	Switzerland	148
Italy	398	Taiwan	57
Japan	1263	Thailand	110
Jordan	69	Turkey	74
Kazakhstan	6	Ukraine	1
Kenya	24	United Kingdom	138
Kuwait	35	United States	6660

Table II: Summary statistics.

This table shows selected descriptive statistics of variables used in our regressions. Between variation captures the differences among the levels of different banks while within variation captures the deviation from individual bank-specific means. The sample consists of 1,659 publicly traded international banks from 74 countries over the period 1999-2012. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. Definitions of variables as well as descriptions of the data sources are given in Appendix I. Total assets is measured in billion U.S. Dollars; the Systemic Size is given in terms of 10^{-3}.

Variable	Observations Banks	Observations Bank-years	Mean	Std. Dev.	Min	Max	Between Variation	Within Variation
Buy-and-hold return	1,659	11,803	0.053	0.398	-0.982	4.273	0.209	0.372
Beta	1,659	11,803	0.041	0.083	-0.531	1.760	0.092	0.045
Z-score	1,114	6,004	0.738	0.868	-4.998	6.726	0.669	0.583
MES	1,659	11,803	0.015	0.075	-0.111	1.819	0.042	0.066
SRISK (in million $)	1,656	11,757	239.333	2,256.150	0.000	917,000.000	1,000.012	1,914.664
ΔCoVaR	1,656	10,566	-0.897	4.947	-37.615	37.301	2.983	4.450
Total assets	1,661	11,814	15.272	2.138	10.598	22.285	2.076	0.390
Market-to-book	1,656	11,761	1.538	3.203	-293.851	93.803	2.126	2.823
Leverage	1,656	11,761	14.969	21.523	1.033	716.452	14.102	16.678
Non-interest income	1,659	11,806	0.362	4.890	-0.909	468.005	6.500	2.449
Loans	1,603	11,270	0.677	0.138	0	0.933	0.134	0.059
Loan loss provisions	1,600	11,248	0.007	0.019	-0.226	1.570	0.025	0.012
Debt maturity	1,644	11,648	0.499	0.293	0	1	0.256	0.191
Deposits	1,659	11,801	0.768	0.191	0	0.9922	0.184	0.059
Return on assets	1,558	10,644	1.090	1.417	-27.600	20.640	1.525	0.964
Tier 1 capital	1,659	11,803	0.088	0.703	0.001	0.224	0.171	0.672
Tier-1-leverage ratio	1,214	6,770	0.0846	0.050	0	0.969	0.051	0.025
Tier-2-leverage ratio	1,125	6,205	0.015	0.016	0	0.455	0.0201	0.0078
Tangible equity ratio	1,089	5,570	0.0756002	0.048	0	0.900	0.050	0.022
Liquidity	1,643	11,362	-0.001	0.003	-0.140	0.000	0.003	0.002
Interconnectedness	1,599	9,619	0.073	0.065	0.009	0.578	0.050	0.053
Systemic size	1,659	11,803	0.060	0.335	0.000	10.97	0.249	0.117
Official Supervisory Power	1,586	10,114	12.281	2.169	4	16	2.002	0.795
Diversification Index	1,645	11,513	1.404	0.502	0	2	0.393	0.367
Entry requirements	1,645	11,440	7.480	0.789	0	8	0.697	0.477
Private Monitoring Index	1,628	11,295	8.966	1.189	5	11	0.999	0.798
Capital Requirements	925	3,678	6.785	1.322	3	10	1.211	0.637
Deposit insurance fund to total assets	1,317	5,808	0.000	0.056	-0.060	1.060	0.089	0.026
Corp. Governance (PCA)	1,659	11,803	-0.231	1.173	-4.157	3.207	1.088	0.325
Corp. Governance	1,659	11,803	1.192	0.500	-1.177	1.986	0.629	0.088
GDP growth	1,656	11,802	2.445	2.672	-13.127	26.750	2.552	1.607
Inflation	1,643	11,700	2.276	3.264	-21.582	75.271	3.688	2.139
HHI	1,448	10,039	0.088	0.066	-2.459	0.760	0.060	0.021
Crisis dummy	1,659	11,803	0.270	0.444	0	1	0.302	0.377

Table III: Correlations of independent variables.

