

# Online Appendix to Evaluating Indicators for Use in Setting the Countercyclical Capital Buffer

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## *Crisis-Signaling Performance Results for All Indicators and Their Transformations*

The following information pertains to all tables (A1–A7) in this appendix.

The indicators and the transformations are defined in table 2 and equations (3)–(10) in the main part of the paper, respectively. Sign + (–) indicates that larger (smaller) values of indicator signal a financial crisis.  $KK_i$  are the indicators proposed by Kauko (2012a); see equations (1) and (2) in section 2.2.

The “AUC” column reports the area under the ROC curve ( $0.5 \leq \text{AUC} \leq 1$ ); larger AUC is better.

The “Logit” column reports the statistical significance of the respective coefficient in univariate logit model. \*, \*\*, and \*\*\* denote statistical significance with the expected sign at the 10 percent, 5 percent, and 1 percent significance level, respectively, based on clustered bootstrap estimation. † replaces \* where the sign is unexpected.

The “ $U_r$ ” and “ $U_{r,o}$ ” columns report the full-sample and out-of-sample relative usefulness, respectively, with policy preference  $\theta = 0.5$  or, equivalently,  $\mu = 0.9$  ( $U_r \leq 1$ ); larger  $U_r$  is better. FNR and FPR are the false negative rate and false positive rate, respectively.

$N$ ,  $N_c$ , and  $N_f$  are the number of observations, countries, and financial crises, respectively.

Full-sample results are for 1970–2012; out-of-sample results are for 2000–12. All indicators are quasi-real time with a one-quarter publication lag. Crisis data set is Detken et al. (2014); prediction horizon is one to three years.

Table A1. Performance Evaluation for Measures of Credit Developments

Indicator	Transformation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation							
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
1.1. Real Total Credit		+	0.70***	***	0.38	0.30	0.32	1312	15	15	0.18	0.35	0.47	475	15	9
1.1.1.	1y Growth	+	0.69***	***	0.30	0.07	0.63	1262	15	14	0.24	0.01	0.75	471	15	9
1.1.2.	3y Growth	+	0.67***	**	0.26	0.01	0.73	1172	15	12	-0.05	0.48	0.57	463	15	9
1.1.3.	Relative Gap	+	0.75***	***	0.41	0.01	0.58	1096	15	12	0.11	0.69	0.20	456	15	9
1.2. Real Total Bank Credit		+	0.71***	***	0.34	0.51	0.15	1293	15	15	0.12	0.42	0.46	475	15	9
1.2.1.	1y Growth	+	0.71***	***	0.37	0.14	0.49	1243	15	14	0.33	0.09	0.58	471	15	9
1.2.2.	3y Growth	+	0.73***	***	0.40	0.07	0.52	1153	15	12	0.23	0.13	0.64	463	15	9
1.2.3.	Relative Gap	+	0.79***	***	0.51	0.04	0.45	1077	15	12	-0.12	0.64	0.48	456	15	9
1.3. Real Household Credit		+	0.65***	**	0.25	0.16	0.59	1011	15	15	0.15	0.35	0.50	458	15	9
1.3.1.	1y Growth	+	0.66***	*	0.27	0.23	0.50	961	15	14	0.17	0.03	0.81	450	15	9
1.3.2.	3y Growth	+	0.71***	***	0.37	0.20	0.42	874	15	12	0.05	0.61	0.34	434	15	9
1.3.3.	Relative Gap	+	0.7***	***	0.41	0.06	0.53	798	15	12	0.18	0.17	0.65	417	15	9
1.4. Real Corporate Credit		+	0.61***	**	0.25	0.52	0.22	1011	15	15	0.04	0.53	0.43	458	15	9
1.4.1.	1y Growth	+	0.69***	***	0.29	0.29	0.43	961	15	14	0.21	0.08	0.71	450	15	9
1.4.2.	3y Growth	+	0.57*		0.14	0.17	0.69	874	15	12	0.02	0.17	0.81	434	15	9
1.4.3.	Relative Gap	+	0.58*		0.17	0.11	0.72	798	15	12	-0.24	0.66	0.58	417	15	9
1.5. Total Credit / GDP		+	0.72***	*	0.40	0.23	0.37	2114	18	22	0.04	0.00	0.96	577	18	11
1.5.1.	1y Difference	+	0.78***	***	0.49	0.28	0.23	2042	18	22	0.28	0.03	0.68	573	18	11
1.5.2.	3y Difference	+	0.80***	***	0.50	0.17	0.34	1899	18	20	0.20	0.06	0.74	565	18	11
1.5.3.	1y Growth	+	0.58*		0.15	0.19	0.66	2042	18	22	0.05	0.42	0.53	573	18	11
1.5.4.	3y Growth	+	0.55		0.12	0.01	0.87	1899	18	20	0.02	0.39	0.59	565	18	11
1.5.5.	Trend Gap	+	0.82***	***	0.53	0.24	0.23	1787	18	20	0.32	0.07	0.61	558	18	11
1.5.6.	Relative Gap	+	0.72***	***	0.35	0.13	0.53	1787	18	20	0.08	0.40	0.52	558	18	11
1.5.7.	5y M.A. Gap	+	0.81***	***	0.52	0.13	0.35	1787	18	20	0.25	0.01	0.74	558	18	11
1.5.8.	KK <sub>1</sub>	+	0.80***	***	0.53	0.31	0.16	2042	18	22	0.31	0.00	0.69	573	18	11
1.5.9.	KK <sub>2</sub>	+	0.79***	***	0.50	0.28	0.23	2054	18	22	0.18	0.00	0.82	573	18	11

