

CHAPTER 4 DATA AND DATA ANALYSIS

The data available were obtained directly from X clothing store. There are codes, code descriptions, number of sales, and number of stocks per item. The data were taken from January 2016 to December 2018 and were separated monthly. The number of sales is used to make demand forecast and the number of stocks is analyzed to know which items face overstock and out of stock problem.

4.1. X Clothing Store's Demand data

Table 4.1 Some Product Sold on January 2016

Code	Description	Sales	Stock
ACCABC0001	KERTAS KADO KECIL	104	.
ACCABC0002	KARTU UCAPAN 053	95	290
PJK1169	PTP 2/12 PIYAMA ANAK CE	60	.
PJK1593	01005057883 SPC PIJAMA 50.000	54	.
ACCABB0001	KERTAS KADO MOTIF	43	.
HPK0811	H 2-4 CO	36	.
ACCABB0070	KERTAS KADO KECIL	30	.
PJL0755	PTP 14/18 PIYAMA DEWASA	30	.
HPK1037	01005057883 SPC PIJAMA 50.000	29	.
CKLFLC0001	37 CLN PDK NB LDS PLS	26	.
CKLYSC0030	CPD GAP FIT SPORT MIX	26	.
HPK0812	H 2/12 HOTPANT ANAK CE	25	.
BLM1372	KAOS SPANDEX	23	.
SPTIMLC0002	KK BOOT CARTER	22	.
ACCABB0007	KERTAS TEKSTUR	20	.
DSLYSC0063	DRESS POLO RL TPD KRAH KC 3 APL TGN	19	.
CDLLRC0005	PANTY LADY'S SECRET 6 COLOURS ISI 3PCS	19	.
PJK1168	PP 2/6 PIYAMA ANAK CO	19	.
CJITHC0007	CPJ TRAINING KARET BWH VAR TALI SALUR BABY GAP	18	.
BLKFLC0004	79 KMJ FLANEL KOTAK ANAK	18	.
TASABF0005	B8 TAS LIPAT B.F. STAR MOTIF BUNGKUS KAOS	17	.
CKLFLC0002	38 CLN PDK NB LDS MTF	17	.
CKMTHC0026	BOXER MIX	17	.
ACCABB0002	KERTAS KADO POLOS	16	.
BLLTHC0083	BL TPJ KC 4 POLOS SK 2 4 WRN TOM TAILOR	16	.
BLKYSC0273	SW TUMBLE & DRY RAJUT KOMB DNM KC 3	16	.

X clothing store has thousands of items and they sell thousands of items in a month. Table 4.1 shows some SKU which customers bought on January 2016. X clothing store has their own SKU (Stock Keeping Unit). Items in the same family have the same first three letters in their SKU. As can be seen from Table 4.1, there are some codes that have the same first three letter code. ACC is accessories, PJK is kids' pajama sets (t-shirts with long pants), PJI is ladies' pajama sets (t-shirts with long pants), HPK is kids' hot pants (pajama with t-shirts and shorts), CKL is short pants for ladies, and so on.

The first two letters are abbreviation of the type of item and the third letter is to indicate if the item is for baby, kids or teenagers, adult female, or adult male (I is for baby, K is for kids and teenagers, L is for ladies, and M is for Men). Though some codes do not follow this rule, most of the codes are written like this. The letters and numbers after that are specific codes only the company knows.

4.2. Grouping of Every SKU

To sort the data better, a pivot table was made in Microsoft Excel. However, before making the pivot table, several columns need to be made. Aside from the already existing columns, three columns for year, month, and code group were added. To make the code group, excel LEFT function was used. The results are shown in Table 4.2.

