

CHAPTER 7

FORECAST TOOL MANUAL FOR FUTURE FORECAST

This manual was made so that X clothing store could do demand forecasting by using the forecast tool developed in chapter five and used in chapter 6. The forecast tool was simplified as much as possible for easier use.

7.1. Future Forecasting and Decision Making

Forecasting is always better with more data, considering if the data patterns are still the same but the forecast tool can only be used on three years of monthly data. In the future, the data pattern could change. If there would be a change in data pattern, the forecast model and method would need to be checked and changed accordingly so that the forecast errors could be minimized. The similar the pattern, the higher the possibility of achieving more accurate forecasts. If in future data the pattern changes, the previous data might not be included as input data for forecasting. If the pattern does not change, the recent three years of data would be used to do demand forecasting.

After some time, when the old SKUs are already sold out and more data is available for newer SKUs, forecasts need to be done on their respective newer code groups because newer code groups differentiate the gender while the old ones do not. Those newer SKU would make deciding the quantity to order easier in regard to gender-based products.

When making decision on product type and quantity, there are three major celebrations in Indonesia that need to be considered. Those celebrations are going to affect the sales and data pattern in X clothing store. They are religious celebrations of Ramadhan and Christmas; and Chinese New Year. From those three celebrations, Ramadhan and Chinese New Year follows a different calendar and the dates of both celebrations changes in the common calendar used normally, making the time when demand increase happens slightly different every year. When ordering to suppliers, purchasing personnel should keep in mind the dates of these celebrations to make sure X clothing store has enough items before customers start buying products before celebration days come.

7.2. Using the Forecast Tool

Here are step by step manual to use the forecast tool:

Autofill Month Column (2)

Month	(3) Item Sold	
	BLK	Forecast
Jan-16	1224	0
Feb-16	1347	0
Mar-16	1285	0
Apr-16	1590	0
May-16	1739	0
Jun-16	3162	0
Jul-16	2030	0
Aug-16	1252	0
Sep-16	1266	0
Oct-16	2636	0
Nov-16	1241	0
Dec-16	4780	0
Jan-17	716	1055.319
Feb-17	342	418.6173
Mar-17	868	436.9715
Apr-17	1539	1441.128
May-17	1558	2042.483
Jun-17	3059	3066.074
Jul-17	2037	1494.466
Aug-17	1039	1130.665
Sep-17	1544	1378.41
Oct-17	1338	1061.29
Nov-17	1393	1107.604
Dec-17	1900	1640.645
Jan-18	1224	1039.584
Feb-18	527	402.8825
Mar-18	441	421.2367
Apr-18	1557	1425.393
May-18	2306	2026.749
Jun-18	3285	3050.339
Jul-18	1245	1478.731
Aug-18	1427	1114.93
Sep-18	1489	1362.675
Oct-18	1085	1045.556
Nov-18	1111	1091.869
Dec-18	1474	1624.91
Jan-19		1023.849
Feb-19		387.1478
Mar-19		405.5019
Apr-19		1409.658
May-19		2011.014

FORECAST TOOLS FOR X CLOTHING STORE

RMSE Summary				
RMSE	Data Perio	Method	MPE	
1107.023	1107	16-18	MA 2	-40.11%
1139.725	1140	16-18	MA 3	-44.09%
956.4104	956	16-18	MA 6	-44.93%
764.3209	764	16-18	MA 12	-54.15%
923.3287	923	16-18	SES	-22.97%
937.1479	937	16-18	DOUBLE E	-24.31%
810.9397	811	16-18	ETS 3	-24.43%
626.2567	626	16-18	ETS 6	-0.44%
581.4693	581	16-18	ETS 12	-13.26%
766.5125	767	17-18	SES	-16.02%
783.398	783	17-18	DOUBLE E	-12.49%
687.597	688	17-18	ETS 3	-16.20%
560.288	560	17-18	ETS 6	5.89%
249.9533	250	17-18	ETS 12	4.82%