(continued)

Table A1. (Continued)

Indicator	Transformation	Sign	Full-Sample Evaluation							Out-of-Sample Evaluation						
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
1.6. Total Bank Credit / GDP																
1.6.1.	1y Difference	+	0.74***	***	0.39	0.10	0.51	2082	18	22	0.13	0.00	0.87	577	18	11
1.6.2.	3y Difference	+	0.78***	***	0.53	0.31	0.16	2010	18	22	0.37	0.05	0.58	573	18	11
1.6.3.	1y Growth	+	0.84***	***	0.60	0.17	0.23	1867	18	20	0.32	0.11	0.57	565	18	11
1.6.4.	3y Growth	+	0.60**		0.16	0.27	0.56	2010	18	22	0.24	0.41	0.35	573	18	11
1.6.5.	Trend Gap	+	0.60*		0.19	0.11	0.71	1867	18	20	0.25	0.26	0.49	565	18	11
1.6.6.	Relative Gap	+	0.83***	***	0.55	0.26	0.19	1755	18	20	0.29	0.31	0.41	558	18	11
1.6.7.	5y M.A. Gap	+	0.74***	***	0.37	0.25	0.38	1755	18	20	0.25	0.29	0.45	558	18	11
1.6.8.	KK <sub>1</sub>	+	0.84***	***	0.60	0.17	0.23	1755	18	20	0.35	0.06	0.59	558	18	11
1.6.9.	KK <sub>2</sub>	+	0.80***	***	0.55	0.22	0.24	2010	18	22	0.38	0.08	0.53	573	18	11
1.7. Total Household Credit / GDP																
1.7.1.	1y Difference	+	0.80***	***	0.55	0.20	0.25	2022	18	22	0.37	0.02	0.61	573	18	11
1.7.2.	3y Difference	+	0.72***	***	0.37	0.54	0.09	1436	18	20	0.19	0.04	0.77	560	18	11
1.7.3.	1y Growth	+	0.86***	***	0.51	0.20	0.29	1368	18	20	0.38	0.02	0.60	552	18	11
1.7.4.	3y Growth	+	0.58*		0.19	0.26	0.55	1368	18	20	0.13	0.32	0.56	552	18	11
1.7.5.	Trend Gap	+	0.60**		0.26	0.05	0.69	1240	18	18	0.27	0.00	0.73	536	18	11
1.7.6.	Relative Gap	+	0.83***	***	0.57	0.19	0.23	1135	17	18	0.42	0.03	0.54	516	17	11
1.7.7.	5y M.A. Gap	+	0.71***	***	0.37	0.16	0.47	1135	17	18	0.29	0.18	0.53	516	17	11
1.7.8.	KK <sub>1</sub>	+	0.85***	***	0.61	0.14	0.25	1135	17	18	0.50	0.02	0.47	516	17	11
1.7.9.	KK <sub>2</sub>	+	0.82***	***	0.55	0.29	0.16	1368	18	20	0.47	0.03	0.50	552	18	11
1.8. Total Corporate Credit / GDP																
1.8.1.	1y Difference	+	0.71***	***	0.35	0.16	0.49	1424	18	19	0.13	0.00	0.87	560	18	11
1.8.2.	3y Difference	+	0.74***	***	0.41	0.31	0.28	1356	18	19	0.24	0.20	0.56	552	18	11
1.8.3.	1y Growth	+	0.65***	***	0.23	0.31	0.45	1227	18	18	-0.05	0.37	0.68	536	18	11
1.8.4.	3y Growth	+	0.62***	*	0.20	0.17	0.63	1356	18	19	0.11	0.59	0.30	552	18	11
1.8.5.	Trend Gap	+	0.54		0.10	0.76	0.14	1227	18	18	-0.05	0.56	0.49	536	18	11
1.8.6.	Relative Gap	+	0.66***	***	0.28	0.29	0.42	1115	17	18	0.11	0.33	0.56	516	17	11
1.8.7.	5y M.A. Gap	+	0.64***	***	0.27	0.11	0.62	1115	17	18	0.16	0.21	0.63	516	17	11
1.8.8.	KK <sub>1</sub>	+	0.67***	***	0.29	0.26	0.46	1115	17	18	0.06	0.28	0.66	516	17	11
1.8.9.	KK <sub>2</sub>	+	0.77***	***	0.42	0.20	0.39	1356	18	19	0.30	0.16	0.54	552	18	11

See page 1 of this appendix for notes.