Table 4.2 Some Updated Data Table

Year	Month	Group	Code	Description	Sales	Stock
2016	JAN	ACC	ACCABC0001	KERTAS KADO KECIL	104	.
2016	JAN	ACC	ACCABC0002	KARTU UCAPAN 053	95	290
2016	JAN	PJK	PJK1169	PTP 2/12 PIYAMA ANAK CE	60	.
2016	JAN	PJK	PJK1593	01005057883 SPC PIJAMA 50.000	54	.
2016	JAN	ACC	ACCABB0001	KERTAS KADO MOTIF	43	.
2016	JAN	HPK	HPK0811	H 2-4 CO	36	.
2016	JAN	ACC	ACCABB0070	KERTAS KADO KECIL	30	.
2016	JAN	PJI	PJI0755	PTP 14/18 PIYAMA DEWASA	30	.
2016	JAN	HPK	HPK1037	01005057883 SPC PIJAMA 50.000	29	.
2016	JAN	CKL	CKLFLC0001	37 CLN PDK NB LDS PLS	26	.
2016	JAN	CKL	CKLYSC0030	CPD GAP FIT SPORT MIX	26	.
2016	JAN	HPK	HPK0812	H 2/12 HOTPANT ANAK CE	25	.

To make the pivot table, pivot table function in the insert tab of Microsoft Excel is used. The pivot table summarized the original data table and shows the total sales or stock every month for every code group as shown in Figure 4.1.

Sum of Sales		Column Labels	
Row Labels		2016	
		JAN	FEB
BLI		77	72
BLK		1224	1347
BLK2270 ATASAN ANAK 2/12			
BLK2676 191.1 BEAUTES GIRL SHORT SLEEVE TS MIX		8	3
BLK2679 191.1 BEAUTES GIRL SHORT SLEEVE TS THE RABBIT		1	1
BLK2680 191.1 BEAUTES GIRL SHORT SLEEVE TS SHOOPING		1	1
BLK2687 191.1 BEAUTES GIRL SHORT SLEEVE TS KUDA BUNGA TEMPEL		1	
BLK2689 191.1 BEAUTES GIRL SHORT SLEEVE TS HOPE		1	1

Figure 4.1 Sum of Sales Pivot Table with Description

There were originally 156 code group but some of the code group are newly breakdown of another code group so most of the data are in the old code group. Those new code groups were combined manually into their previous code group. After the code groups combined, there are 81 code groups. In these code groups, there are items that the clothing store decided to not sell anymore, items that are new and do not have enough data to be forecasted. These groups were eliminated. In the end, there were 66 code groups to be forecasted as shown in Table 4.3.

Table 4.3 The Final 66 Code Groups

No.	Code Group	Information
1	ACC	Accessories
2	BDI	Baby bedong
3	BLI	Baby tops
4	BLK	Kids tops
5	BLL	Adult (female) tops
6	BLM	Adult (male) tops
7	BNK	Dolls
8	BRI	Baby swimsuit
9	BRK	Kids swimsuit
10	BRL	Bra
11	CDK	Kids underwear
12	CDL	Adult (female) underwear

Table 4.3 Continuation

No.	Code Group	Information
13	CDM	Adult (male) underwear
14	CJI	Baby long pants
15	CJK	Kids long pants
16	CJL	Adult (female) long pants
17	CJM	Adult (male) long pants
18	CKI	Baby short pants
19	CKK	Kids short pants
20	CKL	Adult (female) short pants
21	CKM	Adult (male) short pants
22	DSI	Baby dress
23	DSK	Kids dress
24	DSL	Female dress
25	HDA	Adult towel
26	HDI	Baby towel
27	HDK	Kids towel
28	HPI	Baby Pajama Set (T-shirt with shorts)
29	HPK	Kids Pajama Set (T-shirt with shorts)
30	HPL	Female Pajama Set (T-shirt with shorts)
31	JKI	Baby jacket
32	JKK	Kids jacket
33	JKL	Adult (female) jacket
34	JKM	Adult (male) jacket
35	JSI	Baby jumpsuit
36	JSK	Kids jumpsuit
37	JSL	Female jumpsuit
38	KKI	Baby socks
39	KKK	Kids socks
40	KKL	Adult (female) socks
41	KKM	Adult (male) socks
42	KRL	Hijab
43	PJI	Baby Pajama Set (T-shirt with long pants)
44	PJK	Kids Pajama Set (T-shirt with long pants)
45	PJL	Female Pajama Set (T-shirt with long pants)
46	PJM	Male Pajama Set (T-shirt with long pants)
47	ROI	Baby skirt
48	ROK	Kids skirt
49	ROL	Female skirt
50	SBK	Belt
51	SDK	Kids flip-flops
52	SDL	Adult flip-flops