This table shows Pearson correlations between the independent variables used in our main regressions. The sample consists of 1,659 publicly traded international banks from 74 countries over the period 1999-2012. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	Log return	MES	ΔCoVaR	SRISK	Beta	Z-Score	Total assets	Market-to-book	Leverage	Non-interest income	Loans	Loan loss provision	Debt maturity	Deposits	Return on assets	Tier 1 capital
MES	0.107	1														
ΔCoVaR	0.046	0.024	1													
SRISK	-0.080	0.145	-0.033	1												
Beta	-0.055	-0.143	-0.095	-0.018	1											
Z-Score	0.279	-0.004	0.043	-0.169	0.106	1										
Total assets	-0.027	0.096	-0.040	0.246	0.042	-0.255	1									
Market-to-book	0.116	0.015	0.005	-0.017	-0.009	0.242	0.025	1								
Leverage	-0.326	-0.038	-0.022	0.223	-0.023	-0.521	0.161	-0.110	1							
Non-interest income	0.003	0.005	-0.007	0.002	0.004	0.024	0.023	0.007	-0.011	1						
Loans	-0.051	-0.080	-0.018	-0.097	0.011	0.031	-0.151	-0.096	0.056	-0.086	1					
Loan loss provision	-0.131	-0.006	-0.022	0.022	0.031	-0.353	0.026	-0.080	0.119	-0.005	-0.005	1				
Debt maturity	-0.026	-0.001	-0.003	-0.028	0.049	-0.057	-0.150	-0.058	0.089	0.010	0.142	0.037	1			
Deposits	0.016	-0.029	0.048	-0.218	-0.081	0.032	-0.382	-0.024	-0.115	-0.027	0.089	0.004	0.022	1		
Return on assets	0.252	0.034	-0.004	-0.013	0.036	0.451	-0.044	0.279	-0.313	0.089	-0.035	-0.400	-0.020	-0.200	1	
Tier 1 capital	0.008	-0.003	0.000	-0.007	0.002	0.357	-0.034	0.003	-0.020	0.002	0.000	0.001	0.014	0.012	0.021	1
Tier-1-leverage ratio	0.020	-0.026	-0.004	-0.097	0.095	0.356	-0.383	0.016	-0.223	0.042	0.037	0.059	-0.006	0.028	0.209	0.995
Tier-2-leverage ratio	0.030	0.032	-0.008	-0.003	-0.038	-0.022	0.191	0.038	-0.014	0.060	0.086	0.094	0.005	-0.154	0.018	0.056
Tangible equity ratio	0.080	-0.035	0.038	-0.111	0.151	0.530	-0.384	0.039	-0.371	0.043	0.058	0.025	-0.039	0.039	0.302	0.816
Systemic Size	-0.018	0.018	-0.014	0.193	-0.014	-0.092	0.345	0.010	0.062	0.004	-0.127	0.001	-0.080	-0.234	0.014	-0.010
Liquidity	0.030	-0.040	-0.013	0.034	0.146	0.050	0.296	0.031	-0.067	0.011	-0.064	-0.022	-0.052	-0.029	0.037	-0.002
Interconnectedness	-0.094	-0.098	-0.034	-0.008	0.330	-0.047	-0.040	-0.021	0.022	-0.006	0.018	0.031	0.035	0.023	-0.034	-0.005
Capital requirements	-0.115	-0.050	0.039	-0.040	0.131	0.060	-0.249	-0.089	-0.010	-0.135	-0.028	0.000	0.189	0.251	0.007	0.056
Activity Restrictions	-0.009	-0.044	0.057	-0.165	-0.005	0.049	-0.279	-0.014	-0.091	-0.033	-0.019	-0.015	0.065	0.418	-0.039	0.004
Entry requirements	-0.041	0.027	-0.056	-0.008	0.132	0.152	-0.113	-0.007	-0.076	-0.001	0.026	0.059	0.011	-0.077	0.035	0.020
Diversification index	0.120	0.035	0.033	-0.022	-0.058	0.144	0.228	0.017	0.042	0.027	0.017	-0.118	0.012	0.076	-0.010	0.002
Official superivsory power	-0.083	-0.037	-0.034	-0.116	0.001	0.019	-0.333	-0.040	-0.110	-0.125	-0.049	0.031	0.108	0.491	-0.094	0.013
Private monitoring index	-0.069	0.007	-0.018	-0.029	0.096	0.088	-0.098	-0.014	-0.020	-0.015	0.001	0.091	0.079	0.298	-0.102	0.017
Deposit insurance	0.003	0.030	0.045	-0.005	-0.027	-0.070	-0.231	-0.004	-0.054	-0.020	-0.038	-0.037	-0.042	-0.030	0.125	-0.002
Governance	0.004	0.072	-0.025	0.026	-0.158	-0.041	-0.223	-0.069	0.059	-0.003	-0.005	-0.132	0.087	-0.029	-0.101	-0.004
Governance (pca)	-0.031	0.015	0.043	-0.068	-0.120	-0.197	0.046	-0.077	0.181	0.027	0.044	0.046	0.008	0.227	-0.171	-0.013
GDP growth	0.097	-0.110	0.007	-0.060	-0.021	0.224	-0.028	0.102	-0.222	-0.021	-0.018	-0.161	-0.180	-0.013	0.301	0.008
HHI	0.047	0.100	0.017	-0.010	-0.069	0.007	0.108	0.012	-0.001	-0.001	-0.045	-0.048	-0.060	0.055	0.004	-0.004

Table III: Correlations of dependent variables (continued).