Table A2. Performance Evaluation for Measures of Private-Sector Debt Burden

Indicator	Transformation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation							
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
2.1. Debt-Service Ratio																
2.1.1.	1y Difference	+	0.60**	**	0.22	0.57	0.21	2256	26	27	0.01	0.33	0.66	784	26	16
2.1.2.	3y Difference	+	0.78***	***	0.42	0.36	0.22	2161	26	26	0.26	0.09	0.65	764	26	16
2.1.3.	1y Growth	+	0.76***	**	0.40	0.15	0.45	1966	24	23	0.11	0.19	0.70	724	24	15
2.1.4.	3y Growth	+	0.74***	**	0.38	0.11	0.51	2161	26	26	0.22	0.09	0.69	764	26	16
2.1.5.	Trend Gap	+	0.73***	***	0.37	0.16	0.47	1966	24	23	0.08	0.20	0.72	724	24	15
2.1.6.	Relative Gap	+	0.72***	***	0.32	0.13	0.55	1817	22	22	0.20	0.15	0.65	694	22	14
2.1.7.	5y M.A. Gap	+	0.70***	**	0.32	0.13	0.55	1817	22	22	0.15	0.17	0.68	694	22	14
2.2. Corporate Debt-Service Ratio																
2.2.1.	1y Difference	+	0.77***	**	0.41	0.20	0.39	1817	22	22	0.15	0.14	0.71	694	22	14
2.2.2.	3y Difference	+	0.60**		0.21	0.29	0.50	1058	25	19	0.14	0.40	0.46	649	25	13
2.2.3.	1y Growth	+	0.73***	***	0.39	0.28	0.33	967	25	17	0.20	0.03	0.77	599	25	13
2.2.4.	3y Growth	+	0.69***	***	0.30	0.41	0.29	798	21	14	0.19	0.06	0.75	499	21	11
2.2.5.	Trend Gap	+	0.73***	***	0.37	0.33	0.30	967	25	17	0.22	0.03	0.75	599	25	13
2.2.6.	Relative Gap	+	0.68***	***	0.26	0.43	0.30	798	21	14	0.10	0.35	0.55	499	21	11
2.2.7.	5y M.A. Gap	+	0.64*	*	0.28	0.17	0.56	673	19	13	0.14	0.20	0.66	431	19	10
2.3. Household Debt-Service Ratio																
2.3.1.	1y Difference	+	0.62*	***	0.26	0.19	0.55	673	19	13	0.01	0.37	0.62	431	19	10
2.3.2.	3y Difference	+	0.72***	***	0.35	0.34	0.30	673	19	13	0.10	0.04	0.86	431	19	10
2.3.3.	1y Growth	+	0.66**	***	0.29	0.31	0.40	1046	25	19	0.18	0.33	0.49	649	25	13
2.3.4.	3y Growth	+	0.75***	***	0.37	0.29	0.34	952	25	18	0.21	0.00	0.79	599	25	13
2.3.5.	Trend Gap	+	0.77***	***	0.45	0.45	0.10	775	21	15	0.17	0.00	0.83	499	21	11
2.3.6.	Relative Gap	+	0.68***	***	0.30	0.05	0.64	952	25	18	0.20	0.00	0.80	599	25	13
2.3.7.	5y M.A. Gap	+	0.68***	**	0.26	0.27	0.47	775	21	15	0.10	0.00	0.90	499	21	11
		+	0.70***	***	0.38	0.04	0.58	650	19	14	0.30	0.04	0.66	428	19	10
		+	0.64*	***	0.40	0.05	0.55	650	19	14	0.27	0.03	0.70	428	19	10
		+	0.78***	***	0.43	0.43	0.14	650	19	14	0.19	0.00	0.81	428	19	10

(continued)

Table A2. (Continued)

Indicator	Transfor- mation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation							
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
2.4. Household Credit × 10y Rate / GDP		+	0.66***	**	0.33	0.35	0.32	951	18	17	0.41	0.42	0.17	539	18	11
2.4.1.	1y Difference	+	0.61***	***	0.23	0.56	0.21	893	18	15	-0.12	0.44	0.68	522	18	11
2.4.2.	3y Difference	+	0.68***	***	0.34	0.28	0.38	788	17	14	0.23	0.34	0.44	481	17	11
2.4.3.	1y Growth	+	0.59***	**	0.18	0.53	0.29	893	18	15	0.09	0.03	0.87	522	18	11
2.4.4.	3y Growth	+	0.65***	**	0.32	0.28	0.40	788	17	14	0.20	0.32	0.48	481	17	11
2.4.5.	Trend Gap	+	0.56		0.14	0.64	0.22	694	17	13	0.10	0.00	0.90	443	17	11
2.4.6.	Relative Gap	+	0.51		0.08	0.54	0.38	694	17	13	0.02	0.00	0.98	443	17	11
2.4.7.	5y M.A. Gap	+	0.67***	***	0.32	0.44	0.24	694	17	13	-0.14	0.56	0.58	443	17	11
2.5. Household Credit × 3m Rate / GDP		+	0.60**	*	0.20	0.27	0.52	1328	25	21	0.23	0.54	0.24	738	25	15
2.5.1.	1y Difference	+	0.71***	***	0.29	0.26	0.45	1240	25	21	0.14	0.06	0.81	696	25	15
2.5.2.	3y Difference	+	0.70***	***	0.31	0.35	0.34	1065	25	20	0.03	0.40	0.57	610	25	14
2.5.3.	1y Growth	+	0.70***	***	0.31	0.41	0.28	1240	25	21	0.20	0.08	0.72	696	25	15
2.5.4.	3y Growth	+	0.69***	***	0.31	0.25	0.44	1065	25	20	0.16	0.09	0.75	610	25	14
2.5.5.	Trend Gap	+	0.68**	**	0.31	0.41	0.28	906	25	19	0.13	0.16	0.72	528	25	14
2.5.6.	Relative Gap	+	0.66***	**	0.31	0.26	0.43	906	25	19	0.17	0.07	0.76	528	25	14
2.5.7.	5y M.A. Gap	+	0.74***	***	0.37	0.27	0.36	906	25	19	0.18	0.17	0.65	528	25	14

See page 1 of this appendix for notes.