Table 4.3 Continuation

No.	Code Group	Information
53	SEL	Scarf
54	SET	Set of pajamas (1 top, 1 short)
55	SLA	Kids blanket
56	SLB	Baby bib
57	SLI	Baby blanket
58	SPT	Shoes
59	STI	Baby set of clothes (1 top, 1 short)
60	STK	Kids set of clothes (1 top, 1 short)
61	STL	Female set of clothes (1 top, 1 short)
62	TAS	Bags
63	TPI	Baby hat and beanie
64	TPK	Kids hat and beanie
65	TPL	Sun hats
66	TPM	Caps

Table 4.4 Unincluded Code Groups

No.	Code Group	Reason
1	OPUS	Not sold anymore
2	CDI	Not sold anymore
3	DPI	Not sold anymore
4	HPM	Not sold anymore
5	JHM	Not sold anymore
6	KMI	Not sold anymore
7	KMK	Not sold anymore
8	KNL	Not sold anymore
9	SRL	Not sold anymore
10	KLL	Not actively sold items
11	KML	Not actively sold items
12	JHK	New items
13	KST	New items
14	SKM	New items
15	SPC	Various items

The information on code groups that are not sold anymore, shown in Table 4.4, were obtained from interviewing the head inventory personnel. Not actively sold items are items that are sold but not all the time. The company sells them, but those items are not their focus. The company would restock whenever they feel like it. KLL is code for necklace and KML is code for bathrobe for female. The new

items are items that are just sold for a few months before 2018 ended. While the code SPC is for special priced items, consisting of various items from children outfit, teen outfit, to adult outfit. Items that are sold especially for promotions purpose and items that do not sell well after a certain period of time have SPC code. Items that do not sell well will have its code changed to SPC and sold in low prices or promotions like buy one get one.

4.3. X Clothing Store's Sales and Stock Data

From the revised pivot table, there are total number of items sold and total number of stocks of every code group for every year. There is also the grand total number of sales and stocks for three years (2016 to 2018). From that data, the total sales and stocks of all code groups were calculated.

The total number of items sold of every code group are divided by the total number of items sold for the year and are put in percentage. The same was done to the number of total stocks. VLOOKUP function was used to make tables in Figure 4.2. The number of demand column is then sorted to show the percentage from largest to smallest. A conditional formatting is done to percentage of demand and percentage of stock columns to show the data bar. Green color for demand percentage and red color for stock percentage.

