Anatomy of international banking crises at the Onset of the Great Recession

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ABSTRACT

The paper examines a wide range of potential predictors of 25 international banking crises that broke out in 2007–2011 on the basis of cross–sectional logit models and the BCT (binary classification tree) algorithm, a novel technique in assessing the causes of banking crises. The major determinants of the crises arise from excessive credit depth (measured as private credit to GDP ratio) and illiquidity of the banking sector (credits to deposits ratio). The implementation of explicit deposit insurance schemes is also a pro–crisis factor due to the moral hazard effect they tend to cause. On the contrary, higher values of remittance inflows to GDP decrease the susceptibility to banking crises. These findings are robust under both methodologies. Lower bank concentration, bigger values of cost to income ratios as well as a higher level of economic liberalization make countries more vulnerable to banking crises, as derived from the logit analysis.

Keywords: banking crisis; Great Recession; logit analysis; binary classification tree.

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1. Introduction

The beginning of the Great Recession was marked by a wave of banking crises. Unlike previous episodes of financial turmoil, the recent international banking meltdown has primarily centered in developed economies. Laeven and Valencia (2012) identify 25 systemic and borderline banking crises in 2007–2011, with only 6 of them taking place in non–OECD countries.

The banking meltdown triggered the sequential stages of the global financial turmoil – sovereign debt crises, but to our knowledge most of the research on the 2007–2011 banking crises has been carried out at country or regional levels. It contrasts with the existing banking crisis literature, e.g. by Demirguc–Kunt and Detragiache (1997, 2000, 2005) based on panel data or big cross–sectional datasets.

In this paper I examine a wide range of potential predictors of the 25 banking crises on the basis of traditional cross–sectional logit models and BCT (Binary Classification Tree) procedure, a novel approach to banking crisis analysis. The combination of the two techniques helps identify the most robust determinants of crises. Several notable results are obtained. The major determinants of the crises arise from excessive credit depth (private credit to GDP) and illiquidity of the banking sector (unbalanced credits to deposits ratio). Higher values of remittance inflows to GDP decrease the susceptibility to banking crises while explicit deposit insurance schemes fuel them. These are the findings robust under both methodologies. Lower bank concentration and higher cost to income ratios as well as a higher level of economic liberalization tend to make economies more vulnerable to banking crises, as derived from the logit analysis.

The paper is organized as follows. Section 2 briefly reviews the banking crisis literature. Section 3 discusses data and methodology. Section 4 presents the results and their discussion, followed by concluding remarks in Section 5.

2. Causes of Banking Crises: A Brief Literature Review[2]

The determinants of banking crises can be split into three broad categories: 1) macroeconomic fundamentals; 2) aggregate characteristics of the banking sector performance (depth, soundness, concentration, etc.); 3) institutional variables. However, there has been no clear-cut consensus concerning relative importance of the categories and variables falling under each of them. Klomp (2010) finds that there exists substantial heterogeneity in the determinants of a banking crisis, identifying 3 most robust predictors for the period 1970–2007 – a high credit growth, high real interest rates and negative GDP growth rates. Yet, none of the indicators has a significant impact in more than 60 percent of the banking crises.

Though the findings of banking crisis research appear sensitive to sample composition, *a priori* selected proxies and modeling techniques, there are several

[2] In this section I survey only the most recent contributions on banking crises. Comprehensive literature reviews encompassing previous developments in this research program are Demirguc–Kunt and Detragiache (2005) and Laeven (2011).

indicators that are found to be more or less reliable crisis predictors in empirical studies. As for macroeconomic fundamentals, negative GDP growth rates, high inflation and current account balance/GDP ratio are the most frequently mentioned proxies since Demirguc–Kunt and Detragiache (1997) paper. Most recent research has generally been in line with their findings, adding a number of other promising predictors. Duttagupta and Cashin (2011) establish that significant nominal depreciation (more than 9%) is conducive to banking crises and it can be reinforced by highly dollarized liabilities of the banking sector (over 140% of foreign exchange reserves). Angkinand and Willett (2011) examine the impact of exchange rate regimes on the probability of banking crises and find that intermediate regimes (i.e. the regimes between hard and soft pegs) are mostly crisis–prone. This influence is channeled through net foreign borrowing and currency crises.

A high credit growth and credit/GDP ratio open the second group of indicators. Not only credit depth, but also its composition matter. Buyukkarabacak and Valev (2010) find that a larger share of household credit relative to business loans increases proneness towards banking crises. A higher overall capital adequacy and liquidity position of the banking sector constitute a buffer against banking crises. The conclusion has recently been confirmed by Caprio et. al (2010) and Barrell et. al (2011). Barrell et. al (2010) also find that the two indicators along with property prices can outperform macroeconomic variables as predictors of banking crises and this is especially true in case of developed economies. Besides capital adequacy and a sound liquidity position, a higher concentration in the banking system tends to have a positive impact on its stability and thus reduces the likelihood of crises. This effect is pronounced in cross–country studies, though subject to variation when analyzed along with regulatory and institutional features (Beck et. al 2013). Its theoretical underpinning posits that in more concentrated banking systems banks have better profit opportunities and fewer incentives to take aggressive risks. This result has two straightforward implications. First, it necessitates a balanced view on the impact of financial liberalization on the occurrence of banking crises. Second, it brings to the fore the analysis of institutional features of banking systems.

