Chapter 6

Data Mining for Optimal Combination Demand Forecasts

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ABSTRACT

This chapter is a case study in combining forecasts for inventory management in which the need for data mining in combination forecasts is necessary. The need comes from selection of sample items on which forecasting strategy can be made for all items, selection of constituent forecasts to be combined and selection of weighting method for the combination. A leading bank in Hong Kong consumes more than 300 kinds of printed forms for its daily operations. A major problem of its inventory control system for such forms management is to forecast their monthly demand. The bank currently uses simple forecasting methods such as simple moving average and simple exponential smoothing for its inventory demands. In this research, the individual forecasts come from well-established time series models. The weights for combination are estimated with quadratic programming. The combined forecast is found to perform better than any of the individual forecasts. Some insights in data mining for this context are obtained.
INTRODUCTION

Errors in forecasting demand can have a significant impact on the costs of operating and the customer service provided by an inventory management system. It is therefore important to make the errors as small as possible. The usual practice in deciding which system to use is to evaluate alternative forecasting methods over past data and select the best. However, there may have been changes in the process generating the demand for an item over the past period used in the evaluation analysis. The methods evaluated may differ in their relative performance over subperiods of the method that was best only part of the time or in fact never the best method and perhaps only generally second best. Each method evaluated may be modeling a different aspect of the underlying process-generating demands. The methods discarded in the selection process may contain some useful independent information. A combined forecast from two or more methods might improve upon the best individual forecasts. Furthermore, the inventory manager typically has to order and stock hundreds or thousands of different items. Given the practical difficulty of finding the best method for every individual item, the general approach is to find the best single compromise method over a sample of items, unless there are obvious simple ways of classifying the items, by item value or average demand per year, etc. Even if this is possible, there will still be many items in each distinct category for which the same forecasting method will be used. All of the points made on dealing with an individual data series, as above, apply with even more force when dealing with a group of items. If no one individual forecasting method is best for all items, then some system of combining two or more forecasts would seem a priori an obvious approach, if the inventory manager is going to use the same forecasting system for all items.

This chapter describes a case study of combining forecasts for inventory management in which the need for data mining in combination forecasts is addressed. The need comes from selection of sample items on which forecasting strategy can be made for all items, selection of constituent forecasts to be combined and selection of weighting method for the combination.

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A Solution to the Cross-Selling Problem of PAKDD-2007: Ensemble Model of TreeNet and Logistic Regression
Mingjun Wei, Lei Chai, Renying Wei and Wang Huo (2008). International Journal of Data Warehousing and Mining (pp. 9-14).
www.igi-global.com/article/solution-cross-selling-problem-pakdd/1802?camid=4v1a

Resource Constrained Data Stream Clustering with Concept Drifting for Processing Sensor Data
Gansen Zhao, Zhongjie Ba, Jiahua Du, Xinming Wang, Ziliu Li, Chunming Rong and Changqin Huang (2015). International Journal of Data Warehousing and Mining (pp. 49-67).
www.igi-global.com/article/resource-constrained-data-stream-clustering-with-concept-drifting-for-processing-sensor-data/129524?camid=4v1a