	Tier-1-leverage	Tier-2-leverage	Tangible equity ratio	Systemic Size	Liquidity	Interconn	Capital requirements	Activity restric-tions	Entry requirements	Diversifi-cation index	Official supervisory power	Private moni-toring index	Deposit insurance	Governance	Governance (pca)	GDP growth	HHI
Tier-1-capital																	
Tier-1-leverage	1																
Tier-2-leverage	0.066	1															
Tangible equity ratio	0.813	0.023	1														
Systemic Size	-0.115	0.030	-0.117	1													
Liquidity	-0.062	-0.012	-0.090	0.062	1												
Interconnectedness	0.054	-0.014	0.084	-0.018	0.062	1											
Capital requirements	0.188	-0.131	0.172	-0.133	-0.056	0.130	1										
Activity restrictions	0.093	-0.140	0.073	-0.250	0.058	0.016	0.340	1									
Entry requirements	0.191	-0.109	0.093	-0.037	-0.046	0.080	0.186	-0.146	1								
Diversifi- cation index	-0.128	0.010	-0.049	0.051	0.045	-0.045	-0.278	-0.086	-0.008	1							
Official supervisory power	0.150	-0.235	0.026	-0.167	0.053	0.058	0.320	0.438	0.073	-0.072	1						
Private monitoring index	0.183	-0.186	0.062	-0.092	0.011	0.065	0.337	0.121	0.325	0.219	0.411	1					
Deposit insurance	0.028	0.120	0.070	-0.026	-0.119	-0.021	0.114	0.181	-0.154	-0.399	-0.093	-0.395	1				
Governance	-0.099	-0.116	-0.200	0.016	-0.089	-0.121	-0.022	-0.162	-0.017	-0.102	0.099	-0.012	0.251	1			
Governance (pca)	-0.115	0.033	-0.044	-0.120	-0.082	-0.037	-0.115	0.195	-0.189	0.145	-0.096	-0.032	0.028	0.030	1		
GDP growth	0.085	0.096	0.206	0.042	0.057	0.016	-0.101	0.026	-0.083	0.086	-0.038	-0.225	0.132	-0.269	-0.205	1	
HHI	-0.057	-0.033	-0.058	0.056	0.048	-0.040	-0.393	-0.092	-0.043	0.192	-0.105	-0.003	0.065	0.108	0.202	0.055	1

Table IV: Bank capital and banks' stock performance.