Using a dataset on financial reforms in 48 countries between 1973 and 2005, Angkinand et. al (2010) establish an inverted U–shaped relationship between financial liberalization and the likelihood of banking crises. They link this relationship with the strength of capital regulation and supervision. If they are very weak, the probability of a banking crisis is on the rise with further liberalization but the linkage is reversed as capital regulation and supervision get stricter. Better supervision is closely related to more intense political competition as the latter implies a better design of checks and balances and ultimately fewer rent–seeking opportunities (Amri and Kocher 2012). A higher degree of central bank independence also tends to decrease the probability of banking crises (Khan et al. 2011). Ahrend et. al (2011) find that the strength of prudential banking regulation is well and negatively correlated with the extent to which countries suffered from banking crises in 2007–2009.

Among other proxies that reduce the likelihood of banking crises credit information sharing is to be mentioned. As a study of 98 countries between 1975 and 2006 shows, the development of both public registries and private credit bureaus deters an unbalanced credit expansion, thus preventing an outbreak of a banking

crisis. The benign effect of credit information sharing is especially sizeable in low income countries (Buyukkarabacak and Valev 2012).

The explicit deposit insurance scheme (EDIS) has been considered as a pro–crisis factor causing moral hazard and loosening market discipline, but once the interaction between the overall economic development and the use of EDIS is controlled for, the significance of this institutional variable becomes questionable (Khan and Dewan 2011). The recent empirical literature motivates the selection of potential crisis proxies for my paper.

3. Data and Methodology

At first I apply standard (conditional fixed-effects) logit models to figure out the predictors of the 2007–2011 banking crises. The information on the countries engulfed by the crises and their starting dates is taken from Laeven and Valencia (2012). Only the first year of the crises is taken in account as a binary dependent variable (Appendix, table A1).

In the previous literature on banking crises promising proxies have, as a rule, been selected a priori on the basis of earlier theoretical and empirical findings, common sense or researchers' specific interests. In this analysis I am free of any a priori judgments on the applicability of this or that independent variable. Rather, I resort to a rich dataset *Global Financial Development Database (GFDD)* introduced by the World Bank (Cihak et al. 2012). It comprises 71 financial data series for 203 countries and territories since 1960. It contains data on financial institution and market depth, access, stability and efficiency.

Then I add to the dataset a number of potentially valuable proxies accounting for institutional features of the countries and their banking systems. I include 1) monetary (*monfr*) and financial freedom (*finfr*) indices computed by *Heritage Foundation*; 2) KOF index of economic globalization (Dreher 2006); 3) credit depth of information and strength of legal rights indices as well as public credit registry and private credit bureau percentage coverage of adults, all the data retrieved from *Doing Business*; 4) a de-jure measure of financial openness (*kaopen*) (Chinn and Ito 2008); 5) three binary dummy variables accounting for OECD membership (*OECD_dummy*), the implementation of the EDIS (*EDIS_dummy*) and the existence of a unified financial regulator (*regulat_dummy*) (either the central bank or financial services authority (FSA)), the latter two coming from the *International Deposit Insurer Association* and the *World Bank Dataset on Supervisory Structures*. Conventional macroeconomic fundamentals – current account balance/GDP ratio, real interest rate, real effective exchange rate index (2005=100) and GDP per capita growth – have also been incorporated into the initial dataset. All the independent variables refer to the year preceding the outbreak of the banking crises[3].

To reduce the dimension of the initial dataset, I apply ANOVA test to find variables that best discriminate between the countries with and without the banking crisis. Of the feasible variables identified with ANOVA I keep in the analysis those with not more than 25% of missing observations. It is done to eliminate a possible

[3] This is the year 2007 for all the countries but the USA, the UK (2006) and Nigeria (2008).

bias towards developed countries in the sample as most of the data on financial stability and efficiency are available for these economies and are largely missing for developing ones. Finally I estimate logit models taking into account possible multicollinearity. The main criteria of the model selection are the area under the ROC curve and pseudo R^2.

Davis et. al (2011) argue that it may be naive and ultimately inappropriate to model the likelihood of banking crises in a cross–regional pool of countries as crisis determinants may substantially differ. To reconcile my analysis with the critique I verify the robustness of the results by applying random–effects logit models and a binary classification tree (BCT) algorithm[4]. The BCT is a non–parametric statistical method that, starting with the whole sample, compares all the possible proxies of banking crises at different threshold levels and selects an indicator (and its particular threshold) that best splits the sample into "purer" sub-samples, where the probability of the crisis increases or declines significantly compared with the sample average. The splitting process continues until terminal nodes are identified[5].

The BCT approach is useful when there are missing values of explanatory variables and extreme outliers in a dataset. Besides, it is instrumental in terms of multi-collinearity and nonlinear relationships between predictors. This methodology has been used to establish causes of currency and sovereign debt crises (Frankel and Wei 2004; Manasse and Roubini 2005) but to our knowledge there has been a single case of its application to banking crises (Duttagupta and Cashin 2011). As an alternative to standard regression methods, the BCT algorithm may yield results different from the traditional logit analysis. As an alternative to standard regression methods, the BCT algorithm may yield results different from the traditional logit analysis.

