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Addendum 1 to the CRI Technical Report (Version: 2016, Update 1)

This document updates the Technical Report (Version: 2016, Update 1) and details a new treatment to the parameter estimation of the CRI PD model for the Chinese sample. This change has been implemented for the Probabilities of Default (PDs) and Actuarial Spreads (ASes) released on 23 December 2016. This change has significantly improved the performance of the CRI PD model for Chinese firms.

I. Revision to the parameter estimation on the intercept and the DTD Level

In the CRI's PD model, the parameters for all covariates are assumed to be time-invariant. The overall performance of the model on various countries/groups (e.g. North America, Europe, etc.) is good (e.g. the accuracy ratio (AR) for 1-year PD for the North American firms is 82%; the 1-year AR for emerging market is 77%). One rare exception is the Chinese sample with an AR of 57% for 1-year PD. The relatively poor performance is also reflected in Figure 1 where the predicted number of defaults over the 1-year horizon has missed the general pattern of the realized number of defaults over the prediction horizon for the sample period.

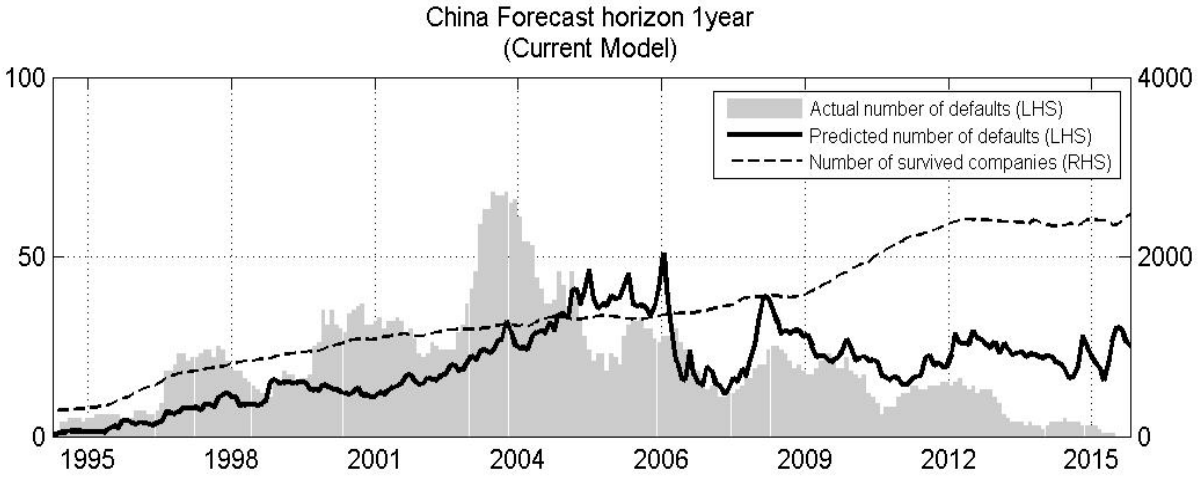

Figure 1

The CRI team has recently discovered a structural break for the Chinese sample occurring in December 2004. By simply allowing two parameters (i.e., coefficients for the intercept and DTD Level) to have a break before and after December 2004, the CRI model's performance on Chinese firms can be measurably improved. The adopted modification is to allow the break to occur in a smooth fashion instead of using a 0 and 1 dummy, and the smooth transition is accomplished by employing a logistic function.

Denote by t_0 the default prediction time where a structural break occurred, which is set to be December 31, 2004 for Chinese firms. We define the parameter for prediction horizon τ which is subject to a structural break at t_0 as

$$\beta(t,\tau;t_0) = \tilde{\beta}(\tau) + \tilde{\gamma}(\tau) \times \frac{1}{1+e^{-\tilde{\alpha}(\tau)(t-t_0)}}$$

where $\tilde{\alpha}(\tau)$ is a positive function of τ, controlling the rate of transition from one parameter value to another. For every prediction horizon τ, $\beta(t,\tau;t_0)$ moves in a smooth manner from $\tilde{\beta}(\tau)$ to $\tilde{\beta}(\tau) + \tilde{\gamma}(\tau)$ when the default prediction time advances toward and then beyond t_0. All functions of τ on the right-hand side of the above equation are modeled by a Nelson-Siegel function with three parameters as in the CRI Technical Report (Version: 2016, Update 1). Using three parameters ensures that the Nelson-Siegel function approaches zero as τ goes to infinity.

The new model specification has 52 parameters in total where 12 are the newly introduced ones and 40 are in the original model for Chinese firms. These parameters are again estimated with the sequential Monte Carlo method as described in the CRI Technical Report (Version: 2016, Update 1).

The new model with a structural break in two parameters delivers a far superior performance on predicting defaults of Chinese firms. The accuracy ratios for 1-year, 2-year, and 5-year PDs have increased from 57%, 49% and 37% to 68%, 65%, and 54%, respectively. Figure 2 also shows a marked improvement of the new model over the old one whose performance was reflected in Figure 1.

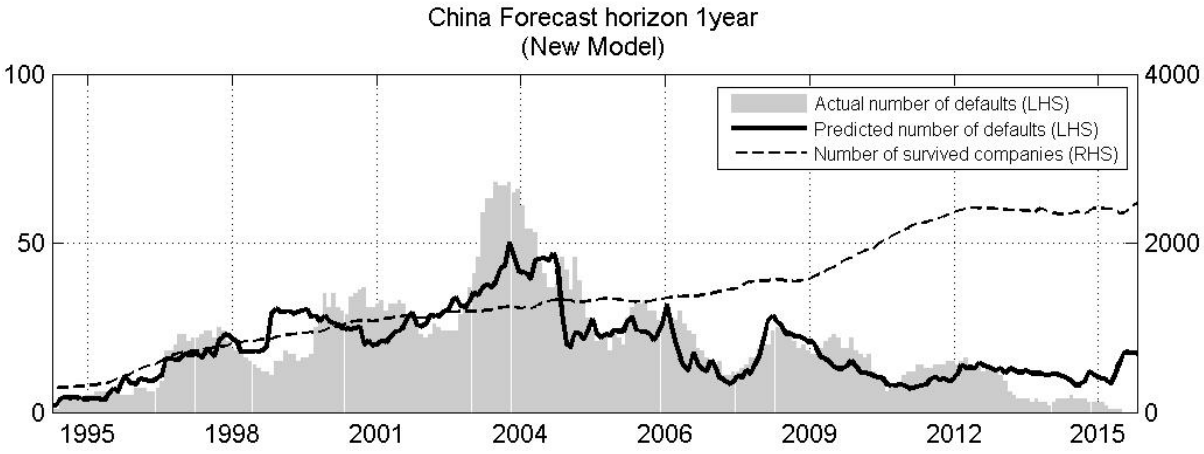

Figure 2