The regressions estimate the relation between stock performance and bank characteristics over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. For Models (5) and (6), the data is divided into two subsamples. The first subsample (Model (5)) consists of banks whose Tier 1 capital ratio is above the mean while the second subsample (Model (6)) consists of banks whose Tier 1 capital ratio is below the mean. Model (7) includes all banks for which a Capital Requirements Index realization is available. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	OLS		Model (1) HLM				Model (2) HLM				Model (3) HLM				Model (4) OLS		Model (5) OLS		Model (6) OLS		Model (7) OLS	
			firm dev.		country mean		firm dev.		country mean		firm dev.		country mean									
Lagged return	-0.142	***	-0.014		-0.100	***	-0.019		-0.276	***	-0.014		-0.294	***	-0.263	***	-0.116	***	-0.178	***	-0.184	***
	(0.019)		(0.020)		(0.025)		(0.026)		(0.030)		(0.026)		(0.031)		(0.022)		(0.029)		(0.026)		(0.030)	
MES	-0.171	**	-0.003		-0.724	***	0.063		-1.217	***	0.067		-1.035	***	-0.194	***	-0.045		-0.289	***	-0.243	*
	(0.072)		(0.044)		(0.137)		(0.059)		(0.212)		(0.063)		(0.242)		(0.063)		(0.116)		(0.088)		(0.134)	
Beta	-0.205	**	0.018		-0.255	*	0.001		-0.310	**	-0.024		-0.274	*	0.242	**	-0.143		-0.309	*	-0.447	**
	(0.089)		(0.051)		(0.131)		(0.063)		(0.145)		(0.065)		(0.148)		(0.120)		(0.105)		(0.171)		(0.191)	
Total assets	-0.205	***	0.002		-0.009		0.009	**	0.008		0.009	**	0.012		-0.362	***	-0.214	***	-0.224	***	-0.404	***
	(0.022)		(0.003)		(0.005)		(0.004)		(0.008)		(0.004)		(0.007)		(0.039)		(0.033)		(0.034)		(0.066)	
Market-to-book	-0.052	***	-0.037	***	-0.041	***	-0.031	***	-0.033	***	-0.035	***	-0.036	***	-0.081	***	-0.125	***	-0.033	***	-0.114	***
	(0.013)		(0.006)		(0.006)		(0.006)		(0.006)		(0.006)		(0.006)		(0.016)		(0.017)		(0.012)		(0.027)	
Leverage	0.000		-0.000		0.000		-0.001		0.000		-0.000		0.000		0.000		0.003	**	0.000		0.004	***
	(0.001)		(0.000)		(0.001)		(0.000)		(0.001)		(0.000)		(0.001)		(0.000)		(0.001)		(0.001)		(0.001)	
Non-interest income	-0.021		-0.002		-0.001		0.004		0.004		-0.011		-0.010		-0.001		-0.022		-0.003		-0.045	
	(0.017)		(0.009)		(0.009)		(0.011)		(0.011)		(0.013)		(0.013)		(0.002)		(0.032)		(0.015)		(0.061)	
Loans	-0.266	***	-0.127	***	-0.139		-0.184	***	-0.105		-0.242	***	-0.201	*	-0.186		-0.269	**	-0.208	*	-1.015	***
	(0.073)		(0.034)		(0.078)		(0.048)		(0.102)		(0.049)		(0.108)		(0.147)		(0.130)		(0.108)		(0.156)	
Loan loss provisions	-2.137	**	-2.193	***	-2.176	***	-3.035	***	0.108		-3.174	***	-0.191		0.031		-2.720	**	-1.544		-2.725	*
	(0.920)		(0.667)		(0.667)		(0.877)		(1.126)		(0.870)		(1.049)		(0.037)		(1.261)		(1.600)		(1.575)	
Debt maturity	-0.013		-0.017		-0.153	***	0.007		-0.122	**	-0.002		-0.104	*	0.070	*	0.006		-0.031		0.049	
	(0.022)		(0.014)		(0.043)		(0.021)		(0.058)		(0.021)		(0.060)		(0.037)		(0.030)		(0.034)		(0.053)	
Deposits	0.212	***	0.166	***	0.054		0.300	***	0.101	**	0.353	***	0.208	***	0.617	***	0.137		0.266	*	1.017	***
	(0.081)		(0.036)		(0.035)		(0.052)		(0.051)		(0.054)		(0.056)		(0.125)		(0.126)		(0.147)		(0.171)	
Return on assets	0.034	***	0.036	***	0.037	***	0.045	***	0.048	***	0.044	***	0.046	***	0.048	***	0.024	**	0.048	***	0.046	***
	(0.009)		(0.005)		(0.005)		(0.006)		(0.006)		(0.006)		(0.006)		(0.010)		(0.010)		(0.014)		(0.016)	
Tier-1-capital	-0.003	***	-0.003	***	0.001												-0.002	***	0.003		0.753	
	(0.000)		(0.000)		(0.029)												(0.000)		(0.727)		(0.542)	*
Liquidity	-8.245	***	-4.388	***	-4.687	***	-5.670	***	-4.829	***	-5.077	***	-3.777	**	-4.559	**	-8.082	***	-5.690		-15.031	*
	(2.199)		(1.199)		(1.528)		(1.377)		(1.778)		(1.446)		(1.775)		(2.111)		(2.025)		(5.505)		(8.186)	
Tier-1-leverage ratio							0.172		-0.534	*												
							(0.130)		(0.316)													
Tier-2-leverage ratio											-0.158		4.329	***								
											(0.325)		(0.731)									
Tangible equity ratio															-1.289	***						
															(0.319)							
Capital requirement deviation																					-0.038	**
																					(0.017)	
Constant	3.010	***			0.024				-0.065				-0.045		4.904	***	3.054	***	3.454	***	6.108	***
	(0.352)				(0.034)				(0.148)				(0.150)		(0.640)		(0.497)		(0.618)		(1.048)	
Fixed effects	Yes				Yes				Yes				Yes		Yes		Yes		Yes		Yes	
N	10032				10032				5975				5731		6095		4923		5109		3320	
N cluster	1519														1120		1043		1048		865	
R^2	0.3														0.4		0.4		0.3		0.4	
Adj. R^2	0.32														0.35		0.39		0.33		0.40	

Table V: Bank risk and banks' stock performance.