4. Results and Discussion

By means of ANOVA test 31 potential predictors of the banking crises have been identified (Appendix, Table A2, variables marked in green). The most unexpected result is that the macroeconomic fundamentals (current account balance/GDP ratio, real interest rate, real effective exchange rate index and GDP per capita annual growth) do not contribute to the discrimination between countries with and without banking crises. However, it may be due to the fact that the data refer to a single year preceding the crisis and does not rule out the significance of these variables if, for example, their averages for a longer pre-crisis period were used. Absolute values of GDP and GNP have intentionally been excluded from further analysis despite their statistical significance. These indicators merely reflect the concentration of the 2007–2011 crisis episodes in advanced economies. As a result, a positive correlation between absolute values of GDP and the occurrence of banking crises is observed. It hasn't been typical before and is unlikely to occur in the future. Had the variables been included in the logit analysis, they might have produced a distortionary effect by suppressing potentially relevant regressors.

[4] The algorithm was implemented using the SALFORD System CART software (http://www.salford-systems.com/products/cart).

[5] See Breiman et al. (1984) for an in–depth technical treatment of the BCT methodology.

Taking into account cross–correlations (Appendix, Table 3A) to avoid multicollinearity, I estimate different logit models and select three most appropriate on the basis of the area under the ROC curve and pseudo R^2. The reduced-form equations (only statistically significant predictors) are reported below.

Table 1

Estimation results – baseline (fixed-effects) logit models

Predictor	Model 1	Model 2	Model 3
Constant	–43.72** (–2.47)	–20.41*** (–2.85)	–14.43*** (–2.94)
Average consumer price index	0.35* (1.66)		0.21* (1.72)
Bank concentration	–0.13*** (–2.83)	–0.08** (–2.24)	–0.08*** (–2.86)
Bank credits to deposits	0.02* (1.92)	0.01* (1.68)	0.01** (1.99)
Bank private credit to GDP	0.04* (1.71)	0.05** (2.17)	0.05** (1.71)
Cost to income ratio	0.28*** (2.83)	0.23*** (2.68)	0.18*** (3.05)
Remittance inflows to GDP	–0.56* (-1.70)	–0.48* (-1.78)	–0.32* (-1.89)
Monetary freedom index	0.25* (1.79)		
KOF_index	0.15** (2.53)	0.10** (2.09)	
Private credit bureau coverage	–0.07** (–2.27)	–0.05** (–2.26)	
EDIS_dummy		2.51* (1.74)	
Bank concentration* *EDIS_dummy			0.04** (2.12)
Number of obs.	110	113	128
Number of crises	24	24	24
Number of non crises	86	89	104

Pseudo R^2	0.74	0.73	0.65
Area under the ROC curve	0.98	0.97	0.96
% crises correctly predicted	79.17	83.33	79.17
% non crises correctly predicted	97.67	98.88	98.08

Note: Z–values between brackets.

* Significance at 10 percent.

** Significance at 5 percent.

*** Significance at 1 percent.

Bank concentration and cost to income ratio in the banking sector appear to be the most robust predictors of the 2007–2011 international banking crises. A higher concentration in the banking system tends to curb its major players' risk–taking. The conclusion meshes well with the earlier cross–country research findings. Bank efficiency matters as cost to income ratio indicates: less cost efficient banking systems are more fragile. Bank private credit to GDP and credits to deposits ratio are also important crisis proxies across all the three specifications, though their overall statistical significance is weaker. Thus, excessive credit depth of an economy as well as a lack of banking sector liquidity increase the proneness towards crises while larger remittance inflows relative to GDP have a stabilizing effect. A higher degree of economic liberalization (KOF index, monetary freedom index), inflation and the implementation of deposit insurance undermine financial stability, whereas private credit information sharing deters banking crises. When a high bank concentration is complemented with an explicit deposit insurance scheme (Bank concentration*EDIS_dummy), it increases the probability of a banking crisis due to moral hazard and partly suppresses the positive effect of a high bank concentration when considered alone. In terms of the crisis it is likely to aggravate the "too big to fail" problem. This quantitative finding unambiguously supports the idea by Raghuram Rajan (2010) that deposit insurance should be phased out for major banks. This measure can mitigate the moral hazard problem and can also have a positive impact on the banking sector competition.

I check the robustness of the findings by computing random-effects versions of the above models. These models are aimed at accounting for sample heterogeneity that can make the results of the pooled models unreliable. The coefficients of random-effects logit models are reported below. They largely confirm the previous findings.

Table 2

Estimation results – random-effects logit models

Predictor	Model 1	Model 2	Model 3
Constant	–210.44* (–1.63)	–20.41*** (–2.85)	–14.43*** (–2.94)
Average consumer	1.06		0.21*

price index	(1.00)		(1.72)
Bank concentration	–0.77 (–1.56)	–0.83** (–2.24)	–0.08*** (–2.86)
Bank credits to deposits	0.14* (1.72)	0.14* (1.68)	0.01** (1.99)
Bank private credit to GDP	0.19 (1.00)	0.05** (2.17)	0.05*** (3.27)
Cost to income ratio	1.54* (1.66)	0.23*** (2.68)	0.18*** (3.05)
Remittance inflows to GDP	–4.68* (-1.80)	–0.48* (-1.78)	–0.32* (-1.89)
Monetary freedom index	1.10 (1.44)		
KOF_index	0.87* (1.77)	0.10** (2.09)	
Private credit bureau coverage	–0.42 (–1.47)	–0.05** (–2.26)	
EDIS_dummy		2.51* (1.74)	
Bank concentration* EDIS_dummy			0.04** (2.12)

Note: Z–values between brackets.

