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Addendum 4 to the CRI Technical Report (Version: 2014, Update 1)

This document updates the Technical Report (Version: 2014, Update 1) and details (1) the replacement of the 3-month interest rate in Thailand, (2) the revision to the treatment of 3-month interest rates for Switzerland and Iceland and their coefficients in the default prediction model, and (3) the addition of Oman, Bangladesh and Jamaica to the CRI coverage. These changes have been implemented for probabilities of default (PDs) and Actuarial Spreads (AS) starting from 15th of November.

I. 3-month interest rate, Thailand

The Bank of Thailand stopped reporting the 3-month Repo rate due to a lack of liquidity, and our data provider (Reuters) ceased updating their Thailand 3-month repo rate (*Reuters Thailand 3m rate*) series in May 2002. We have thus changed to another data provider (Bloomberg) and use the *Bloomberg 3 Month Thailand BIBOR (Bangkok Interbank Offered Rate)* as a replacement for the 3-month short term interest rate for Thailand.

Henceforth, as of November 2014 calibration, the *Bloomberg 3 Month Thailand BIBOR* is used as the 3-month interest rate for all data points starting from 30th May 2002; we continue to use the *Reuters Thailand 3m rate* for earlier periods.

II. Revision to interest rate variables and coefficients for Switzerland and Iceland

As documented in Subsection 3.3 of the Technical Report Version: 2014 Update 1, Switzerland and Iceland do not use the 3-month interest rate in the default prediction model. This treatment originated from Addendum 2 to the Technical Report Version: 2011 Update 1 because at that moment there were insufficient defaults to calibrate the individual benchmark interest rate coefficients for these two economies in a statistically significant way. However, CRI coverage has largely increased during the past three years. It is the right time to change this old treatment in the default prediction model. Therefore, with effect from 15 November, 2014, Switzerland and Iceland will use their own 3-month interest rates, namely the *Swiss Interbank 3 month rate* and *Iceland Interbank 3 month rate* respectively, and share the same benchmark interest rate coefficients as the other eurozone members in the same calibration group.

III. Changes to grouping of monthly calibration

The CRI will be expanding our coverage to 109 economies with the addition of Oman, Jamaica and Bangladesh. Typically, small economies do not have enough defaults, and calibrations of these individual economies are not statistically meaningful. In order to ensure that there are enough defaults for calibration, different economies under the CRI coverage are categorized into groups according to similarities in their stage of economic development and geographic locations. Within these groups the economies are combined and calibrated together.

Based on this approach, Bangladesh, Oman and Jamaica have been added to the calibration group of emerging economies (in addition to Argentina, Bahrain, Brazil, Chile, Colombia, Egypt, Indonesia, Jordan, Kazakhstan, Kuwait, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Saudi Arabia, South Africa, Sri Lanka, Thailand, United Arab Emirates, Venezuela, Vietnam).

Descriptives and summary statistics

When adding new countries to the CRI coverage, several benchmark indexes are carefully selected. The details are listed in the table below.

Economy	Bangladesh	Oman	Jamaica
ISO Code	BD	OM	JM
Calibration Group	Emerging	Emerging	Emerging
Stock Exchange (Period Used)	Dhaka Stock Exchange Index (2008-01-07 – Present)	Muscat Securities Market 30 Index (1992-03-31 - Present)	Jamaica Stock Exchange Market Index (1987-03-03 - Present)
Short Term Interest Rate (Period Used)	Bangladesh 3 Month Bill Auction Cut Off Yield (2006-01-31 – Present)	Omani Rial 3 Month Deposit (2002-07-16 - Present)	Jamaica 3 months repo rate (2008-07-17 - Present)
Interest Rate Name (Period Used)	Bangladesh 12 Month Bill Auction Cut Off Yield (2008-09-30 – Present)	Omani Rial 12 Month Deposit (2002-07-16 - Present)	Jamaica 12 months repo rate (2008-07-17 - Present)

Table 1: ISO Code, stock index and interest rates

The next tables provide further information on the input variables included in the RMI PD model, the number of active companies, defaults and other exits.

	Min	25%	Median	75%	Max	Mean	StdDev	#Observation
DTD Level	-1.81	1.67	2.70	4.29	15.24	3.14	1.95	6452
DTD Trend	-2.59	-0.06	0.15	0.49	5.62	0.26	0.62	6452
Cash/TA Level	0.00	0.01	0.08	0.22	0.82	0.15	0.17	12193
Cash/TA Trend	-0.36	0.00	0.00	0.00	0.40	0.00	0.04	12193
NI/TA Level	-0.04	0.00	0.00	0.01	0.03	0.00	0.01	12711
NI/TA Trend	-0.03	0.00	0.00	0.00	0.03	0.00	0.00	12711
Size Level	-5.27	-1.30	-0.23	1.16	4.78	-0.13	1.73	14039
Size Trend	-1.81	-0.13	-0.02	0.09	2.00	-0.03	0.29	14039
M/B	0.25	1.13	1.54	2.37	31.35	2.34	3.29	12105
Sigma	0.04	0.09	0.11	0.14	0.67	0.12	0.05	13063