The regressions estimate the relation between stock performance and bank characteristics over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	OLS		Model (1) HLM			Model (2) HLM			Model (3) HLM		
			firm dev.	country mean		firm dev.	country mean		firm dev.	country mean	
Lagged return	-0.153	***	-0.016	-0.119	***	-0.017	-0.116	***	-0.012	-0.301	***
	(0.021)		(0.022)	(0.027)		(0.020)	(0.025)		(0.025)	(0.031)	
ΔCoVaR	-0.000		0.000	0.007	**						
	(0.001)		(0.001)	(0.003)							
Beta	-0.193	**	-0.009	-0.226	*	0.013	-0.158		-0.038	-0.351	**
	(0.088)		(0.052)	(0.128)		(0.050)	(0.131)		(0.062)	(0.145)	
Total assets	-0.219	***	-0.001	0.000		0.002	-0.002		0.008	*	0.022	***
	(0.024)		(0.003)	(0.006)		(0.002)	(0.005)		(0.004)		(0.008)	
Market-to-book	-0.049	***	-0.032	***	-0.038	***	-0.037	***	-0.042	***	-0.026	***	-0.028	***
	(0.013)		(0.006)		(0.006)		(0.006)		(0.006)		(0.008)		(0.008)	
Leverage	0.000		-0.001	-0.001		-0.000	0.000		0.001		0.002	**
	(0.001)		(0.000)	(0.001)		(0.000)	(0.001)		(0.001)		(0.001)	
Non-interest income	-0.033		-0.007	-0.006		-0.007	-0.006		-0.005		-0.004	
	(0.026)		(0.011)	(0.011)		(0.009)	(0.009)		(0.010)		(0.010)	
Loans	-0.209	***	-0.125	***	-0.191	**	-0.131	***	-0.191	**	-0.196	***	-0.071	
	(0.077)		(0.034)		(0.096)		(0.034)		(0.078)		(0.048)		(0.106)	
Loan loss provisions	-2.334	**	-2.399	***	-2.381	***	-2.367	***	-2.349	***	-2.296	***	1.762	
	(0.918)		(0.666)		(0.666)		(0.666)		(0.666)		(0.853)		(1.298)	
Debt maturity						-0.018	-0.175	***	0.009		-0.090	
						(0.014)	(0.043)		(0.020)		(0.063)	
Deposits						0.161	***	-0.026		0.314	***	0.215	***
						(0.036)	(0.034)		(0.051)		(0.053)	
Return on assets	0.034	***	0.033	***	0.032	***	0.037	***	0.036	***	0.045	***	0.048	***
	(0.009)		(0.005)		(0.005)		(0.005)		(0.005)		(0.007)		(0.007)	
Tier-1-capital	-0.003	***	-0.003	***	0.018		-0.003	***	-0.021		0.079		-0.842	**
	(0.000)		(0.000)		(0.027)		(0.000)		(0.046)		(0.137)		(0.337)	
Liquidity	-7.544	***	-3.709	***	-3.863	**	-4.286	***	-4.412	***	-5.716	***	-5.287	***
	(2.496)		(1.186)		(1.576)		(1.199)		(1.516)		(1.337)		(1.732)	
SRISK						-0.001	-0.087	***				
						(0.002)	(0.016)					
Z-score									0.026	**	0.116	***
									(0.013)		(0.024)	
Constant	3.289	***		0.039			0.032				-0.060	
	(0.358)			(0.035)			(0.033)				(0.143)	
Fixed effects	Yes			Yes			Yes				Yes	
N	9112			9112			10032				5920	
N cluster	1531											
R^2	0.3											
Adj. R^2	0.30											

Table VI: Regulatory environment and banks' stock performance.