**Table A3. Performance Evaluation for Measures of Potential Overvaluation of Property Prices**

Indicator	Transfor- mation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation								
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>r</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>r</sub>	
3.1 Real House Price																	
3.1.1.	1y Growth	+	0.72***	*	0.39	0.25	0.36	1649	19	22	0.12	0.00	0.88	528	19	12	
3.1.2.	3y Growth	+	0.61**	*	0.20	0.59	0.21	1573	19	22	0.00	0.71	0.30	507	19	12	
3.1.3.	Relative Gap	+	0.67***	**	0.30	0.43	0.27	1429	16	20	0.14	0.42	0.44	465	16	11	
3.2. House Price / Rent																	
3.2.1.	1y Difference	+	0.69***	***	0.26	0.60	0.14	1324	15	20	-0.03	0.22	0.81	437	15	11	
3.2.2.	3y Difference	+	0.74***	*	0.40	0.21	0.38	1501	19	21	0.15	0.00	0.85	547	19	12	
3.2.3.	1y Growth	+	0.64**	**	0.27	0.57	0.16	1428	19	21	0.09	0.52	0.39	526	19	12	
3.2.4.	3y Growth	+	0.70***	***	0.34	0.42	0.24	1286	17	20	0.16	0.37	0.47	483	17	12	
3.2.5.	Trend Gap	+	0.62**	**	0.21	0.58	0.21	1428	19	21	-0.03	0.67	0.35	526	19	12	
3.2.6.	Relative Gap	+	0.68***	***	0.32	0.50	0.18	1286	17	20	0.15	0.42	0.42	483	17	12	
3.2.7.	5y M.A. Gap	+	0.72***	***	0.37	0.54	0.09	1174	16	20	0.03	0.28	0.69	448	16	12	
3.2.8.	Avg. Gap	+	0.68***	***	0.26	0.54	0.20	1174	16	20	-0.03	0.28	0.75	448	16	12	
3.3. House Price / Income																	
3.3.1.	1y Difference	+	0.71***	***	0.36	0.46	0.18	1174	16	20	0.07	0.36	0.57	448	16	12	
3.3.2.	3y Difference	+	0.74***	***	0.45	0.38	0.16	1174	16	20	0.25	0.15	0.60	448	16	12	
3.3.3.	1y Growth	+	0.75***	**	0.39	0.39	0.23	1487	20	21	0.15	0.00	0.85	584	20	12	
3.3.4.	3y Growth	+	0.69***	***	0.33	0.50	0.18	1410	20	21	0.30	0.44	0.26	563	20	12	
3.3.5.	Trend Gap	+	0.77***	***	0.45	0.38	0.18	1260	18	19	0.26	0.27	0.47	512	18	12	
3.3.6.	Relative Gap	+	0.75***	***	0.29	0.56	0.15	1410	20	21	0.24	0.55	0.21	563	20	12	
3.3.7.	5y M.A. Gap	+	0.78***	***	0.40	0.34	0.26	1260	18	19	0.15	0.49	0.36	512	18	12	
3.3.8.	Avg. Gap	+	0.78***	***	0.48	0.38	0.14	1148	17	19	0.16	0.22	0.62	470	17	12	
3.4. Real Commercial Real Estate Price																	
3.4.1.	1y Growth	+	0.74***	***	0.37	0.39	0.23	1148	17	19	0.13	0.26	0.61	470	17	12	
3.4.2.	3y Growth	+	0.78***	***	0.48	0.33	0.19	1148	17	19	0.33	0.31	0.36	470	17	12	
3.4.3.	Relative Gap	+	0.81***	***	0.52	0.30	0.18	1148	17	19	0.31	0.09	0.61	470	17	12	
		+	0.72***	***	0.39	0.18	0.43	775	15	14	0.08	0.00	0.92	416	15	10	
		+	0.73***	***	0.39	0.21	0.40	718	15	14	0.39	0.35	0.26	391	15	10	
		+	0.61**	**	0.22	0.68	0.09	599	14	14	0.04	0.90	0.07	330	14	10	
		+	0.65***	**	0.26	0.11	0.63	501	13	14	-0.16	0.45	0.71	274	13	10	

See page 1 of this appendix for notes.