2016			2017			2018			Grand Total		
Label	Demand	Stock	Label	Demand	Stock	Label	Demand	Stock	Label	Demand	Stock
BLK	19.75%	2.32%	BLK	14.51%	9.28%	BLK	13.14%	14.99%	BLK	15.71%	12.19%
BLL	13.60%	1.94%	BLL	12.75%	3.85%	BLL	11.03%	4.80%	BLL	12.42%	4.25%
BLM	8.84%	3.35%	ACC	9.92%	42.31%	BLM	10.15%	7.12%	BLM	9.33%	6.18%
ACC	7.38%	68.71%	BLM	8.92%	5.01%	ACC	9.21%	18.16%	ACC	8.85%	29.71%
CJK	5.47%	2.97%	CJL	5.58%	3.49%	CJL	6.36%	5.23%	CJL	5.50%	4.60%
CIL	4.47%	3.51%	CJK	5.31%	4.10%	CJK	5.06%	4.74%	CJK	5.27%	4.39%
CKK	3.94%	0.96%	BLI	4.41%	2.37%	BLI	3.91%	4.07%	CKK	3.42%	3.31%
DSL	3.14%	1.71%	PJK	3.25%	0.55%	CKK	3.12%	4.29%	BLI	3.34%	3.25%
PJK	2.90%	0.05%	CKK	3.23%	1.83%	PJK	3.01%	1.97%	PJK	3.05%	1.40%
DSK	2.52%	0.30%	CJI	2.73%	4.26%	DSL	2.93%	3.54%	DSL	2.93%	3.30%
CKM	2.46%	0.21%	DSL	2.72%	3.34%	CKM	2.77%	2.08%	CJI	2.46%	3.57%
HPK	2.13%	0.00%	JSI	2.04%	0.92%	CJI	2.70%	3.60%	CKM	2.40%	1.69%
CJI	1.91%	1.71%	CKM	1.94%	1.33%	JSI	2.19%	1.48%	JSI	2.01%	1.22%
CKL	1.80%	0.93%	CKL	1.72%	0.82%	CKL	1.93%	1.34%	DSK	2.00%	0.74%
JSI	1.78%	0.36%	DSK	1.67%	0.56%	DSK	1.82%	0.88%	CKL	1.82%	1.16%
BLI	1.65%	0.45%	HPK	1.59%	0.02%	HPK	1.55%	0.39%	HPK	1.75%	0.26%
CJM	1.36%	0.83%	CJM	1.18%	0.83%	CJM	1.45%	0.86%	CJM	1.33%	0.85%
ROK	1.06%	0.01%	SPT	1.09%	0.54%	SPT	1.21%	2.27%	SPT	1.12%	1.62%
SPT	1.05%	0.36%	ROL	1.04%	0.80%	DSI	1.20%	0.65%	DSI	0.91%	0.46%
ROL	0.91%	0.35%	CKI	1.00%	0.37%	PJI	0.92%	0.62%	JKK	0.83%	0.15%
BRL	0.88%	0.50%	DSI	0.99%	0.18%	JKM	0.76%	0.19%	ROL	0.82%	0.58%
JKK	0.77%	0.01%	JKK	0.97%	0.01%	JKK	0.75%	0.22%	ROK	0.79%	0.23%
CDK	0.76%	0.68%	ROK	0.79%	0.10%	CKI	0.70%	0.39%	CKI	0.76%	0.35%
STK	0.72%	0.00%	TPK	0.70%	0.26%	STI	0.67%	0.38%	PJI	0.69%	0.44%
PJI	0.71%	0.01%	CDK	0.62%	1.03%	JKL	0.63%	0.19%	BRL	0.64%	0.63%
CKI	0.59%	0.04%	KKK	0.60%	0.91%	TAS	0.58%	1.17%	CDK	0.64%	1.10%
TAS	0.57%	0.07%	SET	0.60%	0.09%	ROK	0.55%	0.31%	JKM	0.56%	0.13%
DSI	0.51%	0.01%	PJL	0.60%	0.11%	BRL	0.54%	0.76%	TPK	0.56%	0.44%
PJL	0.49%	0.05%	BRL	0.51%	0.37%	ROL	0.54%	0.53%	PJL	0.52%	0.28%
TPK	0.46%	0.54%	JKM	0.48%	0.03%	CDK	0.54%	1.19%	TAS	0.52%	1.00%

Figure 4.2 Percentage Table of Demand and Stock

The results show that BLK has the largest number of sales followed by BLL, BLM, ACC, and so on but ACC is the one with the largest number of stocks while BLL and BLM has very few stocks. Since almost fifty percent of sales are from the first four highest sales, the forecast should be focused on those code groups.

To know how much inventory quantities X clothing store needs, the clothing store should calculate the inventory turnover rate of every code groups. The inventory turnover is a measure used to evaluate the efficiency of an inventory (Mwaura, 2015). Usually a higher inventory rate is preferable but higher inventory rate could mean that the retailer had stock outs and lost sales. Lower inventory rate means there are more slow-moving inventories. A retailer needs to find a balanced inventory turnover.

4.4. Creating Time Series Plot of Every Code Group

Time series plot is made by inserting line chart in excel and modifying the Y-axis data from numbers with the date (timeline). A linear trend line is also added to the time series plot to see the trend. From the time series plot, most code groups have trends, some have seasonal component (Figure 4.3), and some have irregular component (Figure 4.4).

