Statistical Approach to Third Party Ratings Treatment

Modeling Third Party Ratings Adjustment

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Third Party Support in Credit Risk

- The ownership structure of a corporate entity significantly influences its creditworthiness.
- Third party support can strengthen a company's credit profile if the supporting party is financially stable and willing to assist during times of stress.
- Conversely, if the third party has a weaker credit profile and relies on the subsidiary's cash flows to meet its obligations, its risk profile may deteriorate.
- Third party support can take various forms and be shaped by multiple factors.
- When assessing its impact on rating assignments, practitioners typically evaluate, among other factors, the timeliness and adequacy of this support in preventing default.
- Regulatory frameworks recognize the role of third party support and guide the incorporation of third party ratings into credit risk assessments.

Regulatory Framework for Third Party Ratings

- Regulatory guidance outlines three main, non-mutually exclusive approaches to incorporating third party ratings into Probability of Default (PD) models:
  1. Rating Transfer (Explicit Guarantees);
  2. Rating-Based Overrides;
  3. Third Party Rating as a Risk Driver.
- The use of third party ratings is not limited to statistical models; they can also influence non-statistical decision-making.
- If third party ratings are not directly incorporated into the PD model, they may still justify overrides, provided institutions ensure no double counting.
- Among other regulatory documents, the Guidelines on PD Estimation, LGD Estimation, and the Treatment of Defaulted Exposures and the ECB Guide to Internal Models provide more details on the treatment of third party ratings.

Statistical Approach to Third Party Ratings Treatment

- Unlike other standardized statistical approaches for model development, practitioners must consider additional inputs and modeling constraints when treating third party rating modeling.
- Given the variety of supporting structures between the third party and subsidiary and data availability, developing a modeling framework that suits all situations is challenging. Therefore, practitioners often opt for tailor-made modeling approaches when tackling this exercise.
- The following slide outlines one of the approaches proposed by Andrija Djurovic, which can serve as a basis for modeling third party support.
- Like other approaches, this relies on specific assumptions, such as the availability and comparability of scores between the third party and subsidiary. It also assumes that the new score always lies between the third party and subsidiary scores.
- The last slide highlights additional points, potential improvements, and adjustments to this framework, complementing the presented framework and simulation study.

Statistical Approach to Third Party Ratings Treatment cont.

The following points outline the steps for a statistical approach to third party rating modeling under the assumptions mentioned on the previous slide:

1. With both subsidiary (ss_{score}) and the third party (gr_{score}) scores available, estimate a logistic regression model of the form:

$$y \sim \alpha + \beta \cdot \text{Score}$$

   where y is the default indicator, and α and β are the regression estimates.
2. Using the results from step 1, compute the log odds separately for the subsidiary ($ss.lo$) and the third party ($gr.lo$).
3. Following the idea of threshold models, create two variables that reflect cases where the subsidiary score is lower than the third party score - n - and cases where the subsidiary score is greater than or equal to the third party score - p. The variables n and p are defined as the absolute difference between the log odds obtained in step 1.
4. To estimate potential improvements in the subsidiary score given the third party score, fit the following constrained logistic regression:

$$y \sim \beta_1 \cdot n + \beta_2 \cdot p$$

   while setting the offset equal to the subsidiary log-odds ($ss.lo$) and imposing the constraints $-1 < \beta_1 < 0$ and $0 < \beta_2 < 1$. By applying these constraints along with the offsets, the predicted probability always falls between those of the subsidiary and the third party.

Practitioners should remember that, depending on the relationship between the initial scores and the default indicator (y), the constraints in step 4 may need to be reversed.

The following slides present the results of a simulation study conducted on the dataset available here.

Simulation Results

The following points present the main results and output of the simulation study, while the graph on the next slide illustrates the log odds distribution for the subsidiary, third party, and combined log odds from the final constrained model.

1. Initially estimated models:

```
##             Estimate Std. Error  z value Pr(>|z|)
## (Intercept)   2.0341     0.3496   5.8179        0
## ss           -0.0059     0.0005 -12.9350        0
```

```
##             Estimate Std. Error  z value Pr(>|z|)
## (Intercept)   2.6401     0.3780   6.9842        0
## gr           -0.0066     0.0005 -13.3741        0
```