* Significance at 10 percent.

** Significance at 5 percent.

*** Significance at 1 percent.

Finally, I check the validity of the conclusions obtained via logit analysis by applying a binary classification tree algorithm. Again, I keep in the analysis the variables with not more than 25% of missing observations and exclude GDP–related indicators. No other prior filtering of the data is applied[6]. The results can be visualized as follows.

[6] ANOVA is redundant as reducing the dimension of the data is embedded in the BCT algorithm.

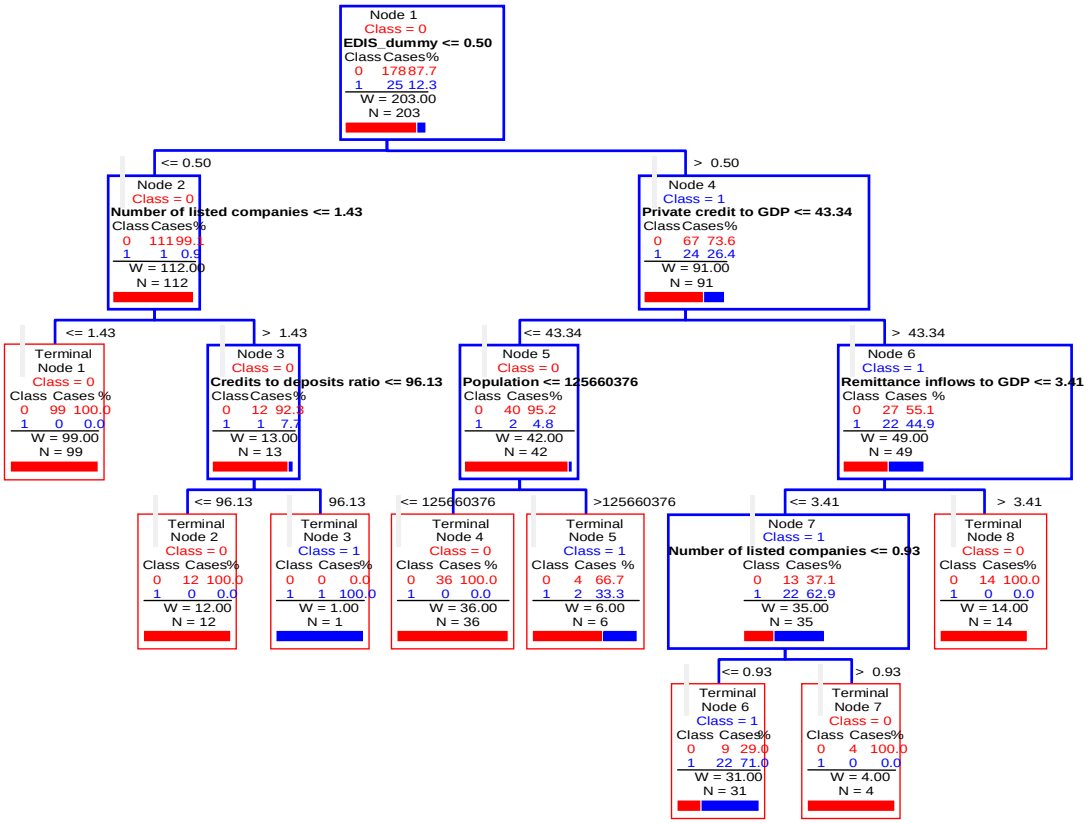

Figure 1. BCT analysis results.

The BCT algorithm identifies the implementation of the explicit deposit insurance scheme as the first–order sample splitter (node 1). Mongolia was the only country without the EDIS affected by the banking crisis. This crisis is related to a high credits to deposits ratio (node 3 and terminal node 3) which totaled 99.6% one year before the start of the crisis. The indicator reflects the adverse consequences of the credit boom in Mongolia in the 2000s when its domestic credit to GDP quadrupled while financial soundness of the banking system left much to desire (Rodolfo et. al 2013). The credit boom was fueled by high commodity prices as Mongolia is a typical resource rich economy.

The second–order splitter is private credit to GDP ratio. The threshold of the indicator is 43.34%: for 22 countries that experienced banking crises it was exceeded (node 4 and 5). It could be offset by higher values of remittance inflows to GDP if it is over 3.41% (node 6 and 8). However, if this condition doesn't hold, a deeper stock market (number of listed companies per 10k population) is associated with the deterrence of banking crises (less than 0.93). On the contrary, if this indicator is below the threshold, it increases the proneness towards the crisis (node 6 and 7 and terminal node 7).

There were two countries (Russia and Nigeria) that faced the crisis at a lower private credit to GDP ratio. They are identified with the population size within the framework of the BCT algorithm, which sheds little light on deeper causes of the crises in these countries (node 5 and terminal node 5). This result along with the

special case of Mongolia emphasizes the importance of specific research of the crisis anatomy in resource rich economies.