The regressions estimate the relation between stock performance and bank characteristics as well as regulatory variables over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	Model (1)					Model (2)					Model (3)		Model (4)		Model (5)		Model (6)		Model (7)	
	OLS		HLM			OLS		HLM			OLS		OLS		OLS		OLS		OLS	
			firm dev.		country mean			firm dev.		country mean										
Bank-level-characteristics																				
Lagged return	-0.125	***	-0.004		-0.101	***	-0.150	***	-0.012		-0.107	***	-0.136	***	-0.093	***	-0.136	***	-0.139	***	-0.099	***
	(0.020)		(0.021)		(0.027)		(0.020)		(0.021)		(0.025)		(0.020)		(0.023)		(0.020)		(0.021)		(0.023)	
MES	-0.184	**	-0.001		-0.762	***	-0.144	**	0.010		-0.749	***	-0.179	**	-0.157	**	-0.178	**	-0.159	**	-0.187	**
	(0.072)		(0.045)		(0.139)		(0.072)		(0.045)		(0.148)		(0.073)		(0.075)		(0.073)		(0.073)		(0.077)	
Beta	-0.223	**	0.014		-0.521	***	-0.200	**	0.022		-0.311	**	-0.250	***	-0.118		-0.195	**	-0.208	**	-0.101	
	(0.090)		(0.052)		(0.139)		(0.091)		(0.052)		(0.135)		(0.091)		(0.092)		(0.089)		(0.092)		(0.092)	
Total assets	-0.208	***	0.002		-0.012	**	-0.200	***	0.004		-0.002		-0.234	***	-0.199	***	-0.214	***	-0.202	***	-0.204	***
	(0.023)		(0.003)		(0.006)		(0.023)		(0.003)		(0.006)		(0.024)		(0.025)		(0.023)		(0.023)		(0.025)	
Market-to-book	-0.050	***	-0.035	***	-0.038	***	-0.048	***	-0.037	***	-0.041	***	-0.051	***	-0.065	***	-0.050	***	-0.045	***	-0.062	***
	(0.013)		(0.006)		(0.006)		(0.012)		(0.006)		(0.006)		(0.013)		(0.017)		(0.013)		(0.012)		(0.016)	
Leverage	0.000		-0.000		-0.000		0.000		-0.000		0.000		0.000		0.000		0.000		0.001		0.000	
	(0.001)		(0.000)		(0.001)		(0.001)		(0.000)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Non-interest income	-0.018		-0.005		-0.004		-0.026		-0.002		-0.001		-0.019		-0.008		-0.023		-0.022		-0.008	
	(0.017)		(0.009)		(0.009)		(0.018)		(0.009)		(0.009)		(0.017)		(0.019)		(0.017)		(0.017)		(0.019)	
Loans	-0.236	***	-0.117	***	-0.140		-0.241	***	-0.122	***	-0.144	*	-0.252	***	-0.197	**	-0.247	***	-0.236	***	-0.189	**
	(0.073)		(0.034)		(0.086)		(0.073)		(0.034)		(0.083)		(0.074)		(0.078)		(0.074)		(0.074)		(0.078)	
Loan loss provisions	-1.764	*	-1.986	***	-1.968	***	-2.577	***	-2.354	***	-2.337	***	-1.901	**	-1.783	*	-2.221	**	-2.317	**	-1.999	*
	(0.955)		(0.685)		(0.685)		(0.948)		(0.685)		(0.685)		(0.941)		(1.082)		(0.963)		(0.971)		(1.109)	
Debt maturity	-0.018		-0.024	*	-0.077		-0.016		-0.016		-0.169	***	-0.015		-0.029		-0.020		-0.018		-0.032	
	(0.023)		(0.014)		(0.047)		(0.023)		(0.014)		(0.045)		(0.022)		(0.024)		(0.022)		(0.022)		(0.023)	
Deposits	0.199	**	0.185	***	0.107	***	0.172	**	0.188	***	0.097	**	0.191	**	0.216	**	0.210	**	0.197	**	0.229	***
	(0.083)		(0.038)		(0.040)		(0.082)		(0.038)		(0.038)		(0.082)		(0.087)		(0.083)		(0.083)		(0.087)	
Return on assets	0.036	***	0.036	***	0.036	***	0.034	***	0.037	***	0.037	***	0.036	***	0.042	***	0.035	***	0.035	***	0.041	***
	(0.009)		(0.005)		(0.005)		(0.009)		(0.005)		(0.005)		(0.009)		(0.011)		(0.009)		(0.009)		(0.011)	
Tier-1-capital	-0.003	***	-0.003	***	0.021		-0.003	***	-0.003	***	0.012		-0.003	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***
	(0.000)		(0.000)		(0.018)		(0.000)		(0.000)		(0.023)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Liquidity	-9.676	***	-3.705	**	-2.931		-7.654	***	-4.548	***	-5.002	***	-7.707	***	-9.705	***	-8.076	***	-7.749	**	-9.077	**
	(3.591)		(1.858)		(2.131)		(2.114)		(1.213)		(1.548)		(2.171)		(3.576)		(2.216)		(3.603)		(3.666)	
Regulatory environment																				
Private monitoring index	-0.029	***			-0.027	***													-0.013	*	-0.028	***
	(0.006)				(0.005)														(0.007)		(0.009)	
Diversification Index							-0.116	***			-0.037	***							-0.095	***		
							(0.018)				(0.013)								(0.020)			
Activity restrictions													0.034	***								
													(0.006)									
Official Supervisory Power															0.014	**					0.015	**
															(0.006)						(0.006)	
Entry requirements																	-0.057	***	-0.053	***	-0.042	**
																	(0.012)		(0.012)		(0.017)	
Constant	3.261	***			0.207	***	3.075	***			0.068	*	3.135	***	2.653	***	3.501	***	3.518	***	3.204	***
	(0.362)				(0.047)		(0.363)				(0.038)		(0.368)		(0.388)		(0.367)		(0.372)		(0.419)	
Fixed effects	Yes				Yes		Yes				Yes		Yes		Yes		Yes		Yes		Yes	
N	9670				9670		9835				9835		9765		8687		9762		9580		8567	
N cluster	1495						1506						1507		1457		1503		1486		1439	
R^2	0.3						0.3						0.3		0.3		0.3		0.3		0.3	
Adj. R^2	0.32						0.33						0.32		0.35		0.32		0.32		0.35	

Table VII: Regressions of a bank's stock performance and interconnectedness.