Table A4. Performance Evaluation for Measures of External Imbalances

Indicator	Transformation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation							
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
4.1 Current Account / GDP	4.1.1.	-	0.64*		0.30	0.45	0.25	1159	21	16	0.14	0.35	0.50	601	21	12
	4.1.2.	-	0.63**	**	0.26	0.43	0.32	1075	20	15	0.07	0.60	0.33	568	20	11
	4.1.3.	-	0.64***	*	0.26	0.50	0.23	921	20	13	0.14	0.41	0.45	490	20	11
	4.1.4.	-	0.4		0.03	0.07	0.90	1075	20	15	-0.01	0.03	0.98	568	20	11
	4.1.5.	-	0.39	†††	0.02	0.05	0.93	921	20	13	-0.42	0.80	0.62	490	20	11
	4.1.6.	-	0.62**	**	0.20	0.36	0.44	792	19	13	0.19	0.36	0.45	410	19	11
	4.1.7.	-	0.41	**	0.04	0.19	0.77	792	19	13	-0.02	0.05	0.97	410	19	11
	4.1.8.	-	0.66***	**	0.30	0.42	0.28	792	19	13	0.15	0.47	0.38	410	19	11
4.2. Portfolio Investments / GDP	4.2.1.	-	0.7**	*	0.41	0.35	0.24	792	19	13	0.29	0.43	0.28	410	19	11
	4.2.2.	-	0.51		0.12	0.03	0.85	622	21	14	-0.01	0.52	0.49	507	21	12
	4.2.3.	-	0.58		0.14	0.07	0.18	542	21	14	0.08	0.54	0.38	447	21	12
	4.2.4.	-	0.61		0.20	0.15	0.65	382	20	11	0.10	0.53	0.37	306	20	10
4.3. Other Investments / GDP	4.3.1.	-	0.54		0.18	0.08	0.13	542	21	14	0.07	0.29	0.64	447	21	12
	4.3.2.	-	0.45		0.09	0.87	0.04	382	20	11	-0.06	0.31	0.75	306	20	10
	4.3.3.	-	0.51		0.12	0.03	0.85	622	21	14	-0.01	0.52	0.49	507	21	12
	4.3.4.	-	0.58		0.14	0.07	0.18	542	21	14	0.08	0.54	0.38	447	21	12
4.4. Capital Account / GDP	4.4.1.	-	0.61		0.20	0.15	0.65	382	20	11	0.10	0.53	0.37	306	20	10
	4.4.2.	-	0.54		0.09	0.87	0.04	382	20	11	0.07	0.29	0.64	447	21	12
	4.4.3.	-	0.45		0.09	0.87	0.04	382	20	11	-0.06	0.31	0.75	306	20	10
	4.4.4.	-	0.4		0.01	0.00	0.99	1015	21	16	0.08	0.00	0.92	601	21	12
4.5. Foreign Currency Cross-Border Loans / GDP	4.5.1.	-	0.5		0.07	0.67	0.26	931	20	15	0.25	0.17	0.58	568	20	11
	4.5.2.	-	0.46		0.05	0.76	0.19	777	20	13	0.09	0.13	0.78	485	20	11
	4.5.3.	-	0.54*		0.10	0.45	0.45	872	20	14	0.08	0.57	0.35	565	20	11
	4.5.4.	-	0.53		0.13	0.50	0.36	718	20	12	0.06	0.51	0.43	482	20	11
4.6. Own Currency Cross-Border Loans / GDP	4.6.1.	+	0.57		0.18	0.32	0.49	861	15	12	-0.08	0.26	0.82	434	15	8
	4.6.2.	+	0.53		0.16	0.58	0.26	805	15	12	0.05	0.46	0.48	422	15	8
	4.6.3.	+	0.56		0.24	0.53	0.23	698	13	11	0.22	0.31	0.47	389	13	7
	4.6.4.	+	0.48		0.04	0.76	0.20	774	15	12	-0.02	0.69	0.33	422	15	8
4.6. Own Currency Cross-Border Loans / GDP	4.6.1.	+	0.45		0.03	0.00	0.97	668	13	10	0.01	0.00	0.99	389	13	7
	4.6.2.	+	0.55		0.14	0.08	0.77	861	15	12	-0.02	0.13	0.89	434	15	8
	4.6.3.	+	0.51		0.12	0.62	0.26	805	15	12	-0.11	0.48	0.64	422	15	8
	4.6.4.	+	0.52		0.19	0.43	0.38	698	13	11	0.18	0.19	0.63	389	13	7
4.6. Own Currency Cross-Border Loans / GDP	4.6.1.	+	0.48		0.09	0.68	0.23	774	15	12	0.06	0.63	0.31	422	15	8
	4.6.2.	+	0.43		0.03	0.00	0.97	668	13	10	-0.02	0.03	0.99	389	13	7

See page 1 of this appendix for notes.

