# Chapter 59
# Potential Indicators Based Neural Networks for Cash Forecasting of an ATM

**Partha Sarathi Mishra**
*North Orissa University, India*

**Satchidananda Dehuri**
*Ajou University, South Korea*

## ABSTRACT

*Cash forecasting is one of the important tasks in the domain of computational finance. A number of tools have been developed by various groups of researchers and are being used by banks or corporate to identify future cash needs. However, due to the high degree of non-linearity of the problem and surrounded by many local optimal solutions, this paper propose a multi-layer locally tuned perceptron (MLTP) to forecast the future needs and at the same time reduce the users frustration. It uses a fine tuned MLTP to forecast a daily cash demand of an automated teller machine (ATM). Further, potential indicators are used to making the model robust in terms of its efficiency and accuracy. The accuracy is compared against a traditional time series method. Furthermore, it is validated using the past data collected from the SBI ATM of Bhadrak district of Odisha, India. The performance of the method is encouraging. This system can be scaled for all branches of a bank in an area by incorporating historical data from these branches.*

## 1. INTRODUCTION

The banking industry in India has a huge canvas of history, which covers the traditional banking practices from the time of Britishers to the reforms period, nationalization to privatization of banks and now increasing numbers of foreign banks in India (Goyal and Joshi, 2012; Platona and Bergman, 2011). All retail banks including leaders (combination of both private and government undertaking) such as State Bank of India (SBI), Industrial Credit and Investment Corporation of India (ICICI), Housing Development Finance Corporation (HDFC), Unit Trust of India (UTI) renamed as Axis Bank, and United Co-operation bank (UCO) are competing for a larger share of the customer's financial transactions. Their efforts are

DOI: 10.4018/978-1-5225-0788-8.ch059

directed to attract and hold customers by offering them a basket of tailor made schemes supported by a state of the art electronic distribution system (the ATMs) (Geeta, 2005). The whole exercise is helping banks to serve their customers fast and avoid human intervention. And for the customers, ATMs offer hassle-free cash withdrawal even in holiday also. No more fighting with the bank's teller for change, fresh notes, and tight bank timing. The total cash movement through ATMs in India is already between Millions of Rupees (local currency) every year. In future, things are going to be even more different and challenging. The ATM has become a medium for non-cash transactions such as payment of bills, insurance payments, printing of statements or even accessing the Internet (Christidis, Papailio, Apostolou, and Mentzas, 2011).

In recent years a lot of attention is devoted to the analysis and forecasting the future demands particularly cash in an ATM which are affected by many complex factors like holidays, salary date, Sunday, geographical locations, development of the area (i.e., whether it is developed or not), etc (Teddy and Ng., 2011). Such an estimation and or forecasting future conditions govern many critical business activities of a bank like inventory control, procurement of supplies, labour cost estimation, prediction of product demand, etc. However, it is difficult to forecast cash with a desired accuracy, if not impossible. Although there are many factors which are imprecise but thorough understanding of the domain leads us to develop models without having uncertainties and in the sequel forecasting will be accurate.

Input/Output data pertaining to the application at hand must be collected over a period of time and analyzed by various automated model fitting procedures. The key to all these forecasting applications is to capture and process the historical data such that it provides insight into the future (Kumar and Walia, 2006; Dash and Liu, 1997). Capturing and forecasting in time is a process. It involves various steps: i) preprocessing the collected data, ii) identify or design the model, and iii) validation of the model, and iv) post processing of the results and deployment.

The ability to predict the future demand estimate of currency within a reasonable accuracy is called cash forecasting. Cash forecasting is integral to the effective operation of an ATM/branch network (Teddy and Ng, 2011). The challenge of forecasting is daunting, but it is important to be able to forecast the daily ATM cash demands accurately. As with other products in vending machines, an inventory of cash money needs to be ordered and each ATM replenished a set period of time beforehand, based on the forecasts. If the forecasts are too high, the unused money stored in the ATMs incurs costs; if the ATMs run out of cash, customers will be dissatisfied. Although, there are many conventional approaches are exist (discussed in Section 2), however, it is often difficult, if not impossible to obtain a general and accurate predictive model (Gooijer and Hyndman, 2006). However, real world time series data, such as daily cash withdrawal data from ATM, have a dynamic nature and consist of multiple time varying patterns, due to seasonality/time influences. In other words the historical withdrawal records may contain contradictory time varying characteristics that will make difficulty for a predictive model to approximate the underlying data dynamics accurately. In contrast, neural networks with good learning algorithms have proven to be an accurate prediction (Adya and collopy, 1998). The well-know multi-layer perceptron (MLP) network was the prediction technique chosen, due to its success in single time series forecasting (Adeodate, Arnaud, Vasconcelos, Cunha, and Monteiro, 2011), simplicity of operation, ability of universal function approximations, and robustness. However, we have adopted a locally tuned activation functions in every layers of neurons. Furthermore, the problem of cash forecasting using multi-layer locally tuned perceptrons (MLTP) has been studied in respect of a cash-withdrawal in an ATM located at Bhadrak district of Odisha, India.