MXB334: Assessment 3 Criteria

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| Task | Credit Risk Model |
| Unit Learning Outcomes Addressed | 1. Expertly and critically carry out statistical analysis using statistical models in the analysis of various data sets and examples. 2. Use R to carry out statistical analyses. 3. Communicate statistical conclusions clearly and concisely both in written form and orally. |
| Due date | Week 14/15 |
| Weighting | 40% |
| Specifications | Groups of 3 or 4 (smaller sizes may be allowed by application) |
| Overview | |
| This project will assess your ability to work as a team to apply generalised linear modelling to create a reproducible piece of analysis of real-world customer loan data. You have 2 opportunities to discuss the project with real analysts working for the Bank of Queensland. The analysis will culminate in the proposal of a credit risk model and an evaluation of its performance using industry standard measures and techniques.  The way you will work will closely mirror that of real analysts working in the financial sector. You will be expected to plan your project, give status updates, summarise your findings for executives, document your analysis in a reproducible way, use version control/collaboration tools, and review your performance against you measures of success.  The project is comprised of deliverables that will be due at various stages throughout semester. They are:   1. A Delivery Plan that decomposes the project into a number of tasks or milestones spread over the semester, to be reviewed with your lecturer weekly. 2. An Interim Milestone Report that details how the dataset for modelling has been created from the initial data sources. 3. A Summary on a Page (SOAP) distilling the key outcomes of your project down to a 1 page executive summary. 4. A final Reproducible Analytical Report that formulates, validates, and tests your proposed credit risk model. 5. A Performance Review where you will argue for the grade your work should receive based on the assessment criteria. | |
| What you will do | |
| The overarching task is the creation of a statistical model for loan default. You will use binomial regression within the generalised linear modelling framework to build this model. Models like the one you will build are used by money lending organisations to assign probability of default to loan applications. This information allows effective management of a lending (credit risk) portfolio.  You will plan your work from the project outset and update the plan as you complete tasks or come to better understanding of the remaining work.  Initially you will work toward the interim milestone, which will be to complete preparation of the data for analysis. This will involve:   * joining, filtering, and cleaning data form 2 sources * documenting your decisions on how to handle missing and unusual data * defining and creating the response variable * excluding variables contaminated by information relating to the response * applying variable selection algorithms or heuristics taught in the course to narrow down the large number of covariates for modelling. * Combining all of the above into a reproducible interim report written in Rmarkdown.   Using your dataset, you will build a model for risk of loan default using binomial regression. This will involve:   * Exploratory analysis of variables of usual interest in credit risk.   + It will be up to you to find out what these are from Bank of Queensland analysts. * Selecting from a space of candidate models using goodness of fit measures and cross validation (AIC, Gini/AUC). * Selecting among 3 link functions: logit, probit, cloglog   + With justification for final selection * Testing and validating the assumptions of the model * Evaluating the performance of the model against existing benchmark * Drawing conclusions about the effects of important variables   + Makes statements of the uncertainty relating to the effects * Combining all of the above into a reproducible report written in Rmarkdown.   Using the insights gained from your analysis you will distil the interesting results into a Summary On a Page (SOAP) for executive consumption. You will:   * Use visuals to communicate where appropriate * Highlight Important covariates in the model * State key assumptions   + in particular any assumptions that could not be verified. Highlight these as risks. * State state performance of model   + Compare it to benchmark in terms that relate directly to the executive.   For the final part of this assessment you will submit an individual performance review where you will assess the project and yourself against performance criteria. A template form shall be provided to you on Blackboard. The argument you make for the grade you shall receive will be taken into consideration in the grade awarded to you. | |
| What you will submit | |
| The **Delivery Plan** is a living document that maps the known remaining tasks in this project onto weeks in the project timeline. It is a living document that you will update weekly. Tasks may be added or removed at any time. Each week during the Thursday practical session, your group will make a short report on how you are tracking toward planned items with your lecturer. This report is an opportunity to raise road blocks the group has encountered and get help.  The **Interim Milestone Report** and the **Reproducible Analytical Report** are collaborative works that will be housed in a private Github repository that will be issued to your group. You will use Github’s workflow to collaborate and manage shared authorship in Rmarkdown format. At the respective submission deadlines an image will be made of your group’s repository for grading. Any instructions required to reproduce your report should be entered into the repository’s readme file, although this should not be necessary.  For the **Interim Milestone Report**, the repository will be imaged on **5pm Friday of Week 9**.  For the **Reproducible Analytical Report** the repository will be imaged on **5pm Friday of Week 14**.  You are encouraged to use Github and Rmarkdown for your **SOAP**, however you may use any format. Showcase your design skills if you wish! There will be a submission link placed on Blackboard to use if you do not wish to included it in your Github repository.  The deadline for submission (or push to Github) of the **SOAP** is **5pm Friday of Week 14**.  Your **Performance Review** needs to be submitted individually on Blackboard via an assignment submission link.  The deadline for submission of the **Performance Review** is **5pm Friday of Week 14.** | |
| Resources and Useful References | |
| 1. Logistic Regression Lecture Notes 2. Cross validated and Stack Overflow websites. 3. Rmarkdown documentation: <http://rmarkdown.rstudio.com/> 4. R data wrangling cheatsheet: <https://www.rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf> 5. Github workflow guide: <https://guides.github.com/introduction/flow/> 6. Blackboard Folder for this Project. | |

