

**TERMS OF REFERENCE  
FOR THE PROCUREMENT OF A STATISTICAL MODELING TOOL  
FOR BANK FAILURE PREDICTION MODEL**

**APPROVED BUDGET FOR THE CONTRACT (ABC): Php 181,468.90**

**I. BACKGROUND**

The World Bank granted technical assistance to the Philippine Deposit Insurance Corporation (PDIC) under the Financial Sector Reform and Strengthening (FIRST) Initiative project to develop stress testing and failure prediction models to help enhance PDIC's capability to assess the financial conditions of banks and to better gauge the possible impact of bank failures to the Deposit Insurance Fund (DIF) and to the financial system.

Bank Statistics Department (BSD) needs a statistical tool to evaluate and refine the bank failure prediction model being developed by the FIRST Initiative for the PDIC.

**II. OBJECTIVE**

To procure a statistical modeling tool to be used by BSD for the Financial Modeling Project to enhance PDIC's bank monitoring and surveillance functions.

**III. SCOPE**

Shipping and delivery of installation DVD with the necessary license, authentication code, user manuals, and training on the use of the software.

**IV. FACT SHEET**

<b>Fact Sheet for Statistical Modeling Tool</b>	<b>Minimum Requirement</b>
1. User Licenses required	Perpetual license and authorization key <ul style="list-style-type: none"><li>• no. of users – minimum 2 users</li><li>• no. of variables – at least 32,000</li><li>• no. of right hand variables – at least 10,000</li><li>• unlimited no. of observations</li></ul>
2. System Capabilities	<b>Data Management</b> Data transformations, import/export data, ODBC, SQL, by-group processing, append files, sort,

row-column transposition, labeling, etc.

### **Basic Statistics**

Summaries, cross-tabulations, confidence intervals, factor variables, correlations, equality-of-variance tests, t tests, tests of proportions

### **Linear Models**

Regression; instrumental variables; three-stage least squares; constraints; quantile regression

### **Multilevel Models**

Crossed random effects; continuous, binary, and count outcomes; two-, three-, and multiway random-intercepts and random-coefficients models; residual error structures; support for survey data in linear multilevel models

### **Panel Data**

Random and fixed effects with robust standard errors, random- and fixed-effects Poisson, linear mixed models, random-effects probit, dynamic panel-data models, and instrumental-variables regression

### **ANOVA/MANOVA**

Balanced and unbalanced designs; factorial, nested, and mixed designs; repeated measures; contrasts; marginal means;

### **Structural equation modeling**

Graphical model builder, standardized and unstandardized estimates, modification indices, direct and indirect effects, path diagrams, factors scores and other predictions, estimations with groups and tests of invariance, goodness of fit, handling of MAR data by FIML, survey data, clustered data

### **Dependent Variables**

Logistic, probit, tobit; Poisson and negative binomial; conditional, multinomial, nested, ordered, rank-ordered, and stereotype logistic; multinomial probit; zero-inflated and left-truncated count models; selection models; marginal effects

**Multivariate Methods**

Factor analysis, principal components, discriminant analysis, rotation, multidimensional scaling, correspondence analysis, user-extensible analyses

**Cluster Analysis**

Hierarchical clustering; kmeans and kmedian nonhierarchical clustering; dendrograms; stopping rules; user-extensible analyses

**Nonparametric Methods**

Wilcoxon–Mann–Whitney, Wilcoxon signed ranks, and Kruskal–Wallis tests; Spearman and Kendall correlations; Kolmogorov–Smirnov tests; exact binomial CIs; survival data; ROC analysis; smoothing; bootstrapping

**Exact Statistics**

Exact logistic and Poisson regression, exact case–control statistics, binomial tests, Fisher's exact test for  $r \times c$  tables

**Resampling and Simulation Methods**

Bootstrap, jackknife, and Monte Carlo simulation, permutation tests

**Graphics**

Line charts, scatterplots, bar charts, pie charts, hi–lo charts, contour plots, regression diagnostic graphs, survival plots, nonparametric smoothers, etc.

**Time Series**

ARIMA, ARFIMA, ARCH/GARCH, VAR, VECM, multivariate GARCH, unobserved components model, dynamic factors, state-space models, business calendars, correlograms, periodograms, forecasts, impulse-response functions, unit-root tests, filters and smoothers, rolling and recursive estimation

**Survey Methods**

Multistage designs; bootstrap, jackknife, linearized, and variance estimation; poststratification; predictive margins; means, proportions, ratios, totals; summary tables;

regression, instrumental variables, probit, Cox regression

### **Survival Analysis**

Kaplan–Meier and Nelson–Aalen estimators, Cox regression; parametric models; time-varying covariates; competing risks; left and right censoring, exponential, and Gompertz analysis; sample size and power analysis

### **Tests, Predictions, and Effects**

Wald tests; LR tests; linear and nonlinear combinations, predictions and generalized predictions, marginal means, least-squares means, adjusted means; marginal and partial effects; Hausman tests

### **Contrasts and Pairwise Comparisons**

Compare means, intercepts, or slopes; compare adjacent categories; compare with reference category or grand mean; orthogonal polynomials; adjust for multiple comparisons; treatment effects; graph effects and potential outcomes

### **GMM and Nonlinear Regression**

Generalized method of moments (GMM), nonlinear regression

### **Other Statistical Methods**

Sample size and power, kappa measure of interrater agreement, Cronbach's alpha, stepwise regression, statistical and mathematical functions

### **User-Written Commands**

User-written commands for meta-analysis and data management

### **Programming Language**

Adding new commands, command scripting, if, while, command parsing, debugging, menu and dialog-box programming, markup and control language

Delivery	Within 5 days upon receipt of Purchase Order by the supplier
Price	Inclusive of all applicable taxes, delivery charges, and training on the use of the software
Terms and Payment	Payment shall be made in check by PDIC within fifteen (15) days from receipt of billing statement