5. Concluding Remarks

The paper examines the causes of the 2007–2011 international banking crises using logit analysis and binary classification tree algorithm. Though the two methodologies conceptually differ, the results have much in common. The major determinants of the crises are related to excessive credit depth (private credit to GDP ratio) and low liquidity of the banking sector (credits to deposits ratio). Higher values of remittance inflows to GDP diminish the susceptibility to banking crises while explicit deposit insurance schemes fuel them. These are the findings consistent with both methodologies. Also, lower bank concentration and higher cost to income ratios are important pro–crisis factors. A higher level of economic liberalization tends to make economies more vulnerable to banking crises as well.

The findings of the paper are relevant to design efficient early warning indicators of banking crises as well as to improve the regulation of the sector at national and international levels, taking into account the lessons of the recent global financial crisis.

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Appendix

Table A1

Country	Start of crisis
Austria	2008
Belguim	2008
Denmark	2008
Germany	2008
Greece	2008
Iceland	2008
Ireland	2008
Kazakhstan	2008
Latvia	2008
Luxembourg	2008
Mongolia	2008
Netherlands	2008
Nigeria	2009
Spain	2008
Ukraine	2008
UK	2007
USA	2007
France	2008
Hungary	2008
Italy	2008
Portugal	2008
Russia	2008
Slovenia	2008
Sweden	2008
Switzerland	2008

Source: Laeven and Valencia (2012).

Table A2

Variable	Descriptive Statistics and ANOVA results					
	Valid N	Mean	Min	Max	Std.Dev.	ANOVA p-value
5-bank asset concentration (%)	139	75.7	28	100.0	17.5	0.000
Average Consumer Price Index (2005=100)	178	112.9	91	258.5	14.6	0.108
Average consumer price Index (annual % change)	176	5.9	-9	35.0	4.8	0.085
Bank accounts per 1000 adults (commercial banks-bank survey)	67	819.7	4	7293.6	1165.6	0.118
Bank branches per 100,000 adults (commercial banks)	120	18.3	0	98.0	18.5	0.000
Bank capital to total assets (%)	93	9.5	3	22.5	3.9	0.004
Bank concentration (%)	160	65.3	21	100.0	20.7	0.000
Bank credit to bank deposits (%)	178	99.5	19	858.5	80.9	0.000
Bank deposits to GDP (%)	169	51.4	5	575.9	56.5	0.000
Bank non-performing loans to gross loans (%)	93	4.0	0	25.6	4.5	0.033
Bank private credit to GDP (%)	171	49.5	2	335.5	50.9	0.000
Bank Z-score	180	17.8	-2	53.6	9.9	0.389
Boone indicator	172	-0.1	-2	1.6	0.3	0.723
Central bank assets to GDP (%)	146	5.1	0	151.3	13.4	0.209
Consolidated foreign claims of BIS-reporting banks to GDP (%)	178	156.2	0	13766.0	1062.4	0.987
Corporate bonds to total bonds and notes outstanding (%)	44	38.7	0	96.7	24.9	0.015
Cost to income ratio (%)	171	54.4	17	116.8	15.4	0.062
Credit to government and state-owned enterprises to GDP (%)	169	8.8	0	60.2	9.5	0.760
December Consumer Price Index (2005=100)	179	12343.4	94	2188589.0	163574.1	0.688
money bank assets to deposit money bank assets and central bank assets (%)	150	88.2	7	100.0	15.8	0.017
Deposit money bank assets to GDP (%)	171	56.7	3	335.5	50.9	0.000
Financial system deposits to GDP (%)	169	51.6	5	575.9	56.5	0.000
Firms with line of credit to total firms (all firms) (%)	11	26.5	4	67.3	18.5	n/a
GDP (Current USD)	194	2.85E+11	26980289	1.40E+13	1.15E+12	0.000
GDP per Capita (Constant 2000 USD)	191	8867.3	98	98397.1	14445.0	0.000
GDP per capita (current US$)	194	14282.5	165	169269.6	23571.1	0.000
GNI (Current USD)	193	2.86E+11	48174819	1.41E+13	1.17E+12	0.000
Gross portfolio debt liabilities to GDP (%)	82	17.6	0	263.7	34.8	0.000
Gross portfolio equity assets to GDP (%)	84	16.1	0	248.5	36.9	0.000