**Table A5. Performance Evaluation for Measures of Potential Mispricing of Risk: Country-Specific Indicators**

Indicator	Transformation	Sign	Full-Sample Evaluation						Out-of-Sample Evaluation							
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
5.1. Stock Market Volatility																
5.1.1.	1y Difference	-	0.56*		0.13	0.44	0.43	2274	28	27	0.16	0.21	0.63	933	28	16
5.1.2.	3y Difference	-	0.49		0.08	0.20	0.72	2169	28	26	-0.12	0.86	0.27	917	28	16
5.1.3.	1y Growth	-	0.53		0.10	0.31	0.59	1957	28	24	0.25	0.34	0.42	885	28	15
5.1.4.	3y Growth	-	0.49		0.03	0.20	0.77	2168	28	26	-0.07	0.89	0.17	917	28	16
5.2. Stock Market Index																
5.2.1.	1y Growth	+	0.53*	**	0.10	0.15	0.74	1956	28	24	0.22	0.11	0.67	885	28	15
5.2.2.	3y Growth	+	0.60***		0.11	0.37	0.53	1114	14	14	-0.24	0.42	0.82	458	14	9
5.3. Bank Stock Index																
5.3.1.	1y Growth	+	0.65***	*	0.28	0.16	0.57	1062	14	14	0.41	0.16	0.44	458	14	9
5.3.2.	3y Growth	+	0.63***	**	0.33	0.21	0.47	958	14	14	0.34	0.22	0.44	453	14	9
5.4. Stock Market P/E Ratio																
5.4.1.	1y Growth	+	0.54	*	0.15	0.26	0.60	1098	13	17	0.18	0.12	0.70	420	13	9
5.4.2.	3y Growth	+	0.62***	*	0.24	0.34	0.42	997	13	16	0.17	0.69	0.14	420	13	9
5.4.3.	1y Difference	+	0.47	††	0.15	0.07	0.78	755	23	15	0.09	0.08	0.83	580	23	13
5.4.4.	3y Difference	+	0.40	††	0.00	0.00	1.00	509	19	10	-0.17	0.95	0.22	434	19	10
5.5. Stock Market P/B Ratio																
5.5.1.	1y Growth	+	0.55***	††	0.14	0.34	0.52	675	23	14	0.16	0.37	0.47	536	23	13
5.5.2.	3y Growth	+	0.41	††	0.00	0.00	1.00	509	19	10	-0.14	0.97	0.18	434	19	10
5.5.3.	1y Difference	+	0.78***	***	0.52	0.16	0.33	159	14	9	0.00	1.00	0.00	159	14	9
5.5.4.	3y Difference	+	0.76***	***	0.40	0.11	0.49	103	13	8	-0.01	1.00	0.01	103	13	8
5.6. Stock Market Dividend Yield																
5.6.1.	1y Growth	-	0.56	***	0.19	0.01	0.80	369	14	9	0.07	0.86	0.07	369	14	9
5.6.2.	3y Growth	-	0.59***	***	0.34	0.05	0.61	321	14	9	-0.02	0.99	0.03	321	14	9
5.6.3.	1y Difference	-	0.72***	***	0.43	0.07	0.49	217	14	9	0.04	0.88	0.09	217	14	9
5.6.4.	3y Difference	-	0.58***	***	0.34	0.06	0.60	321	14	9	0.00	0.96	0.04	321	14	9
5.7. Household Lending Spread																
5.7.1.	1y Growth	-	0.72***	***	0.45	0.06	0.49	217	14	9	0.01	0.88	0.11	217	14	9
5.7.2.	3y Growth	-	0.55		0.16	0.39	0.45	462	27	14	-0.11	0.98	0.12	462	27	14
5.7.3.	1y Difference	-	0.53		0.12	0.26	0.62	361	27	14	-0.10	0.97	0.13	361	27	14
5.7.4.	3y Difference	-	0.6		0.26	0.08	0.66	168	18	9	0.00	1.00	0.00	168	18	9
5.8. Corporate Lending Spread																
5.8.1.	1y Growth	-	0.53		0.10	0.08	0.82	361	27	14	-0.09	0.98	0.11	361	27	14
5.8.2.	3y Growth	-	0.57		0.25	0.08	0.67	168	18	9	0.00	1.00	0.00	168	18	9
5.8.3.	1y Difference	-	0.5		0.08	0.06	0.86	452	26	13	-0.09	0.98	0.10	452	26	13
5.8.4.	3y Difference	-	0.51		0.06	0.18	0.76	355	26	13	-0.10	0.98	0.12	355	26	13
5.8.5.	1y Growth	-	0.68***	***	0.36	0.11	0.53	168	18	9	0.00	1.00	0.00	168	18	9
5.8.6.	3y Growth	-	0.49	**	0.07	0.16	0.77	355	26	13	-0.10	0.98	0.12	355	26	13
5.8.7.	1y Difference	-	0.63*	**	0.36	0.11	0.53	168	18	9	0.00	1.00	0.00	168	18	9

See page 1 of this appendix for notes.



**Table A6. Performance Evaluation for Measures of Potential Mispricing of Risk: Global Indicators**

Indicator	Transformation	Sign	Full-Sample Evaluation							Out-of-Sample Evaluation						
			AUC	Logit	$U_r$	FNR	FPR	N	$N_c$	$N_f$	$U_{r,o}$	FNR	FPR	N	$N_c$	$N_f$
5.9. VIX Index																
5.9.1.	1y Difference	-	0.71***	***	0.35	0.33	0.32	2205	28	30	0.51	0.13	0.36	947	28	16
5.9.2.	3y Difference	-	0.57**	***	0.20	0.30	0.51	2097	28	30	-0.11	0.46	0.64	947	28	16
5.9.3.	1y Growth	-	0.7***	***	0.30	0.28	0.41	1883	28	28	0.20	0.07	0.74	947	28	16
5.9.4.	3y Growth	-	0.58**	**	0.18	0.32	0.50	2097	28	30	-0.13	0.53	0.60	947	28	16
5.9.5.	Trend Gap	-	0.71***	***	0.31	0.27	0.42	1883	28	28	0.17	0.06	0.77	947	28	16
5.9.6.	Relative Gap	-	0.71***	***	0.35	0.44	0.21	1714	28	26	0.20	0.07	0.73	947	28	16
5.9.7.	5y M.A. Gap	-	0.69***	***	0.37	0.50	0.12	1714	28	26	0.11	0.03	0.86	947	28	16
5.9.8.	Avg. Gap	-	0.75***	***	0.38	0.28	0.34	1714	28	26	0.18	0.06	0.76	947	28	16
5.10. High-Yield Spread																
5.10.1.	1y Difference	-	0.79***	**	0.49	0.17	0.33	1043	28	17	0.42	0.12	0.46	947	28	16
5.10.2.	3y Difference	-	0.51	**	0.23	0.05	0.72	947	28	16	0.37	0.10	0.53	947	28	16
5.10.3.	1y Growth	-	0.61***	***	0.34	0.09	0.57	745	28	15	0.50	0.23	0.27	745	28	15
5.10.4.	3y Growth	-	0.56***	***	0.19	0.04	0.77	947	28	16	0.33	0.19	0.48	947	28	16
5.10.5.	Trend Gap	-	0.62***	**	0.37	0.13	0.51	745	28	15	0.50	0.23	0.27	745	28	15
5.10.6.	Relative Gap	-	0.47	***	0.22	0.07	0.70	565	28	15	0.00	1.00	0.00	565	28	15
5.10.7.	5y M.A. Gap	-	0.46	***	0.22	0.07	0.70	565	28	15	0.00	1.00	0.00	565	28	15
5.10.8.	Avg. Gap	-	0.48	***	0.22	0.07	0.70	565	28	15	0.00	1.00	0.00	565	28	15
5.11. German 10y Bund																
5.11.1.	1y Difference	+	0.68***	***	0.29	0.56	0.15	4032	28	33	0.00	0.00	1.00	947	28	16
5.11.2.	3y Difference	+	0.52	***	0.09	0.06	0.85	3920	28	33	0.00	0.00	1.00	947	28	16
5.11.3.	1y Growth	+	0.51	***	0.14	0.10	0.76	3697	28	32	-0.04	0.20	0.84	947	28	16
5.11.4.	3y Growth	+	0.52	***	0.10	0.65	0.25	3920	28	33	-0.09	0.32	0.77	947	28	16
			0.48	***	0.09	0.33	0.57	3697	28	32	-0.07	0.33	0.74	947	28	16

