5. Discussion

In this chapter, the discussion of model selection for each given dataset is explained. Then, a state inference from the model is made. Lastly, a general discussion of this study is provided.

5.1. Model selection

In this analysis, a three-state model which had all switching coefficients from Analysis I (see sec. 4.1) acted as a baseline model for each dataset. This model was used to compare with other models which had different combination of switching coefficients. If the model has higher BIC than the baseline model, it means that this specific model performs worst and should not be considered for further analysis. However, only examining the BIC when choosing a model for the data is insufficient. Other aspects should also be taken into consideration along with the BIC such as model outputs or plots.

Software release L16A Even though model 3 had the lowest BIC, a coefficient of *Paging* in one state had a zero standard error and led t-value to infinity. This zero value can be interpreted in two different ways: an actual zero or an extremely small value that a computer treated as zero because significant digit is lost due to the floating point. Nevertheless, either way suggests that this model might not be a good model to use with this dataset as the model might be overfitting with the training data. The standard error equal to zero means that there is no variation in the data i.e., every data value is equal to the mean. Therefore, model 1 which had the second lowest BIC was chosen for this given dataset instead.

Software release L16B Model 2 had the least BIC among the other models. Nonetheless, its plot provided somewhat difficulty in interpreting a result (see Figure C.1). The plot is divided into two main parts. In the first half of the period, observations stay in State3 while observations are in State2 in the second half of the time period. Figure C.1 indicates a fluctuation in the value of the CPU utilization. Therefore, for observation or software package to remain in the same state for a long duration without switching to other states seems somewhat unrealistic. The next smallest BIC is from a model 6. However, the model established a result similar to the result

from the model 2. Hence, the selected model for this dataset was model 4 where its BIC was in the third place. Even though model 4 had a bit higher BIC than models 2 and 6, the model produced more sensible result.

Software release L17A Model 1 had the lowest BIC and appeared to have a good explanation when examining a plot. Thus, the model was preferably chosen.

5.2. State inference

Another important task after deciding which model will be used is to make an inference on the derived states. A function from the package will estimate coefficients in each state without providing the definition of these states. Therefore, an interpretation and inference of the state need to be specified by a user.

Software release L16A Figure 4.7

It can be seen that State 1

State 2

State 3

Software release L16B Figure 4.8

State 1

State 2

State 3

Software release L17A Figure 4.9

State 1

State 2

State 3

5.3. General discussion

A thorough search of the relevant literature yielded that this thesis work might be the first time that Markov switching model has been applied to the specific type of data – detecting the state of the CPU. In previous work, this model is mainly implemented in finance or signal processing. Researches and works on that matter