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| **Task / Grade** | **7** | **6** | **5** | **4** | **3** | **2-1** |
| Delivery Plan | The team actively updates the delivery plan with new tasks and work allocations as more is learned about the project. The plan is consistently ready for review when called for in the weekly practical. | The team actively updates the delivery plan with new tasks and work allocations as more is learned about the project. The plan is in the main ready for review when called for in the weekly practical. | The team’s delivery plan occasionally contains some tasks and work allocations that are outdated or irrelevant. The plan is in the main ready for review when called for in the weekly practical. | The team’s delivery plan occasionally contains some tasks and work allocations that are outdated or irrelevant. The plan occasionally needs minor updates prior to review when called for in the weekly practical. | The team’s delivery plan consistently contains tasks and work allocations that are outdated or irrelevant. The plan consistently needs updates prior to review when called for in the weekly practical. | The team do not maintain a delivery plan until the end of the project. |
| SOAP (Visuals and Communication) | Clear evidence in design of visualisations with intent to communicate information relevant to queries driving analysis. The design is engaging and transmits information in easy to understand way. The design uses appropriate axes and legends. Refers to performance relative to existing benchmark using terms relevant to Executive, e.g. x% more loans or more $ with y% less defaults. Relative importance of covariates is communicated, along with the effects and uncertainty of the most important ones. Clearly states key assumptions and calls out any risks. | Clear evidence in design of visualisations with intent to communicate information relevant to queries driving analysis. The design is engaging and transmits information in a relatively easy to understand way. The design attempts to use appropriate axes and legends. Refers to performance relative to existing benchmark using terms relevant to business, e.g. x% more loans or more $ with y% less defaults. Some terms unrelated to the business appear. Relative importance of covariates is communicated, along with the effects and uncertainty of the most important ones. States most of the key assumptions and calls out most of the risks. | The information that visual elements are intending to communicate is not evident at first sight. The design is engaging and transmits information in a relatively easy to understand way. The design attempts to use appropriate axes and legends. Refers to performance relative to existing benchmark using terms relevant to business, e.g. x% more loans or more $ with y% less defaults. Some terms unrelated to the business appear. Attempts to communicate relative importance of covariates, along with the effects and uncertainty of the most important ones. When stating assumptions and risks some omissions are apparent. | The visualisations chosen are not appropriate for the combination of audience and information. The design is not engaging and does not transmit information in an easy to understand way. The design attempts to use appropriate axes and legends. Refers to performance relative to existing benchmark using terms relevant to business, e.g. x% more loans or more $ with y% less defaults. Some terms unrelated to the business appear. Attempts to communicate relative importance of covariates, along with the effects and uncertainty of the most important ones. When stating assumptions and risks some omissions are apparent. | The visualisations chosen are not appropriate for the combination of audience and information. The visualisation or other commentary relating to covariate effects and importance is misleading and confusing. | No evidence of design in considering audience or information. Information presented is misleading, confusing, and or technically incorrect. |
| Interim Milestone Report | The team successfully applies join, filtering, and summarisation functions to explore data, identify problems such as outliers, duplicates, and missing values. Defines and creates the response covariate. Builds the complete dataset for modelling. Conducts exploratory analysis and makes preliminary statements of strong relationships between covariates and the response. Uses automated tools to identify and exclude covariates with low variance and high correlation. Applies critical reasoning to identify and remove covariates that are contaminated by response. Justifies removal of covariates based on statistically sound reasoning. Applies appropriate transformations to covariates in anticipation of maximising information for modelling. | The team successfully applies join, filtering, and summarisation functions to explore data, identify problems such as outliers, duplicates, and missing values. A small number of data issues may be missed. Defines and creates the response covariate. Builds a dataset for modelling with minor revisions required. Conducts exploratory analysis and makes preliminary statements of strong relationships between covariates and the response. Uses automated tools to identify and exclude covariates with low variance and high correlation. Applies critical reasoning to identify and remove covariates that are contaminated by response. Justifies removal of covariates based on statistically sound reasoning. Applies appropriate transformations to covariates in anticipation of maximising information for modelling. | The team successfully applies join, filtering, and summarisation functions to explore data, identify problems such as outliers, duplicates, and missing values. A significant number of data issues are missed. Defines and creates the response covariate in a way that is problematic for modelling. Builds a dataset for modelling with revisions required. Conducts exploratory analysis and makes preliminary statements of strong relationships between covariates and the response. Identifies and exclude covariates with low variance and high correlation. Applies critical reasoning to identify and remove covariates that are contaminated by response. Some contaminated covariates remain in data set. Justifies removal of covariates based on reasoning that contains minor flaws. Attempts to apply transformations to covariates in anticipation of maximising information for modelling. | The team successfully applies join, filtering, and summarisation functions to explore data, identify