**Assignment Task**

Business modelling encompasses a variety of different theoretical and practical aspects, even for organisations operating within a single industry. You are a business analyst working within Mercedes and have been asked to evaluate business processes for three members of the strategic management team. This assessment is broken down into three tasks. The word count mentioned is indicative of the level of work required to complete each task effectively and should be used as an upper limit only.

**Task 1**

The Chief Financial Officer wants to evaluate the strength of Mercedes’ parent company, Daimler AG, to evaluate when over a 3 month period to investigate funding opportunities. The higher the share price, the more favourable the lending terms will be. Based on the closing daily stock prices for Daimler AG for the period 1st July 2017 – 1st July 2018 predict the values from 2nd July 2018 – 1st October 2018 with an RBF network and Exponential Smoothing using time series processing techniques. Firstly, state why ARIMA models are not suited to this task. Secondly, plot the data and explain your processing steps. Thirdly, report your modelling results with supporting plots and finally evaluate when the CFO should arrange funding opportunities.

**(LO1, 2, 4 & 6) (1750 words) (35 Marks)**

**Task 2**

The head of sales and marketing is performing market research to assess whether Mercedes should produce a pickup truck. It is expected that BMW is scoping the production of a competing vehicle for the German car market also. Construct a graphical model with at least 8 nodes represented by appropriate probability distributions and models. Plot the graphical model and justify each distribution and corresponding parameters to evaluate the profitability of the venture. Using Monte-Carlo sampling simulate 1000 values of profit for the venture and justify whether this would be beneficial for Mercedes.

**(LO3, 5 & 6) (1500 words) (30 Marks)**

**Task 3**

The dataset accompanying this assignment contains records for the average call wait time for a customer arranging a service with the Mercedes repair centre. The Chief Operations Officer has requested the data be analysed to characterise the telephone queueing times and to predict the 95% upper limit of a queue based on a maximum likelihood approach. Discussions with team members allows you to identify a prior expectation of the queueing times of mean 5 minutes and variance 1 minute. Analyse whether this prior results in a lower posterior average queue time. Many queuing systems experience fluctuations over longer timescales, such as annual periodicity. Investigate whether it is more likely that this data follows a 2nd order Poisson mixture model or the maximum likelihood model and show that your model converges to fixed parameters during each iteration. It is believed that the dataset from August 2012 onwards under-represents the call wait times by between 20% and 50%. Analyse the sensitivity of your optimal model to with regards to data under these circumstances.

**(LO1, 2, 5 & 6) (1750 words) (35 Marks)**