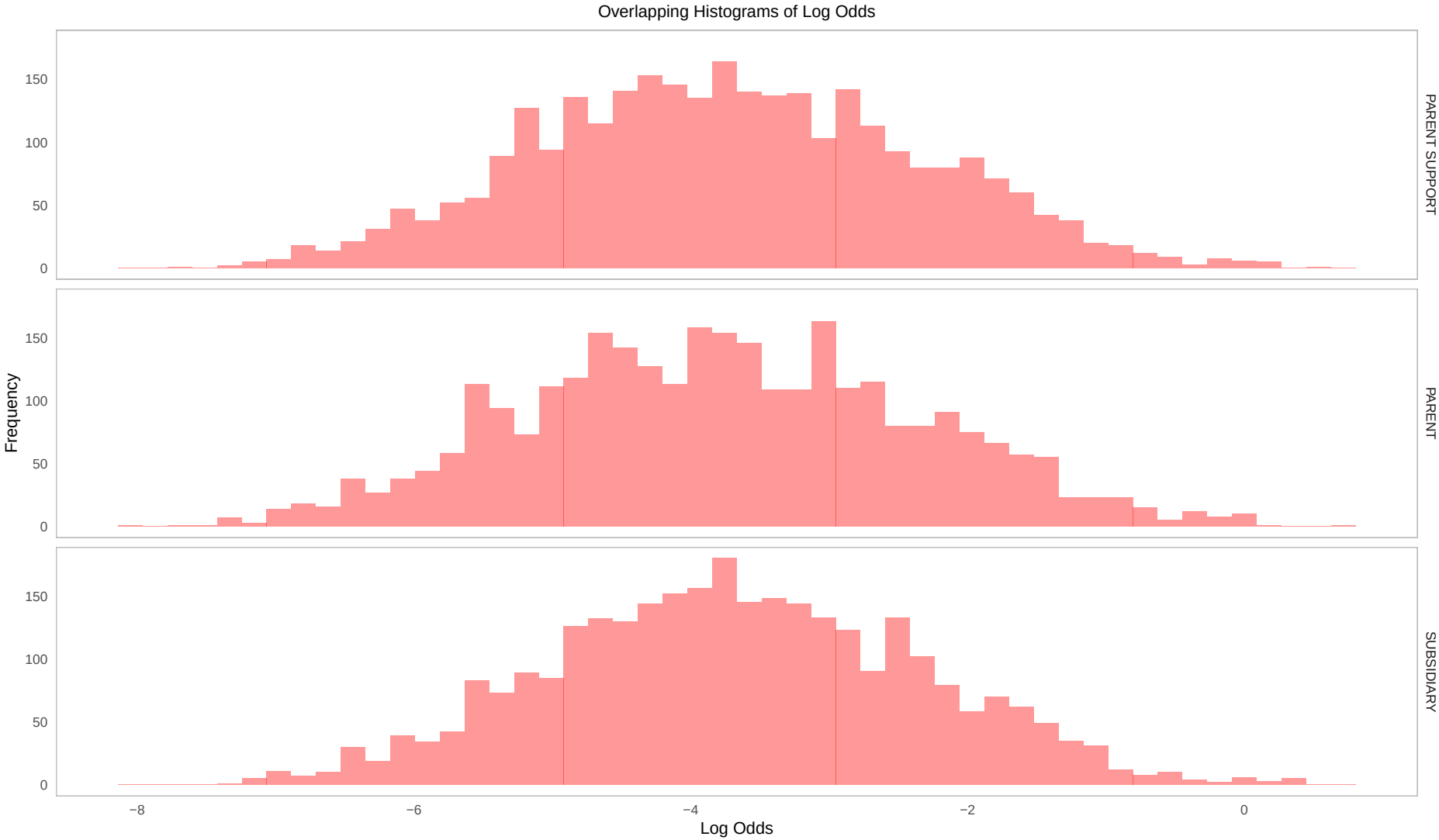
2. Sample of derived variables n and p, reflecting different relationships between subsidiary and the third party scores:

```
##        n      p
## 1 0.6543 0.0000
## 2 0.5928 0.0000
## 3 0.0000 0.6431
## 4 0.0000 0.4340
## 5 0.6648 0.0000
## 6 0.7022 0.0000
```

3. Results of the constrained logistic regression with an offset:

```
##       n       p
## -0.6962  0.7641
```

Simulation Results cont.



Discussion Points

- How do the source and comparability of subsidiary and third party scores affect the statistical method?
- How does the discriminatory power of individual scores (subsidiary and third party) impact the final estimates and conclusions?
- How can practitioners incorporate expert-based inputs, such as different categories of third party support, into the estimation process?
- How can practitioners adjust the proposed method if third party support is expressed as a combination of different variables (continuous and categorical)?