(continued)

Table A6. (Continued)

Indicator	Transformation	Sign	Full-Sample Evaluation							Out-of-Sample Evaluation						
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
5.12. German 1y Bill	1y Difference	-	0.59**		0.20	0.37	0.43	2720	28	31	0.09	0.24	0.67	947	28	16
	3y Difference	+	0.61**	**	0.23	0.27	0.50	2612	28	31	0.28	0.18	0.54	947	28	16
	1y Growth	+	0.55		0.14	0.60	0.26	2396	28	31	-0.33	0.88	0.45	947	28	16
	3y Growth	+	0.62**	***	0.21	0.54	0.25	2612	28	31	0.23	0.25	0.52	947	28	16
5.13. German 1m Bill	1y Difference	-	0.55	**	0.16	0.54	0.30	2396	28	31	0.01	0.46	0.53	947	28	16
	3y Difference	+	0.62***		0.23	0.36	0.42	3152	28	31	0.16	0.01	0.82	947	28	16
	1y Growth	+	0.55		0.17	0.35	0.47	3044	28	31	0.05	0.02	0.93	947	28	16
	3y Growth	+	0.52		0.12	0.30	0.58	2828	28	31	-0.27	0.72	0.56	947	28	16
5.14. U.S. 10y T-Note	1y Difference	+	0.58**		0.17	0.35	0.47	3044	28	31	0.11	0.04	0.85	947	28	16
	3y Difference	+	0.52		0.08	0.69	0.23	2828	28	31	-0.11	0.54	0.56	947	28	16
	1y Growth	+	0.67***	***	0.27	0.38	0.35	4032	28	33	0.00	0.00	1.00	947	28	16
	3y Growth	-	0.49		0.09	0.07	0.84	3920	28	33	0.00	0.00	1.00	947	28	16
5.15. U.S. 1y T-Bill	1y Difference	+	0.52		0.15	0.50	0.35	3697	28	32	0.05	0.01	0.93	947	28	16
	3y Difference	+	0.51		0.11	0.09	0.81	3920	28	33	0.22	0.05	0.73	947	28	16
	1y Growth	+	0.54		0.16	0.50	0.35	3697	28	32	0.14	0.05	0.81	947	28	16
	3y Growth	-	0.57**	*	0.22	0.32	0.47	2720	28	31	0.04	0.01	0.94	947	28	16
5.16. U.S. 1m T-Bill	1y Difference	+	0.63***	***	0.25	0.30	0.45	2612	28	31	0.21	0.19	0.61	947	28	16
	3y Difference	+	0.71***	***	0.39	0.38	0.24	2396	28	31	0.52	0.16	0.32	947	28	16
	1y Growth	+	0.64***	***	0.26	0.30	0.44	2612	28	31	0.36	0.22	0.42	947	28	16
	3y Growth	+	0.72***	***	0.29	0.35	0.26	2396	28	31	0.50	0.12	0.38	947	28	16
5.16. U.S. 1m T-Bill	1y Difference	-	0.63***	***	0.30	0.20	0.50	3152	28	31	0.09	0.03	0.88	947	28	16
	3y Difference	+	0.63***	***	0.25	0.28	0.48	3044	28	31	0.23	0.06	0.71	947	28	16
	1y Growth	+	0.67***	***	0.35	0.37	0.28	2828	28	31	0.48	0.15	0.37	947	28	16
	3y Growth	+	0.65***	***	0.24	0.34	0.42	3044	28	31	0.43	0.10	0.47	947	28	16
5.16.4.			***	0.36	0.42	0.22	2828	28	31	0.47	0.10	0.43	947	28	16	

See page 1 of this appendix for notes.