problems such as outliers, duplicates, and missing values. A significant number of data issues are missed. Defines and creates the response covariate in a way that is problematic for modelling. Builds a dataset for modelling with revisions required. Conducts exploratory analysis but does not link to modelling objective. Identifies and excludes some covariates with low variance and high correlation. Applies critical reasoning to identify and remove covariates that are contaminated by response. Some contaminated covariates remain in data set. Justifies removal of covariates based on reasoning that contains flaws. Fails to apply appropriate transformations to covariates in anticipation of maximising information for modelling. | The team unsuccessfully applies join, filtering, and summarisation functions to explore data, identify problems such as outliers, duplicates, and missing values. The resulting dataset is unsuitable for statistical modelling due to ill definition of response or significant data issues. Much work remains to complete the modelling dataset. | The team does not attempt to use data preprocessing tools in R. The resulting dataset is unsuitable for statistical modelling due to ill definition of response or significant data issues. Much work remains to complete the modelling dataset. |
| Reproducible Analytical Report | The team presents a coherent modelling process that is statistically sound and inherently reproducible. Exploratory analysis creates intuition for findings of credit risk modelling. Makes justifications for selection/transformation of covariates and refers to industry specific measures (gini). Clearly assesses quality of statistical model fit using validation techniques based on theoretical GLM properties as well as data cross validation. Inference about model performance relative to benchmark is statistically sound and uses appropriate measures (gini, ROC, confusion matrix). The impact of the model is explained in business terms. Clearly states the effects and uncertaintly of variables important in the model and historically important variables. | The team presents a coherent modelling process that is in the main statistically sound and inherently reproducible. Exploratory analysis creates intuition for findings of credit risk modelling. Makes justifications for selection/transformation of covariates and refers to industry specific measures (gini). Attempts to assesses quality of statistical model fit using validation techniques based on theoretical GLM properties as well as data cross validation. Attempts inference about model performance relative to benchmark uses mostly appropriate measures (gini, ROC, confusion matrix). The impact of the model is explained in business terms. Clearly states the effects and uncertaintly of variables important in the model and historically important variables. | The team presents a coherent modelling process that is in the main statistically sound and inherently reproducible. Exploratory analysis creates intuition for findings of credit risk modelling. Makes some justifications for selection/transformation of covariates and refers to industry specific measures (gini). Attempts to assesses quality of statistical model fit using validation techniques based on theoretical GLM properties as well as data cross validation. Attempts inference about model performance relative to benchmark uses mostly appropriate measures (gini, ROC, confusion matrix). The impact of the model is explained in business terms. States the effects and uncertainty of variables important in the model but ignores some historically important variables. | The team presents a coherent modelling process that is in the main statistically sound and inherently reproducible. Exploratory analysis creates intuition for findings of credit risk modelling. Makes some justifications for selection/transformation of covariates. Fails to refer to industry specific measures. Attempts to assesses quality of statistical model fit using a limited suite of validation techniques. Attempts inference about model performance relative to benchmark but uses some inppropriate measures. The impact of the model is explained in terms not relevant to business. Statements of the effects and uncertainty of variables important in the model are unclear. | The team presents an incoherent modelling process that is not statistically sound and inherently reproducible. Exploratory analysis fails to create intuition for findings of credit risk modelling. Justifications for selection/transformation of covariates are absent. Fails to refer to industry specific measures. Attempts to assesses quality of statistical model fit using a limited suite of validation techniques. Attempts inference about model performance relative to benchmark but uses some inppropriate measures. The impact of the model is explained in terms not relevant to business. Statements of the covarite effects are unclear, uncertainty is ignored. | The team presents an incoherent modelling process that is not statistically sound and inherently reproducible. Exploratory analysis fails to create intuition for findings of credit risk modelling or is absent. Selection/transformation of covariates is not performed coherently. Fails to refer to industry specific measures. Attempts to assesses quality of statistical model fit using a limited suite of validation techniques. Does not make inference about model performance relative to benchmark. The impact of the model is explained in terms not relevant to business. Statements of the covariate effects are unclear, uncertainty is ignored. |
| Individual Performance Assessment | The team member makes succinct response to performance review template that identify specific actions or examples of work that relate to the performance criteria. | The team member makes succinct response to performance review template that identify some specific actions or examples of work that relate to the performance criteria. | The team member provides verbose response to performance review template that lacks some specific actions or examples of work that relate to the performance criteria. | The team member provides verbose response to performance review template that lacks any specific actions or examples of work that relate to the performance criteria. | The team member makes extremely limited response to performance review template that fails to give any specific examples to justifyfor meeting criteria. | The team member makes extremely limited responses that are of no value in determining their performance. |