Gross portfolio equity liabilities to GDP (%)	77	15.8	0	209.4	32.9	0.042
Insurance company assets to GDP (%)	112	14.9	0	100.3	23.1	0.000
International debt issues to GDP (%)	98	30.8	0	328.9	47.2	0.000
Lending-deposit spread (%)	137	7.6	0	33.1	5.7	0.059
Lerner index	120	0.3	0	0.7	0.1	0.003
Life insurance premium volume to GDP (%)	78	3.1	0	31.3	4.8	0.005
Liquid assets to deposits and short term funding (%)	169	39.3	8	89.0	17.6	0.216
Liquid liabilities in millions 2000 USD	176	256456.3	44	8537822.0	996428.7	0.000
Liquid liabilities to GDP (%)	170	56.9	6	380.3	46.5	0.000
Loans from non-resident banks (amounts outstanding) to GDP (%)	181	147.4	0	11570.1	909.8	0.896
Loans from non-resident banks (net) to GDP (%)	49	1.3	0	8.6	1.6	0.185
Mutual fund assets to GDP (%)	59	122.2	0	5232.8	681.6	0.145
Net interest margin (%)	168	3.6	-4	12.1	2.3	0.000
Non-bank financial institutions assets to GDP (%)	43	4705.1	0	201670.7	30752.2	0.790
Non-interest income to total income (%)	168	40.0	11	195.2	20.1	0.305
Non-Life insurance premium volume to GDP (%)	78	2.1	0	8.9	1.4	0.000
Number of listed companies per 10,000 people	111	0.3	0	2.5	0.5	0.881
Offshore bank deposits to domestic bank deposits (%)	159	159.8	0	14939.1	1200.3	0.531
Outstanding domestic private debt securities to GDP (%)	46	35.0	0	303.4	51.5	0.002
Outstanding domestic public debt securities to GDP (%)	50	34.0	3	157.3	24.5	0.678
Outstanding international private debt decurities to GDP (%)	64	26.2	0	305.4	47.2	0.000
Outstanding international public debt securities to GDP (%)	77	8.0	0	46.6	9.5	0.379
Overhead costs to total assets (%)	155	3.19	-0	10.4	2.1	0.003
Pension fund assets to GDP (%)	62	22.34	0	128.8	31.8	0.166
Percentage of foreign bank assets among total bank assets (%)	129	38.26	0	100.0	33.0	0.005
Percentage of foreign banks among total banks (%)	136	41.77	0	100.0	27.9	0.063
Population, Total	203	3.26E+07	9762	1.32E+09	1.28E+08	0.678
credit by deposit money banks and other financial institutions to GDP (%)	171	52.44	2	335.5	54.4	0.000
Provisions to non-performing loans (%)	87	83.15	7	209.8	45.3	0.603
Regulatory capital to risk-weighted assets (%)	97	14.90	8	35.0	4.4	0.001
Remittance inflows to GDP (%)	158	5.20	0	45.5	7.7	0.004
Return on assets (%)	182	1.63	-1	5.8	1.0	0.000
Return on equity (%)	182	16.27	-47	70.1	10.7	0.045
Small firms with line of credit to total small firms (%)	11	20.29	3	60.2	18.2	n/a
Stock market capitalization to GDP (%)	100	297.37	1	22306.3	2224.3	0.600
Stock market total value traded to GDP (%)	98	59.68	0	754.0	105.7	0.068
Stock market turnover ratio (value traded/capitalization) (%)	96	66.76	0	271.7	69.0	0.001
Value traded of top 10 traded companies to total value traded (%)	43	52.81	13	97.8	21.6	0.069
Volatility of stock price index	82	22.48	9	55.8	9.2	0.436
OECD_dummy	203	0.17	0	1.0	0.4	0.000
regulat_dummy	203	0.13	0	1.0	0.3	0.000
Current account balance (% of GDP)	162	-3.31	-45	39.7	13.3	0.455
Real interest rate (%)	147	5.53	-8	35.8	6.7	0.136
Real effective exchange rate index (2005 = 100)	94	102.61	83	126.2	7.2	0.716
GDP per capita growth (annual %)	192	4.39	-11	23.6	4.4	0.584
monfr	155	74.81	0	94.3	9.0	0.012
finfr	155	51.94	10	90.0	19.0	0.000
kof_index	150	62.99	24	96.4	17.2	0.000
kaopen	177	0.49	-2	2.5	1.7	0.000
Credit depth of information index (0=low to 6=high)	179	2.63	0	6.0	2.2	0.000
Private credit bureau coverage (% of adults)	174	19.12	0	100.0	31.1	0.004
Public credit registry coverage (% of adults)	175	4.23	0	67.1	10.1	0.012
Strength of legal rights index (0=weak to 10=strong)	179	5.23	0	10.0	2.5	0.002
EDIS_dummy	203	0.45	0	1.0	0.5	0.000