(6) Adjust Smoothing Constants

Method with Min. RMSE			
Data Perio	Method	RMSE	MPE
17-18	ETS 12	249.9533	4.82%

Generally a good forecast (8)

Naïve Method	RMSE	MPE
	1213.463	-0.25061

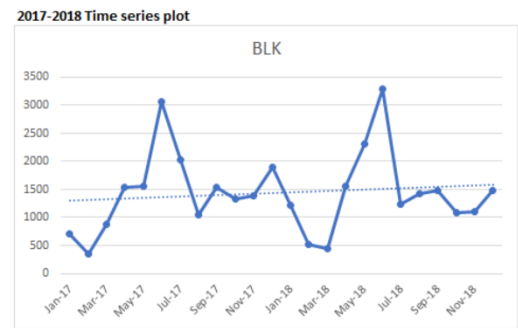
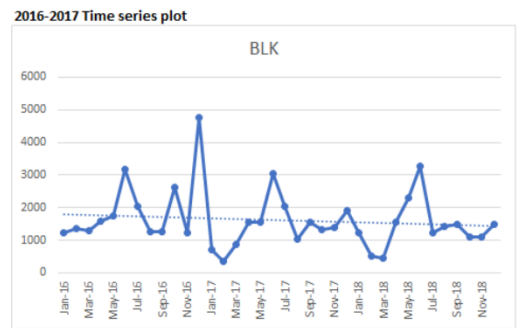
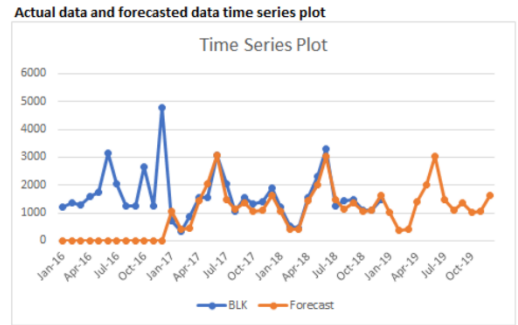


Figure 7.1 Summary Sheet Guide

- a. The forecast tool is designed to be used at the end of the month.
- b. In summary sheet, month and year info in month column could be changed by typing the beginning month and year desired in row (1) and clicking the autofill month column button (2) to fill and change the rest of the month and year;
- c. Input the data in column (3);
- d. Time series plot for three years (currently 2016 to 2017) and two years (currently 2017 to 2018) of data would automatically change with the input;
- e. Click the “adjust smoothing constants” button (4) to adjust the smoothing constants to achieve optimum result for single exponential smoothing (SES) and double exponential smoothing method;
- f. Forecasted values could be seen in column (5);
- g. The result summary from other method sheets would be shown in (6);
- h. The method with the smallest RMSE would be shown in (7) and it also shows if the forecast is generally good enough or not.
- i. (8) originally use MIN function to display the method with the smallest RMSE from (6). Change (8) by using equal sign (=) and pick the RMSE desired from (6).
- j. The time series plot for actual and forecast data, and forecasted values in column (5) would change depends on what is in (6);
- k. RMSE and/or MPE can be not satisfying enough. This can be seen from the forecast errors values or forecast results pattern that do not resemble the actual data. If this happens, choosing other method by changing (8) or by using custom sheet may be necessary.

Aside from steps mentioned above, there are also several things X clothing store should be mindful of:

- a. Do not use cut and paste on anything. Using copy and paste to fill the input is okay but do not use cut and paste;
- b. Always use the summary sheet except if the forecast model did not produce desired standard, use the custom sheet;
- c. Do not toggle with the exponential smoothing methods sheet (ES sheet);
- d. Password to open the locked sheet (naïve and MA sheets) would be given to the person in charge of X clothing store.

X clothing store uses Bahasa Indonesia as for their everyday conversation so a manual in Bahasa Indonesia was also made (Appendix 1).

