The paper deals with the problem of predicting the time to default in credit behavioural scoring. This area opens a possibility of including a dynamic component in behavioural scoring modelling which enables making decisions related to limit, collection and recovery strategies, retention and attrition, as well as providing an insight into the profitability, pricing or term structure of the loan. In this paper we compare survival analysis and neural networks in terms of modelling and results. The neural network architecture is designed such that its output is comparable to the survival analysis output. Six neural network models were created, one for each period of default. A radial basis neural network algorithm was used to test all six models. The survival model used a Cox modelling procedure. Further, different performance measures of all models were discussed since even in highly accurate scoring models, misclassification patterns appear. A systematic comparison ‘3+2+2’ procedure is suggested to find the most effective model for a bank. Additionally, the survival analysis model is compared to neural network models according to the relative importance of different variables in predicting the time to default. Although different models can have very similar performance measures they may consist of different variables. The dataset used for the research was collected from a Croatian bank and credit customers were observed during a twelve-month period. The paper emphasizes the importance of conducting a detailed comparison procedure while selecting the best model that satisfies the users’ interest.