Wachovia Bank Case Solution

i. Summary and Problem Statement

Wachovia Bank provided a full line of trust services to its customers and had total assets worth $3.5 billion and a net income of $30.5 million. The Piedmont Operations Center of the Wachovia Bank was the largest operating center serving 58 branches and 10 cities.

The Proof Department was the heart of the bank's check-clearing operations. This department received and processed checks to clear them in the shortest possible time to save on float, which averaged $220 million a day system wide. A. Mebane Davis, the new manager of the Piedmont Operations Center of Wachovia Bank and Trust of North Carolina, was reviewing the staffing needs for the Proof Department of the bank, with the goal to ensure continued cost effective employee performance.

The proof contents were labelled as commercial, personal and "big-ticket" work. The big-ticket items were always processed first, followed by commercial and then personal items. The proof operators were responsible for processing work by the end of their day. The volume of items processed in the Proof Department had significantly increased in the last two years, from 38.01 million to 42.975 million. Due to this, the scheduling and staffing problem of the bank had magnified. This volume pattern led management to use a large part-time staff to cover peak loads. There were 14 full-time and 22 part-time operators working at each center with an average processing rate of 1,000 items per hour.

Mr. Davis had to forecast the demand for the 67th Week and then schedule the number of full-time and part-time workers to meet the predicted demands. His base schedule, which included full-time and some part-time workers, was enough to clear 60,000 checks, and he had the flexibility to add as many part-time hours as he wished to his schedule. There was no requirement to finish clearing all the checks on the day they arrived, but the checks that arrived during the entire week had to finished by Friday afternoon. In order to complete the work, if the workers had to be paid overtime, their wage was 50% above their regular wage.

In order to solve the forecasting problem, Mr. Davis had the available weekly proof volumes of the previous 66 weeks, which were de-seasonalized to take out the yearly seasonal patterns, and he could also use the seasonal index of 0.975 to adjust the de-seasonalized forecast. The procedure suggested for forecasting the weekly-load requirement of the Piedmont Operations Center Proof Department is discussed in this report.

ii. Analysis of the data

A total of 3 procedures were suggested to Mr. Davis in order to forecast the weekly workload requirement for the proof department.

The first approach involved a simple forecasting scheme for which previous week's volume was used to forecast each succeeding weeks' value. The second approach used a forecast suggested by Mr. Davis' predecessor for each week in the future. Here an estimate of 730,000 was used as reflected by the prior experience during the entire time on the job. The last approach suggested using a forecast method where each forecast was calculated by putting some weight (alpha) on the previous actual volume and some weight (with a total of 1) on the previous long-run forecast (this technique is called exponential smoothing).

All 3 methods are evaluated and the analysis is reported below. To check the accuracy of the forecasts, the Mean Absolute Deviation (MAD), the Running Sum Forecast of Error (RSFE), the Tracking Signal (TS) and the Mean Squared Error (MSE) is used. The lower the value of these errors, the better the technique. All of these error metrics are also compared to decide which forecasting model would be the most optimal in this case.

a. Simple Forecasting

The simple forecasting scheme uses the previous week's volume to forecast each succeeding week's volume. Based on the data given in the Excel sheet, a **forecast of 931,000 is given for the 67th week** which is actually the volume of the 66th week. Then the error term e_t is calculated by subtracting the actual value and the forecasted values in order to calculate the MAD, RSFE, TS and MSE. The detailed calculations for all the values is found in the Excel sheet. For this method, the following error metrics were found:

$$MAD = \frac{\sum |e_t|}{n} = \frac{3169.028}{65} = 48.75$$

$$RSFE = \sum e_t = -297.73$$

$$TS = \frac{RSFE}{MAD} = -6.107$$

$$MSE = \frac{\sum {e_t}^2}{n} = 4043$$

b. Forecasting based on Predecessor

This approach uses a forecast suggested by Mr. Davis' predecessors for each week in the future. The predecessors used an **estimated value of 730,000** based on their prior experience for forecasting the sales of each week. Here, the error term is calculated again by subtracting the actual value and the forecasted values and then used for finding the MAD, RSFE, TS and MSE. The detailed calculations of all the values is found in Excel.