CHAPTER 8

CONCLUSIONS AND SUGGESTIONS

8.1. Conclusions

X clothing store had inventory overstock and understock problems. To help X clothing store decide the order quantity of their items, demand forecasts were calculated to predict the next period of estimated demands. To forecast the number of demands, every SKU in X clothing store was grouped according to their respected type of items. Forecasting was done with basic forecasting methods of simple averages, moving averages, and exponential smoothing methods. For easier forecasting, a forecast tool was made with moving averages and exponential smoothing methods that could calculate the forecast and forecast errors automatically. The forecast tool could also choose the best method for a code group by choosing the method with the lowest RMSE. Forecast values were calculated using the forecast tool and it was concluded that:

- a. Out of sixty-six code groups, three code groups used 2016 to 2018 data. Two of them used ETS 12 forecasting method and one of them used ETS 11 forecasting method;
- b. There were thirty-six code groups that used ETS 12 methods (excluding code groups that used data from 2016 to 2018);
- c. There were eleven code groups that used ETS method with seasonal length lower than twelve;
- d. There were eleven code groups that used ETS method with seasonal length higher than twelve;
- e. There were three code groups that used SES method;
- f. There were two code groups that used simple average method;
- g. There was no code group with moving average and double exponential smoothing method as its best forecasting method.

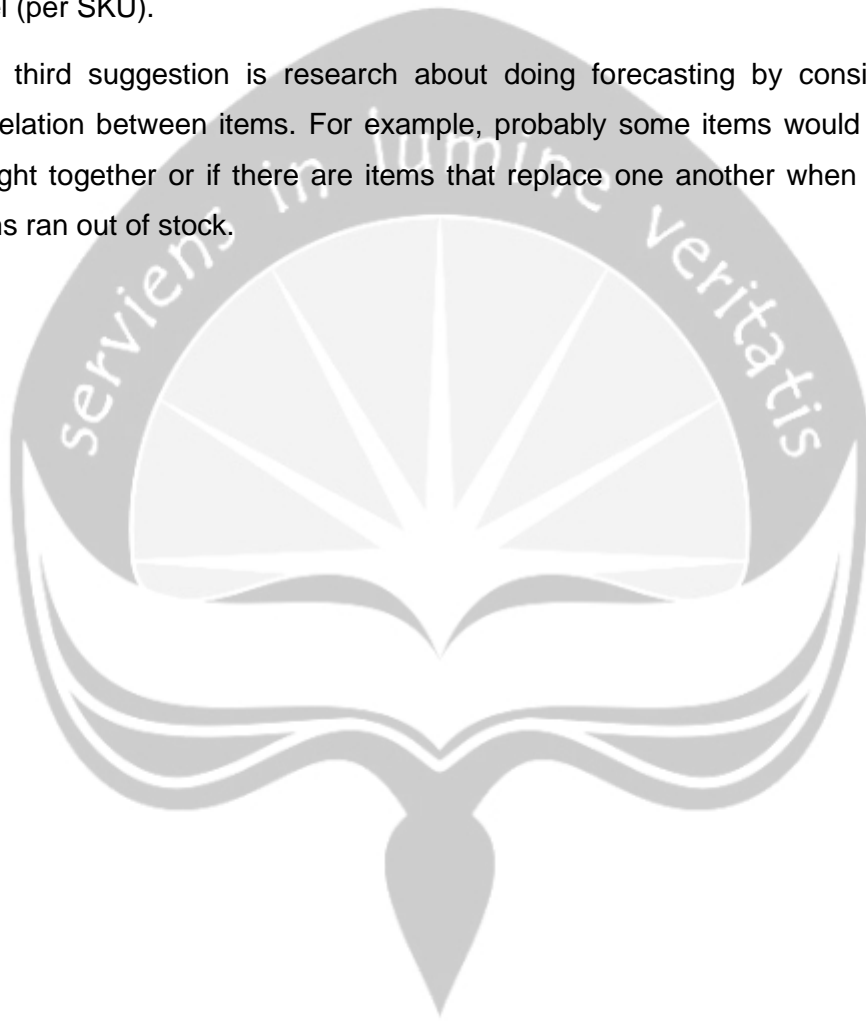
Code groups with seasonal component had triple exponential smoothing as their best methods. Code groups with no seasonal component and high irregular component had single exponential smoothing as their best methods. Code groups which has low volume of demand used simple average method to forecast the number of demands in the next period.

