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**Addendum 4 to the CRI Technical Report (Version: 2015, Update 1)**

This document updates the Technical Report (Version: 2015, Update 1) and details a revision to estimate the parameter  $\delta$ , which is the fraction of other liabilities in defining the default point in Distance-to-Default (DTD) computation. This change has been implemented for the Probability of Defaults (PDs) and Actuarial Spreads (AS) released on 17 March 2016. The March 2016 calibration after revision results in relatively minor differences in PDs and AS.

### **I. Revision to other liabilities fraction estimation in DTD computation**

In CRI model, the debt level in defining the default point in DTD computation includes the firm's current liabilities plus half of the long-term debt plus the fraction  $\delta$  multiplied by the other liabilities. Since the financial statement is released at most quarterly, it is impossible to obtain stable estimates of  $\delta$  for individual firms. Therefore in the previous DTD computation, all financial sector firms in the same economy are assumed to share the same estimate of  $\delta$ , chosen to be the average of all its individual estimates. The same is done for non-financial firms. However, for some small economies especially in early years, this average of  $\delta$  is still observed to be not stable due to small number of firms available.

To overcome this issue, instead of using economy level differentiated by only financial and non-financial sectors, we change to assume that the fraction  $\delta$  is shared on the calibration group level but differentiated by Bloomberg 10-industry sectors, with its estimate still taken as the average of all its individual estimates.

It is still possible that some sector or even the whole calibration group has only few individual estimates of  $\delta$  in the early period. To well handle such cases, we apply a threshold rule<sup>1</sup> to each time point of estimation in the following conditions: a) if a sector has available individual estimates fewer than the threshold, the shared estimate of  $\delta$  will be set to the whole calibration group average instead of the sector average; b) furthermore, if the whole calibration group still has available individual estimates fewer than the threshold, the shared estimate of  $\delta$  is deemed not available.

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<sup>1</sup> Threshold is set as 10 from March 2016 calibration.