The regressions estimate the relation between stock performance and a bank's interconnectedness with other banks, bank characteristics, and regulatory variables over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

Variable	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Bank-level characteristics										
Lagged return	-0.201	***	-0.189	***	-0.214	***	-0.199	***	-0.21	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
MES	-0.187	**	-0.2	***	-0.165	**	-0.189	**	-0.19	**
	(0.015)		(0.010)		(0.034)		(0.015)		(0.017)	
Total assets	-0.218	***	-0.228	***	-0.219	***	-0.233	***	-0.224	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Market-to-book	-0.049	***	-0.048	***	-0.046	***	-0.048	***	-0.042	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.001)	
Leverage	0.000		0.000		0.000		0.000		0.000	
	(0.995)		(0.912)		(0.982)		(0.716)		(0.738)	
Non-interest income	-0.009		-0.003		-0.013		-0.01		-0.004	
	(0.734)		(0.907)		(0.643)		(0.712)		(0.893)	
Loans	-0.368	***	-0.338	***	-0.349	***	-0.355	***	-0.348	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Loan loss provisions	-2.93	**	-2.408	*	-3.216	**	-2.904	**	-2.822	**
	(0.018)		(0.059)		(0.013)		(0.024)		(0.030)	
Debt maturity	0.01		0.006		0.008		0.005		0.008	
	(0.704)		(0.820)		(0.766)		(0.837)		(0.771)	
Deposits	0.244	***	0.242	***	0.211	**	0.247	***	0.25	***
	(0.008)		(0.010)		(0.021)		(0.008)		(0.007)	
Return on assets	0.037	***	0.04	***	0.039	***	0.039	***	0.041	***
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Tier-1-capital	-0.004	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Liquidity	-10.679	***	-11.287	***	-9.678	***	-10.568	***	-9.442	**
	(0.002)		(0.008)		(0.005)		(0.003)		(0.029)	
Interconnectedness	-0.181	**	-0.17	**	-0.195	***	-0.17	**	-0.163	**
	(0.014)		(0.023)		(0.008)		(0.020)		(0.028)	
Regulatory environment										
Private monitoring index			-0.044	***					-0.031	***
			(0.000)						(0.000)	
Diversification index					-0.098	***			-0.07	***
					(0.000)				(0.003)	
Entry requirements							-0.066	***	-0.064	***
							(0.000)		(0.000)	
Fixed effects	Yes		Yes		Yes		Yes		Yes	
N	8,078		7,768		7,902		7,843		7,696	
R^2	0.34		0.34		0.35		0.34		0.34	
Adj. R^2	0.34		0.34		0.35		0.34		0.34	

Table VIII: Systemic size and bank's stock performance.

The regressions estimate the relation between stock performance and bank characteristics as well as regulatory variables over the period 1999-2012. We use the banks' log annual buy-and-hold return as our dependent variable. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects using clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

Variable	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)		Model (7)		Model (8)	
Bank-level characteristics																
Lagged return	-0.129	***	-0.141	***	-0.131	***	-0.131	***	-0.082	***	-0.112	***	-0.138	***	-0.123	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
MES	-0.233	***			-0.224	***	-0.229	***	-0.203	***	-0.25	***	-0.201	***	-0.241	***
	(0.001)				(0.001)		(0.001)		(0.005)		(0.000)		(0.005)		(0.001)	
Beta	-0.392	***	-0.398	***	-0.384	***	-0.388	***	-0.284	***	-0.411	***	-0.374	***	-0.39	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.001)		(0.000)		(0.000)		(0.000)	
Systemic size	-43.847		-36.983		-40.431		-50.773		-199.782	**	-119.369		-77.285		-101.203	
	(0.280)		(0.346)		(0.341)		(0.201)		(0.049)		(0.161)		(0.398)		(0.225)	
Market-to-book	-0.049	***	-0.046	***	-0.047	***	-0.049	***	-0.063	***	-0.047	***	-0.045	***	-0.047	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Leverage	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.001	
	(0.694)		(0.696)		(0.725)		(0.704)		(0.700)		(0.659)		(0.635)		(0.434)	
Non-interest income	-0.011		-0.013		-0.012		-0.011		-0.001		-0.01		-0.019		-0.013	
	(0.536)		(0.591)		(0.502)		(0.521)		(0.953)		(0.573)		(0.275)		(0.453)	
Loans	-0.259	***	-0.233	***	-0.254	***	-0.24	***	-0.165	**	-0.238	***	-0.243	***	-0.251	***
	(0.000)		(0.004)		(0.001)		(0.001)		(0.035)		(0.002)		(0.001)		(0.001)	
Loan loss provisions	-2.162	**	-2.44	***	-2.223	***	-2.076	**	-1.883	*	-1.915	**	-2.781	***	-2.369	***
	(0.011)		(0.006)		(0.009)		(0.016)		(0.067)		(0.032)		(0.002)		(0.009)	
Deposits	0.434	***	0.423	***	0.42	***	0.426	***	0.413	***	0.409	***	0.38	***	0.433	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Return on assets	0.032	***	0.033	***	0.032	***	0.032	***	0.038	***	0.033	***	0.032	***	0.033	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Tier-1-capital	-0.003	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***	-0.003	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Liquidity	-8.467	***	-9.205	***	-8.413	***	-8.539	***	-12.245	***	-12.008	***	-8.091	***	-8.389	***
	(0.000)		(0.001)		(0.000)		(0.000)		(0.001)		(0.001)		(0.000)		(0.000)	
ΔCoVaR			0													
			(0.960)													
Regulatory environment																
Governance (pca)					0.033	**										
					(0.042)											
Governance							0.102	*								
							(0.077)									
Official Supervisory Power									0.014	**						
									(0.020)							
Private monitoring Index											-0.033	***				
											(0.000)					
Diversification Index													-0.129	***		
													(0.000)			
Entry requirements															-0.051	***
															(0.000)	
Fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
N	10,149		9,108		10,149		10,149		8,793		9,782		9,951		9,875	
R^2	0.31		0.29		0.31		0.31		0.34		0.30		0.32		0.31	
Adj. R^2	0.31		0.29		0.31		0.31		0.33		0.30		0.31		0.31	