Table A7. Performance Evaluation for Measures of Strength of Bank Balance Sheets

Indicator	Transformation	Sign	Full-Sample Evaluation					Out-of-Sample Evaluation								
			AUC	Logit	U <sub>r</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>	U <sub>r,o</sub>	FNR	FPR	N	N <sub>c</sub>	N <sub>f</sub>
6.1. Leverage Ratio		-	0.61		0.27	0.02	0.72	696	26	14	0.01	0.79	0.20	663	26	14
6.1.1.	1y Difference	-	0.61**	*	0.21	0.46	0.33	605	26	14	0.36	0.17	0.47	605	26	14
6.1.2.	3y Difference	-	0.67***		0.33	0.16	0.50	422	24	12	-0.02	0.85	0.17	422	24	12
6.1.3.	1y Growth	-	0.62***		0.22	0.49	2.29	605	26	14	0.38	0.13	0.49	605	26	14
6.1.4.	3y Growth	-	0.67***	**	0.36	0.18	0.46	422	24	12	-0.03	0.86	0.17	422	24	12
6.2. Loans / Deposits		+	0.66**	**	0.27	0.10	0.63	515	26	13	-0.12	0.86	0.26	512	26	13
6.2.1.	1y Difference	+	0.58		0.18	0.51	0.31	422	26	13	-0.10	0.86	0.24	422	26	13
6.2.2.	3y Difference	+	0.58		0.15	0.67	0.17	222	21	11	-0.14	0.79	0.34	222	21	11
6.2.3.	1y Growth	+	0.54		0.11	0.01	0.88	422	26	13	-0.10	0.85	0.25	422	26	13
6.2.4.	3y Growth	+	0.51		0.15	0.01	0.84	222	21	11	-0.26	0.79	0.47	222	21	11
6.3. Total Assets / GDP		+	0.55		0.14	0.45	0.42	739	21	14	0.05	0.39	0.56	613	21	12
6.3.1.	1y Difference	+	0.64**		0.22	0.26	0.52	658	21	13	0.22	0.41	0.37	589	21	12
6.3.2.	3y Difference	+	0.57		0.19	0.53	0.28	507	19	11	0.18	0.63	0.19	504	19	11
6.3.3.	1y Growth	+	0.68***	***	0.33	0.22	0.45	658	21	13	0.36	0.17	0.48	589	21	12
6.3.4.	3y Growth	+	0.64*	**	0.23	0.50	0.27	507	19	11	0.24	0.59	0.17	504	19	11
6.4. Non-core Liabilities / GDP		+	0.48		0.10	0.11	0.79	405	20	10	-0.10	0.98	0.12	405	20	10
6.4.1.	1y Difference	+	0.52		0.12	0.58	0.30	334	19	9	-0.07	0.97	0.10	334	19	9
6.4.2.	3y Difference	+	0.5		0.14	0.12	0.74	189	17	8	-0.31	1.00	0.31	189	17	8
6.4.3.	1y Growth	+	0.56		0.19	0.36	0.45	334	19	9	-0.18	0.97	0.21	334	19	9
6.4.4.	3y Growth	+	0.5		0.17	0.72	0.11	189	17	8	-0.25	1.00	0.25	189	17	8
6.5. Non-core Liabilities / Total Assets		+	0.57		0.19	0.40	0.41	475	25	12	-0.10	0.98	0.12	475	25	12
6.5.1.	1y Difference	+	0.49		0.06	0.91	0.03	386	24	11	-0.15	0.94	0.21	386	24	11
6.5.2.	3y Difference	+	0.5		0.13	0.75	0.12	202	20	10	-0.12	0.95	0.17	202	20	10
6.5.3.	1y Growth	+	0.49		0.06	0.94	0.00	386	24	11	-0.14	0.94	0.19	386	24	11
6.5.4.	3y Growth	+	0.48		0.07	0.91	0.02	202	20	10	-0.16	0.95	0.20	202	20	10
6.6. (ST Liabilities - Liquid Assets) / Total Assets		+	0.73**	*	0.37	0.60	0.03	286	13	7	-0.02	1.00	0.02	286	13	7
6.6.1.	1y Difference	+	0.70**		0.36	0.28	0.36	242	13	7	-0.05	1.00	0.05	242	13	7
6.6.2.	3y Difference	+	0.81**	**	0.49	0.21	0.29	138	12	6	-0.07	1.00	0.07	138	12	6
6.6.3.	1y Growth	+	0.70**	**	0.35	0.28	0.37	242	13	7	-0.08	0.98	0.10	242	13	7
6.6.4.	3y Growth	+	0.67***		0.35	0.19	0.46	138	12	6	-0.09	1.00	0.09	138	12	6
6.7. Short-Term Liabilities / Liquid Assets		+	0.77**	**	0.52	0.37	0.11	286	13	7	-0.01	0.98	0.03	286	13	7
6.7.1.	1y Difference	+	0.67***		0.37	0.28	0.35	242	13	7	-0.08	0.98	0.10	242	13	7
6.7.2.	3y Difference	+	0.86**	*	0.72	0.17	0.11	138	12	6	-0.05	1.00	0.05	138	12	6
6.7.3.	1y Growth	+	0.67***		0.33	0.35	0.32	242	13	7	-0.09	0.98	0.10	242	13	7
6.7.4.	3y Growth	+	0.86***	*	0.70	0.24	0.06	138	12	6	-0.04	1.00	0.04	138	12	6

See page 1 of this appendix for notes.