# Assessment supplementary information

## Extensions

Requests for extensions need to be submitted before the assessment item due date to SEF Student Services.  If you can't apply by this date due to circumstances beyond your control, contact  [SEF Student Services](https://www.student.qut.edu.au/about/contact/groups/faculty-student-offices)  to discuss your options. You need to provide supporting documentation to verify your special circumstances claim and to show how the circumstances impact your ability to submit the assignment by the due date. Examples of special circumstances that warrant an extension, and those that do not, can be found on Student Gateway: <https://www.student.qut.edu.au/studying/special-circumstances>

## Late submission of assessment item

If you submit an assessment item after the due date without an approved extension (or after the extended date where an extension has been granted) your work will not be marked and will be awarded a grade of 1, or 0%.

If special circumstances prevent you from meeting the assessment due date, you can apply for an extension (see above). If you don’t have an approved extension you should submit the work you have completed by the due date and it will be marked against the assessment criteria.

QUT’s assessment submission requirements reflect the expectations of professional practice where you will need to meet deadlines. Further information is available on Student Gateway <https://www.student.qut.edu.au/studying/assessment/late-assignments-and-extensions>

## Remarking of your assessment item(s)

QUT has mechanisms in place to ensure that all assessment pieces are marked consistently and fairly. During the semester or teaching period you should discuss your progress in all course work with teaching staff. You can expect a clear indication of whether you have achieved the objectives set for each assessment item. Accordingly, no individual piece of assessment will be remarked during the semester.

At the end of semester, please check your overall mark and if you are not satisfied with your final grade, you can contact relevant teaching staff to clarify the reason for your grade and if you remain dissatisfied after discussion with teaching staff, you can apply for a formal review of grade within ten working days. Further information is available on Student Gateway: <https://www.student.qut.edu.au/studying/assessment/reviews-and-appeals/review-of-grade-or-academic-ruling>