$$MAD = \frac{\sum |e_t|}{n} = \frac{4770.437}{66} = 72.3$$

$$RSFE = \sum e_t = -3954.92$$

$$TS = \frac{RSFE}{MAD} = -54.71$$

$$MSE = \frac{\sum {e_t}^2}{n} = 7407.3$$

c. Exponential Soothing

This method is a compromise between the above two methods. Each forecast is calculated by putting some weight (*Alpha*) on the previous actual volume and on the previous long-run forecast (a total of one). A formula for the scenario is shown below:

$$Next\ forecast = Alpha * (Volume) + (1 - Alpha) * (Previous\ Forecast)$$

$$F_{t+1} = Alpha * (X_t) + Alpha * (F_t)$$

X_t is the volume in period t and F_t is the forecast in period t. It is checked if F_{t+1} is close to X_{t+1}. This model is evaluated for $\boldsymbol{Alpha = 0.2 , 0.4 , 0.5 , 0.7, 0.8}$

For different values of $Alpha$, the error terms are calculated and shown below. Furthermore, for the **initial forecast of the 1st week, 730000** is used as the forecasted value (obtained from the predecessor forecast value). Later, a comparison between error metrics for all the values of Alpha is made and the best model is chosen.

Exponential Smoothing with $\mathrm{Alpha} = 0.2$

$$MAD = \frac{\sum |e_t|}{n} = \frac{2733.3120}{65} = 42$$

$$RSFE = \sum e_t = -563.176$$

$$TS = \frac{RSFE}{MAD} = -13.4$$

$$MSE = \frac{\sum {e_t}^2}{n} = 2927.545$$

Exponential Smoothing with $Alpha = 0.4$

$$MAD = \frac{\sum |e_t|}{n} = \frac{2727.3182}{65} = 42$$

$$RSFE = \sum e_t = -390.49$$

$$TS = \frac{RSFE}{MAD} = -9.30$$

$$MSE = \frac{\sum {e_t}^2}{n} = 3005.43$$

Exponential Smoothing with $Alpha = 0.5$

$$MAD = \frac{\sum |e_t|}{n} = \frac{2783.7355}{65} = 42.83$$

$$RSFE = \sum e_t = -357$$

$$TS = \frac{RSFE}{MAD} = -8.33$$

$$MSE = \frac{\sum {e_t}^2}{n} = 3102.765$$

Exponential Smoothing with $Alpha = 0.7$

$$MAD = \frac{\sum |e_t|}{n} = \frac{2941.23}{65} = 45.24$$

$$RSFE = \sum e_t = -321.51$$

$$TS = \frac{RSFE}{MAD} = -7.1$$

$$MSE = \frac{\sum {e_t}^2}{n} = 3374.89$$

Exponential Smoothing with $Alpha = 0.8$

$$MAD = \frac{\sum |e_t|}{n} = \frac{3016.1572}{65} = 46.40$$

$$RSFE = \sum e_t = -311.27$$

$$TS = \frac{RSFE}{MAD} = -6.70$$

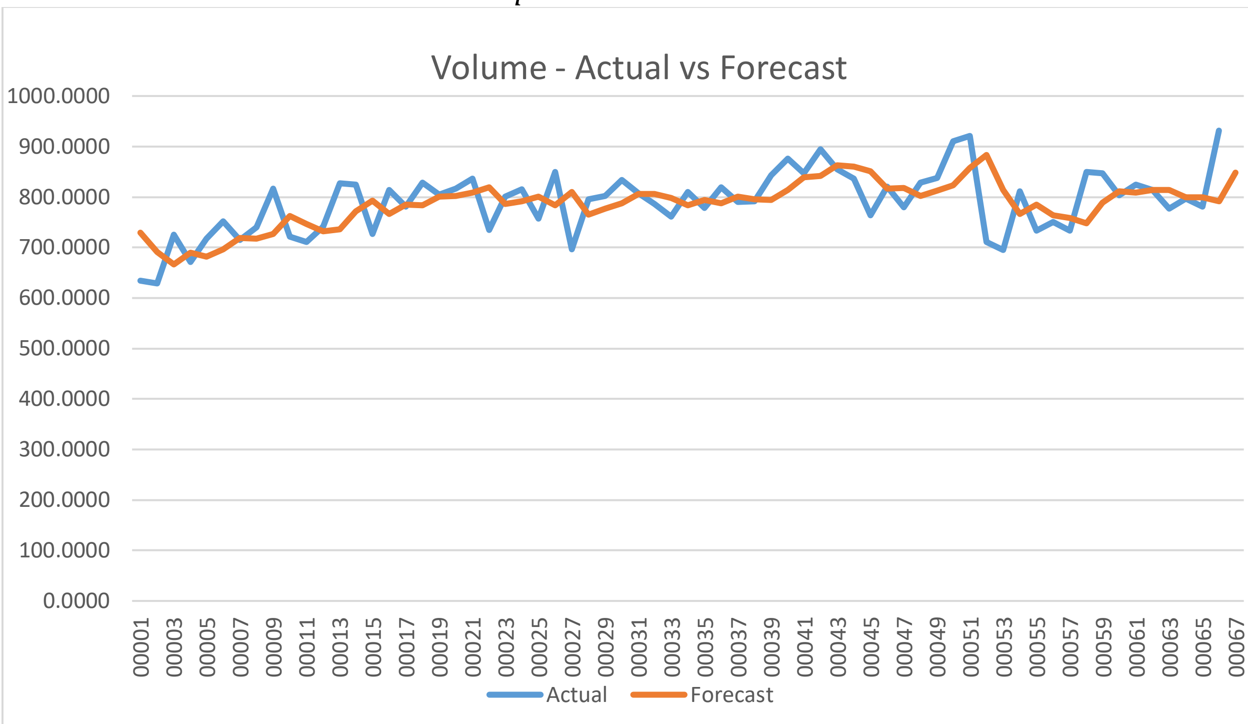
$$MSE = \frac{\sum {e_t}^2}{n} = 3556.15$$

iii. Summary and Conclusion