8.2. Suggestion

Suggestions for future research could be about developing a way or a tool to easily prepare the data (grouping of code groups) to be used for forecasting using the forecast tool.

The second suggestion is about what type of products that have highest demand quantity (model, price, color, size, etc.) with customer preferences included as well. This would help X clothing store to decide what to order from supplier in individual level (per SKU).

The third suggestion is research about doing forecasting by considering the correlation between items. For example, probably some items would always be bought together or if there are items that replace one another when one of the items ran out of stock.



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Appendix 1: Manual for Forecast Tool in Bahasa Indonesia

(2) Autofill Month Column

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(6) Adjust Smoothing Constants

(7) Method with Min. RMSE

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(8) Generally a good forecast

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Actual data and forecasted data time series plot

2016-2017 Time series plot

2017-2018 Time series plot

Berikut langkah-langkah yang diperlukan untuk melakukan peramalan permintaan:

- a. Alat peramalan yang dibuat, didesain untuk digunakan diakhir bulan;
- b. Di halaman *summary* di excel, bulan dan tahun dapat diubah di kolom bulan dengan menetik awalan bulan dan tahun yang diinginkan di baris (1) and mengklik tombol "*autofill month column*" (2) untuk mengisi sisa bulan dan tahun secara otomatis;
- c. Masukkan data ke kolom (3);
- d. Grafik permintaan (*time series plot*) yang ada di halaman *summary* akan berubah dengan sendirinya saat kolom (3) diubah;
- e. Tombol "*adjust smoothing constants*" (4) diklik untuk mendapatkan hasil yang optimal dari metode SES dan *double exponential smoothing*;
- f. Hasil peramalan permintaan dapat dilihat di kolom (5);
- g. Rangkuman hasil perhitungan peramalan permintaan dari halaman excel lainnya dapat dilihat di kolom (6);
- h. Metode dengan nilai error terkecil dapat dilihat di kolom (7), yang juga menunjukkan apakah metode tersebut sudah bagus secara umum atau belum;
- i. (8) menggunakan fungsi MIN excel untuk memilih RMSE dengan nilai terkecil dari semua metode. (8) dapat diubah dengan menggunakan fungsi tanda sama dengan (=) di excel dan memilih RMSE lainnya dari kolom (6).
- j. Grafik permintaan dan peramalan (*time series plot*) akan berubah saat kolom (7) berubah, begitu juga dengan kolom (5) yang akan berubah saat kolom (7) berubah.
- k. Hasil RMSE dan atau MPE mungkin tidak sesuai dengan standar yang diinginkan. Hal ini dapat dilihat dari nilai RMSE dan MPE atau dari kemiripan pola data hasil ramalan dan data asli. Jika pola data tidak mirip, maka merubah (8) atau menggunakan *custom sheet* mungkin dibutuhkan.

Selain dari langkah-langkah yang disebut diatas, ada beberapa hal yang perlu diperhatikan:

- a. Jangan menggunakan fitur *cut* dan *paste* di excel. Menggunakan *copy* dan *paste* untuk memasukan data tidak apa-apa akan tetapi jangan gunakan *cut* dan *copy*;
- b. Selalu gunakan halaman *summary* di excel kecuali saat hasil peramalan tidak sesuai dengan standar yang diinginkan, gunakanlah metode ato model peramalan lainnya di halaman *custom* di excel;

- c. Jangan merubah halaman ES yang berisi perhitungan metode *exponential smoothing*;
- d. Kata kunci yang digunakan untuk mengunci halaman *naïve* (metode naif) dan MA (metode *moving average*) akan diberikan kepada personel yang bertanggung jawab atas toko baju X.