Table A3

Variable	Correlations Marked correlations are significant at p < .05000 N=91 (Casewise deletion of missing data)																															
	Aver consur Index (chang	Ban conce (%)	Bank to ba depos	Bar depo GDI	Bank cred GDF	Cos inco ratio	Deposi bank a deposit bank as central assets	Depo mone assets (%)	Finar syste depo GDF	GD (Cur USI	GDF Cap (Con 2000	GDI cap (cur US	GN (Cur USI	Liqu liabili millio USI	Liqu liabil GDF	Net i marg	Over cost total (%)	Private deposit banks a financ institut GDP	Remi inflo GDF	Retu asse	Retu equit	OEC my	regula my	mo	fin	kof_	kao	Credi of inf index to 6=	Private bureau (% of	Public regis covera adul	Streng legal index to 10=	EDIS_
Average consumer price Index (annual % chang	1.0	-0.0	-0.1	-0.5	-0.4	-0.	-0.3	-0.5	-0.5	-0.2	-0.4	-0.4	-0.2	-0.3	-0.5	0.5	0.4	-0.4	0.2	0.4	0.2	-0.4	-0.1	-0.	-0.	-0.2	-0.	-0.2	-0.2	-0.1	-0.1	0.1
Bank concentration (%)	-0.0	1.0	-0.1	-0.	-0.2	0.1	-0.3	-0.2	-0.1	-0.4	-0.2	-0.	-0.4	-0.4	-0.2	0.1	0.2	-0.2	0.1	0.2	0.3	-0.2	-0.1	0.1	-0.	-0.0	0.0	-0.3	-0.2	-0.1	-0.2	-0.4
Bank credit to bank deposits (%)	-0.1	-0.1	1.0	0.0	0.4	-0.	0.3	0.4	-0.0	0.0	0.2	0.2	0.0	0.0	0.2	-0.3	-0.	0.4	-0.0	-0.	-0.0	0.2	0.2	0.1	0.2	0.3	0.0	0.3	0.1	0.0	0.2	0.1
Bank deposits to GDP (%)	-0.5	-0.1	0.0	1.0	0.8	0.0	0.3	0.9	1.0	0.4	0.8	0.7	0.4	0.5	0.9	-0.6	-0.(	0.8	-0.2	-0.	-0.	0.7	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.2	0.4	0.3
Bank private credit to GDP (%)	-0.4	-0.2	0.4	0.8	1.0	0.0	0.4	1.0	0.8	0.3	0.8	0.8	0.3	0.3	0.8	-0.6	-0.(	0.9	-0.3	-0.	-0.	0.8	0.4	0.5	0.6	0.6	0.4	0.5	0.4	0.1	0.4	0.2
Cost to income ratio (%)	-0.1	0.1	-0.1	0.0	0.0	1.0	-0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.0	-0.(	0.1	0.5	0.0	0.0	-0.	-0.	0.1	0.1	0.1	0.1	-0.(	0.1	0.1	0.1	0.0	0.0	0.0
Deposit money bank assets to deposit money bar	-0.3	-0.3	0.3	0.3	0.4	-0.	1.0	0.4	0.3	0.1	0.3	0.4	0.1	0.1	0.3	-0.3	-0.(	0.4	-0.3	-0.	-0.	0.3	0.1	0.3	0.3	0.4	0.0	0.2	0.1	-0.0	0.3	0.2
Deposit money bank assets to GDP (%)	-0.5	-0.2	0.4	0.9	1.0	0.0	0.4	1.0	0.9	0.3	0.8	0.8	0.3	0.4	0.9	-0.7	-0.7	0.9	-0.3	-0.	-0.	0.8	0.4	0.5	0.6	0.6	0.4	0.4	0.4	0.1	0.4	0.3
Financial system deposits to GDP (%)	-0.5	-0.1	-0.(	1.0	0.8	0.1	0.3	0.9	1.0	0.4	0.8	0.7	0.4	0.5	0.9	-0.6	-0.(	0.8	-0.2	-0.	-0.	0.7	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.2	0.4	0.3
GDP (Current USD)	-0.2	-0.4	0.0	0.4	0.3	0.0	0.1	0.3	0.4	1.0	0.5	0.4	1.0	0.9	0.4	-0.3	-0.	0.5	-0.2	-0.	-0.	0.4	0.1	0.3	0.2	0.1	0.2	0.3	0.3	0.0	0.2	0.2
GDP per Capita (Constant 2000 USD)	-0.4	-0.2	0.2	0.8	0.8	0.1	0.3	0.8	0.8	0.5	1.0	1.0	0.5	0.6	0.7	-0.6	-0.	0.8	-0.4	-0.	-0.	0.9	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.1	0.4	0.3
GDP per capita (current US$)	-0.4	-0.1	0.2	0.7	0.8	0.1	0.4	0.8	0.7	0.4	1.0	1.0	0.4	0.4	0.6	-0.6	-0.(	0.8	-0.4	-0.	-0.	0.9	0.5	0.6	0.7	0.7	0.5	0.4	0.5	0.1	0.4	0.3
GNI (Current USD)	-0.2	-0.4	0.0	0.4	0.3	0.0	0.1	0.3	0.4	1.0	0.5	0.4	1.0	0.9	0.4	-0.3	-0.	0.5	-0.2	-0.	-0.	0.4	0.1	0.3	0.2	0.1	0.2	0.3	0.3	0.0	0.2	0.2
Liquid liabilities in millions 2000 USD	-0.3	-0.4	0.0	0.5	0.3	0.0	0.1	0.4	0.5	0.9	0.6	0.4	0.9	1.0	0.6	-0.3	-0.	0.6	-0.2	-0.	-0.(	0.4	0.2	0.3	0.2	0.1	0.2	0.3	0.3	0.0	0.2	0.2