A summary table of all the above observations is shown below:

Forecast Type	MAD	RSFE	TS	MSE	Forecast	Additional Part-Time Employees
Simple Forecast	48.75	-297.73	-6.107	4043	931448	9
Predecessor	72.3	-3954.92	-54.71	7407.3	730000	4
Alpha = 0.2	42	-563.176	-13.4	2927.545	823378	6
Alpha = 0.4	***42***	***-390.49***	***-9.30***	***3005.43***	***847680***	***7***
Alpha = 0.5	42.83	-357	-8.33	3102.765	860363	7
Alpha = 0.7	45.24	-321.51	-7.1	3374.89	887658	8
Alpha = 0.8	46.40	-311.27	-6.70	3556.15	901987	8

Based on the table above, the $Alpha$ value of 0.4 is chosen as the forecasting method because it has the minimum MAD and the other errors are lower compared to different forecasts. However, this decision is difficult to make because all of the error values are close to each other for different $Alpha$ values. But, clearly, the exponential forecasting technique gives lesser MAD and MSE error when compared to the simple and predecessor forecasting techniques. A plot of the actual vs forecast values for the volume when $Alpha = 0.4$ is shown below:



Assuming all workers work for 8 hours a day (normal workday), and since each operator has an average processing rate of 1,000 items per hour, the current workload that can be handled by the 14 full-time workers is **560,000 checks per week** $(14 * 40\frac{hr}{week} * 1000\frac{items}{hour})$. Thus, a balance of **40,000 checks** is handled by 1 part-time worker. For processing the additional workload:

The $Alpha$ value of 0.4 gives the forecast for the 67th week as 847.680127**.** The expected volume for the 67th week is $847.680127 * 1000 \approx \mathbf{847680}$. Since the forecasted volume is greater than 600,000 and each operator has an average processing rate of 1000 items per hour, Mr. Davis needs extra part-time workers. The extra working hours are calculated by: $\frac{847680-600000}{1000} = \boldsymbol{247.68\ extra\ working\ hours.}$ Based on the working time of a normal workday, the additional number of part-time employees needed to get the work done is: $\frac{247.68}{8*5} \approx \boldsymbol{7\ part-time\ employees}$.

Using exponential soothing across the historical volume avoids the use of extra part-time employees or helps handling the additional volume with minimal over-time hours.