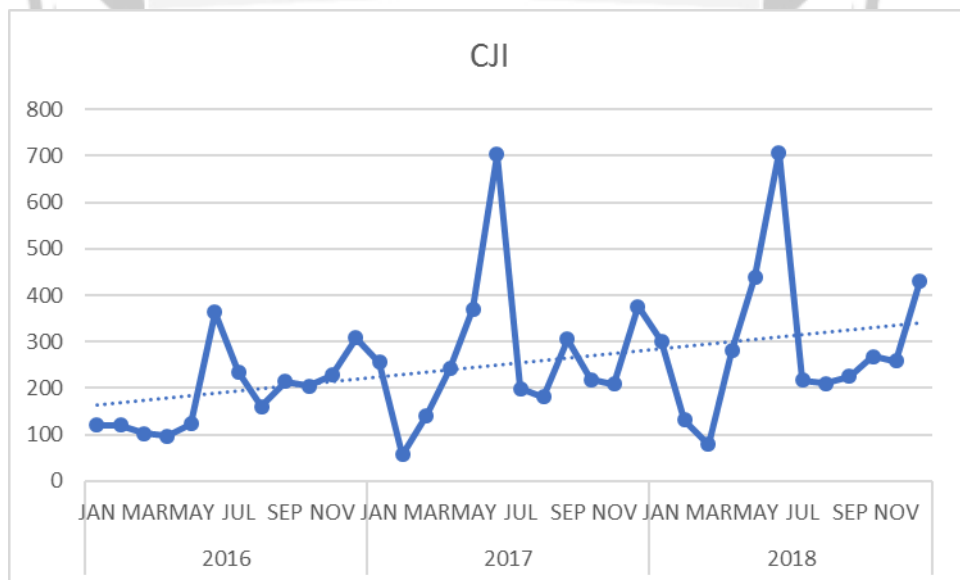


Figure 4.3 Code Group with Seasonal Component and Upward Trend

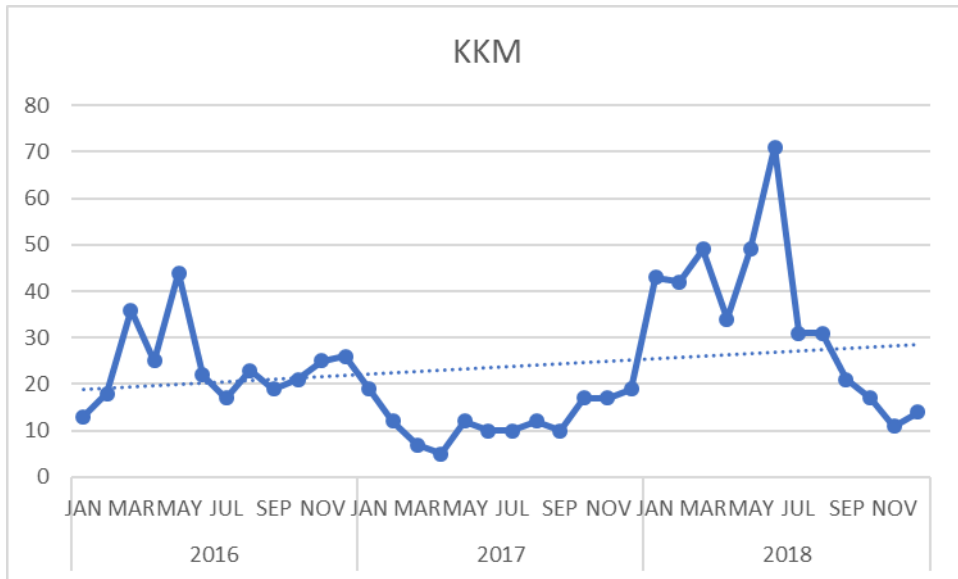


Figure 4.4 Code Group with Irregular Component

Some code groups with seasonal component have the same patterns from 2016 to 2018. However, some of them have different patterns in 2016 but have the same pattern in 2017 to 2018 (Figure 4.5). Because of this, there are two forecast versions made for exponential smoothing method. One using data from 2016 to 2018 and the other one using data from 2017 to 2018.