Table IX: Bank-specific and regulatory interactions.

The regressions estimate the relation between stock performance and bank characteristics, a bank's interconnectedness with other banks, and regulatory variables over the period 1999-2012. Table IV reports the results of our baseline regressions over the period 1999-2012 using banks' log annual buy-and-hold return as our dependent variable. In addition to our multivariate analyses, we include several interaction terms. The sample consists of 1,659 publicly traded international banks from 74 countries. Stock market data are retrieved from *Thomson Reuters Financial Datastream* while financial accounting data are taken from the *Worldscope* database. Regulation variables come from Barth et al. (2013a) and country characteristics are retrieved from the World Bank's World Development Indicator (WDI) Database. The regressions include all banks from our sample and we apply panel regression with time-fixed and bank-fixed effects clustered robust standard errors (at the bank level). P-values are given in parentheses, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Adj. R^2 is adjusted R-squared. Definitions of variables as well as descriptions of the data sources are given in Appendix I.

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)		Model (7)	
Bank-level-characteristics														
Loans	-0.270	***	-0.552	***	-0.496	***	-0.274	***	-0.273	***	-0.149	*	-0.318	***
	(0.074)		(0.127)		(0.126)		(0.075)		(0.074)		(0.079)		(0.089)	
Debt Maturity	-0.014		0.032		0.017		-0.012		-0.015		-0.019		0.012	
	(0.022)		(0.036)		(0.036)		(0.022)		(0.022)		(0.022)		(0.025)	
Tier-1-capital	-0.003	***					-0.003	***	-0.003	***	-0.003	***	-0.003	***
	(0.000)						(0.000)		(0.000)		(0.000)		(0.000)	
Tier-1 leverage ratio			-1.132	**										
			(0.492)											
Tier-2 leverage ratio					2.559	***								
					(0.894)									
Interconnectedness													0.028	
													(0.068)	
Crisis	-0.079	***	-0.055		0.145	***	0.113	***	0.008		0.300	***	0.006	
	(0.026)		(0.052)		(0.030)		(0.027)		(0.026)		(0.062)		(0.022)	
Interactions														
Tier-1-capital × crisis	1.238	***												
	(0.300)													
Tier-1 leverage × crisis			1.784	***										
			(0.510)											
Tier-2 leverage × crisis					-3.118	**								
					(1.457)									
Leverage × crisis							-0.006	***						
							(0.001)							
Debt maturity × crisis									0.005					
									(0.040)					
Loans × crisis											-0.421	***		
											(0.089)			
Interconnect. × crisis													-0.911	***
													(0.205)	
Constant	2.864	***	6.171	***	5.585		2.885	***	3.038	***	2.927	***	3.155	***
	(0.371)		(0.790)		(0.773)		(0.374)		(0.369)		(0.373)		(0.441)	
Fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
N	10,032		5,975		5,731		10,032		10,032		10,032		8,078	
N cluster	1,519		1,104		1,072		1,519		1,519		1,519		1,391	
R^2	0.3		0.3		0.3		0.3		0.3		0.3		0.3	
Adjusted R^2	0.32		0.35		0.34		0.33		0.32		0.32		0.34	