Liquid liabilities to GDP (%)	-0.5	-0.2	0.2	0.9	0.8	-0.(	0.3	0.9	0.9	0.4	0.7	0.6	0.4	0.6	1.0	-0.6	-0.	0.8	-0.1	-0.	-0.	0.6	0.3	0.5	0.4	0.4	0.3	0.3	0.3	0.1	0.3	0.2
Net interest margin (%)	0.5	0.1	-0.3	-0.(	-0.6	0.1	-0.3	-0.7	-0.6	-0.3	-0.6	-0.(	-0.3	-0.3	-0.6	1.0	0.7	-0.6	0.2	0.5	0.1	-0.6	-0.2	-0.	-0.	-0.5	-0.	-0.3	-0.4	-0.2	-0.2	-0.2
Overhead costs to total assets (%)	0.4	0.2	-0.3	-0.(	-0.6	0.5	-0.6	-0.7	-0.6	-0.2	-0.5	-0.(	-0.2	-0.3	-0.7	0.7	1.0	-0.6	0.2	0.5	0.2	-0.5	-0.2	-0.	-0.	-0.4	-0.	-0.2	-0.2	-0.1	-0.2	-0.2
Private credit by deposit money banks and other	-0.4	-0.2	0.4	0.8	0.9	0.0	0.4	0.9	0.8	0.5	0.8	0.8	0.5	0.6	0.8	-0.6	-0.(	1.0	-0.3	-0.	-0.	0.8	0.4	0.5	0.6	0.6	0.4	0.5	0.5	0.1	0.5	0.2
Remittance inflows to GDP (%)	0.2	0.1	-0.(	-0.2	-0.3	0.0	-0.3	-0.3	-0.2	-0.2	-0.4	-0.4	-0.2	-0.2	-0.1	0.2	0.2	-0.3	1.0	0.3	-0.	-0.4	-0.1	-0.	-0.	-0.2	-0.(	-0.2	-0.2	-0.1	-0.1	-0.0
Return on assets (%)	0.4	0.2	-0.2	-0.5	-0.5	-0.	-0.3	-0.5	-0.5	-0.2	-0.5	-0.	-0.2	-0.3	-0.5	0.5	0.5	-0.5	0.3	1.0	0.5	-0.4	-0.2	-0.	-0.	-0.1	-0.	-0.2	-0.2	-0.1	-0.1	-0.1
Return on equity (%)	0.2	0.3	-0.(	-0.2	-0.1	-0.2	-0.1	-0.1	-0.2	-0.1	-0.1	-0.	-0.1	-0.0	-0.2	0.1	0.2	-0.1	-0.1	0.5	1.0	-0.1	0.0	-0.	0.1	0.1	0.1	0.0	0.1	-0.0	-0.1	-0.0
OECD_dummy	-0.4	-0.2	0.2	0.7	0.8	0.1	0.3	0.8	0.7	0.4	0.9	0.9	0.4	0.4	0.6	-0.6	-0.5	0.8	-0.4	-0.4	-0.	1.0	0.4	0.5	0.6	0.6	0.5	0.4	0.5	0.2	0.4	0.3
regulat_dummy	-0.1	-0.1	0.2	0.4	0.4	0.1	0.1	0.4	0.4	0.1	0.4	0.5	0.1	0.2	0.3	-0.2	-0.2	0.4	-0.1	-0.2	0.0	0.4	1.0	0.3	0.4	0.4	0.3	0.4	0.4	0.1	0.2	0.3
monfr	-0.7	0.1	0.1	0.5	0.5	0.1	0.3	0.5	0.5	0.3	0.6	0.6	0.3	0.3	0.5	-0.3	-0.4	0.5	-0.2	-0.	-0.	0.5	0.3	1.0	0.6	0.3	0.3	0.2	0.3	-0.0	0.3	0.1
finfr	-0.4	-0.1	0.2	0.5	0.6	0.1	0.3	0.6	0.5	0.2	0.6	0.7	0.2	0.2	0.4	-0.3	-0.	0.6	-0.2	-0.	0.1	0.6	0.4	0.6	1.0	0.7	0.6	0.4	0.4	0.1	0.5	0.2
kof_index	-0.2	-0.0	0.3	0.5	0.6	-0.(	0.4	0.6	0.5	0.1	0.6	0.7	0.1	0.1	0.4	-0.5	-0.4	0.6	-0.2	-0.	0.1	0.6	0.4	0.3	0.7	1.0	0.7	0.5	0.4	0.2	0.4	0.3
kaopen	-0.2	0.0	0.0	0.4	0.4	0.1	0.0	0.4	0.4	0.2	0.5	0.5	0.2	0.2	0.3	-0.4	-0.2	0.4	-0.0	-0.	0.1	0.5	0.3	0.3	0.6	0.7	1.0	0.4	0.4	0.2	0.2	0.3
Credit depth of information index (0=low to 6=h	-0.2	-0.3	0.3	0.4	0.5	0.1	0.2	0.4	0.4	0.3	0.5	0.4	0.3	0.3	0.3	-0.3	-0.2	0.5	-0.2	-0.2	0.0	0.4	0.4	0.2	0.4	0.5	0.4	1.0	0.7	0.3	0.2	0.2
Private credit bureau coverage (% of adults)	-0.2	-0.2	0.1	0.4	0.4	0.1	0.1	0.4	0.4	0.3	0.5	0.5	0.3	0.3	0.3	-0.4	-0.2	0.5	-0.2	-0.2	0.1	0.5	0.4	0.3	0.4	0.4	0.4	0.7	1.0	0.0	0.3	0.1
Public credit registry coverage (% of adults)	-0.1	-0.1	0.0	0.2	0.1	0.0	-0.0	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.1	-0.2	-0.1	0.1	-0.1	-0.	-0.(	0.2	0.1	-0.(	0.1	0.2	0.2	0.3	0.0	1.0	-0.2	0.2
Strength of legal rights index (0=weak to 10=str	-0.1	-0.2	0.2	0.4	0.4	0.0	0.3	0.4	0.4	0.2	0.4	0.4	0.2	0.2	0.3	-0.2	-0.2	0.5	-0.1	-0.	-0.	0.4	0.2	0.3	0.5	0.4	0.2	0.2	0.3	-0.2	1.0	0.2
EDIS_dummy	0.1	-0.4	0.1	0.3	0.2	0.0	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	-0.2	-0.2	0.2	-0.0	-0.	-0.(	0.3	0.3	0.1	0.2	0.3	0.3	0.2	0.1	0.2	0.2	1.0