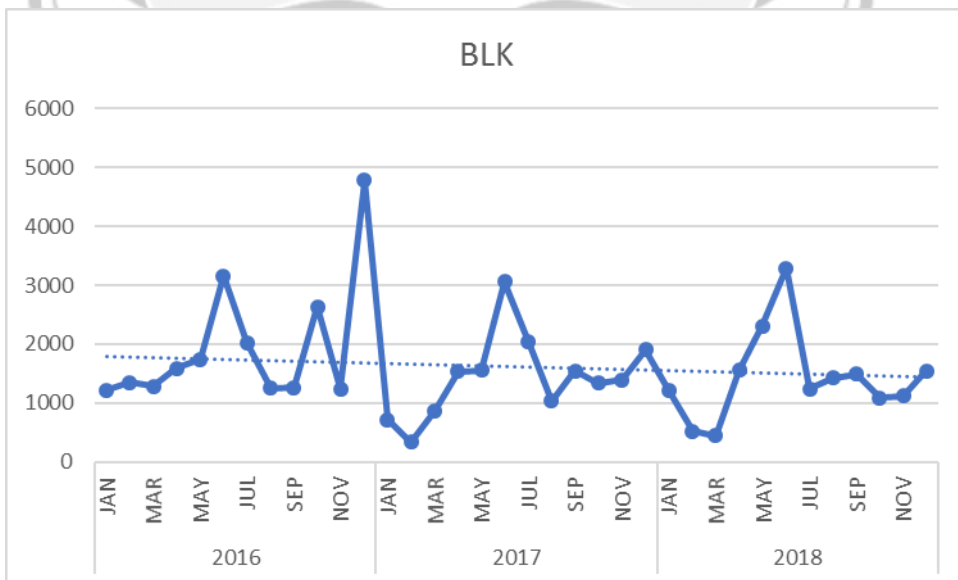


Figure 4.5 Code Group with Different Data Pattern Over the Years

The difference in data pattern happened because sometimes X clothing store had promotional events like item discounts or promotions like “buy one get one free”.

Also, from the time series plots, outliers are seen in some of the code groups also usually because of promotional events (Figure 4.6).

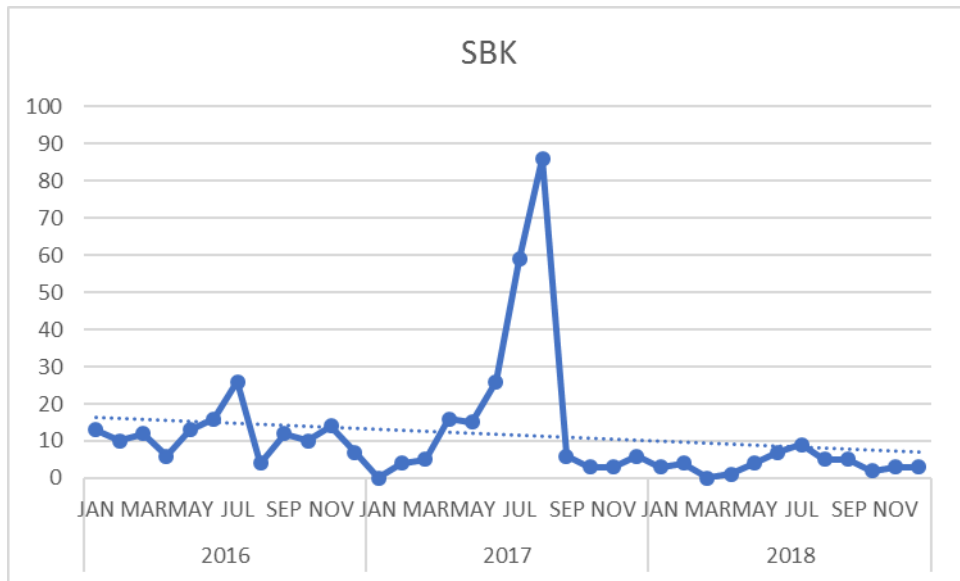


Figure 4.6 Code Group with Outliers