Table 2: Bangladesh – Summary statistics of input variables (based on data from 1999 to 2014)

	Active		Defaults		Others	
	#	%	#	%	#	%
1999	160		0	0	8	4.76%
2000	123		0	0	56	31.29%
2001	105		0	0	41	28.08%
2002	103		0	0	20	16.26%
2003	98		0	0	17	14.78%
2004	102		0	0	5	4.67%
2005	199		0	0	16	7.44%
2006	208		0	0	16	7.14%
2007	211		0	0	20	8.66%
2008	226		0	0	13	5.44%
2009	191		0	0	51	21.07%
2010	216		0	0	20	8.47%
2011	229		0	0	6	2.55%
2012	240		0	0	3	1.23%
2013	256		0	0	1	0.39%
2014	271		0	0	0	0.00%

Table 3: Bangladesh – number of defaults and other exits from 1999 to 2014

	Min	25%	Median	75%	Max	Mean	StdDev	#Observation
DTD Level	-0.10	3.45	4.85	7.26	23.90	5.92	3.89	1778
DTD Trend	-7.52	-0.35	0.15	0.80	7.53	0.29	1.50	1778
Cash/TA Level	0.00	0.03	0.07	0.16	0.94	0.12	0.14	13526
Cash/TA Trend	-0.36	-0.01	0.00	0.01	0.40	0.00	0.05	13526
NI/TA Level	-0.04	0.00	0.00	0.01	0.03	0.00	0.01	13721
NI/TA Trend	-0.03	0.00	0.00	0.00	0.03	0.00	0.01	13721
Size Level	-6.43	-1.20	-0.07	0.99	4.71	-0.11	1.73	16355
Size Trend	-1.81	-0.10	0.00	0.10	2.00	0.01	0.24	16355
M/B	0.19	1.00	1.17	1.49	7.38	1.33	0.61	12860
Sigma	0.01	0.06	0.09	0.12	0.98	0.10	0.07	8346

Table 4: Oman – Summary statistics of input variables (based on data from 1996 to 2014)

	Active	Defaults		Others	
		#	%	#	%
1996	51	0	0	2	3.77%
1997	70	0	0	12	14.63%
1998	55	0	0	50	47.62%
1999	57	0	0	32	35.96%
2000	52	0	0	43	45.26%
2001	47	0	0	45	48.91%
2002	75	0	0	16	17.58%
2003	79	0	0	33	29.46%
2004	92	0	0	19	17.12%
2005	83	0	0	38	31.41%
2006	95	0	0	35	26.92%
2007	102	0	0	35	25.55%
2008	91	0	0	54	37.24%
2009	87	0	0	36	29.27%
2010	93	0	0	40	30.08%
2011	113	0	0	29	20.42%
2012	114	0	0	24	17.39%
2013	115	0	0	3	2.54%
2014	118	0	0	0	0.00%

Table 5: Oman – number of defaults and other exits from 1996 to 2014

	Min	25%	Median	75%	Max	Mean	StdDev	#Observation
DTD Level	-1.09	0.98	2.56	3.69	15.39	2.75	2.36	1799
DTD Trend	-6.45	-0.41	0.00	0.40	5.28	0.02	0.93	1799
Cash/TA Level	0.00	0.05	0.12	0.27	0.94	0.20	0.21	5212
Cash/TA Trend	-0.36	-0.01	0.00	0.01	0.40	0.00	0.07	5212
NI/TA Level	-0.04	0.00	0.00	0.01	0.03	0.01	0.01	5717
NI/TA Trend	-0.03	0.00	0.00	0.00	0.03	0.00	0.01	5717
Size Level	-5.85	-1.50	0.01	1.01	3.00	-0.27	1.81	6218
Size Trend	-1.81	-0.11	0.00	0.12	2.00	0.02	0.28	6218
M/B	0.19	0.87	1.04	1.35	23.38	1.25	0.89	5580
Sigma	0.03	0.12	0.15	0.20	0.84	0.17	0.08	4224

Table 6: Jamaica – Summary statistics of input variables (based on data from 1993 to 2014)

	Active		Defaults		Others	
	#	%	#	%	#	%
1993	29		0	0	7	19.44%
1994	35		0	0	4	10.26%
1995	34		0	0	5	12.82%
1996	29		0	0	10	25.64%
1997	28		0	0	6	17.65%
1998	27		0	0	6	18.18%
1999	29		0	0	6	17.14%
2000	31		0	0	3	8.82%
2001	32		0	0	2	5.88%
2002	32		0	0	0	0.00%
2003	31		0	0	3	8.82%
2004	32		0	0	1	3.03%
2005	33		0	0	4	10.81%
2006	32		0	0	3	8.57%
2007	33		0	0	4	10.81%
2008	34		0	0	4	10.53%
2009	35		0	0	3	7.89%
2010	43		0	0	1	2.27%
2011	43		0	0	8	15.69%
2012	40		0	0	8	16.67%
2013	45		0	0	2	4.26%
2014	48		0	0	3	5.88%

Table 7: Jamaica – number of defaults and other exits from 1993 to 2014

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