Optimal Inventory Management Analysis

Introduction

Examine data spanning from 2014 to 2016 for a U.S.-based company with a 30-year history, currently conducting sales in Canada, Germany, and the United Kingdom. The company specializes in offering mid to high-end footwear priced in the range of $120 to $200.

There are two main analysis:
-->To find out the optimum inventory level.
-->Conduct a comparison between two stores to assess their respective performance.

Problem

1.Stores fell short of meeting the required supply.
2.Shoes gathering dust indicates an oversupply compared to demand.

Method used

First of all Segment the data:
1.Shoe Size
2.Country
3.Gender

Then use statistical method for finding Confidence Interval.

Extract relevant data from Raw data.

Frequency distribution tables

Men sizes

	Country				
US	Canada	United States	United Kingdom	Germany	Total
6	15	54	6	30	
6.5	15	45	12	18	**90**
7	24	39	21	30	**114**
7.5	45	66	12	48	**171**
8	51	141	45	117	**354**
8.5	192	225	87	174	**678**
9	324	492	183	348	**1347**
9.5	375	741	225	549	**1890**
10	237	543	156	411	**1347**
10.5	243	462	150	453	**1308**
11	114	213	69	156	**552**
11.5	75	156	39	129	**399**
12	51	87	24	78	**240**
13	12	39	3	33	**87**
14	21	60	15	30	**126**
15	27	24	12	48	**111**
16	0	0	0	0	**0**
Total	**1821**	**3387**	**1059**	**2652**	**8919**

Women sizes

	Country				
US	Canada	United States	United Kingdom	Germany	Total
4	0	0	0	0	**0**
4.5	6	21	15	9	**51**
5	6	9	9	12	**36**
5.5	6	42	6	9	**63**
6	21	33	12	15	**81**
6.5	51	93	24	84	**252**
7	93	147	27	156	**423**
7.5	153	318	87	222	**780**
8	192	618	168	324	**1302**
8.5	171	399	129	339	**1038**
9	213	384	93	264	**954**
9.5	84	189	57	126	**456**
10	48	75	21	87	**231**
10.5	36	87	18	57	**198**
11.5	12	30	3	15	**60**
Total	**1092**	**2445**	**669**	**1719**	**5925**

These tables are extracted from historical data, it display the sales distribution across various countries, categorized by shoe size and gender.

Determining the Optimal Inventory Level

Frequency distribution tables

By size and month

Men shoes sales

	United States, 2016												Mean	Standard error	ME	95% CI		Number of pairs required
US	1	2	3	4	5	6	7	8	9	10	11	12	2016	2016	2016	2016		
6	4	1	3	1	3	3	3	4	3	7	3	0	2.92	0.51	1.13	1.78	4.05	4
6.5	3	2	0	1	0	0	1	7	2	1	2	1	1.67	0.56	1.22	0.45	2.89	3
7	0	0	1	0	6	4	4	2	3	0	0	0	1.67	0.61	1.34	0.33	3.00	3
7.5	3	2	3	1	7	0	7	3	4	6	1	1	3.17	0.69	1.53	1.64	4.70	5
8	7	9	7	3	12	2	9	4	7	5	2	6	6.08	0.88	1.94	4.14	8.03	8
8.5	12	12	8	8	15	9	17	17	6	9	10	6	10.75	1.12	2.47	8.28	13.22	13
9	17	13	13	11	21	22	25	30	26	25	13	10	18.83	1.97	4.33	14.50	23.17	23
9.5	19	25	27	24	26	33	25	47	31	44	37	26	30.33	2.45	5.39	24.95	35.72	36
10	17	26	26	19	16	31	25	24	23	31	15	20	22.75	1.57	3.45	19.30	26.20	26
10.5	13	16	22	14	28	19	18	15	19	21	16	10	17.58	1.37	3.01	14.57	20.59	21
11	5	16	13	10	10	11	15	8	9	7	6	7	9.75	1.01	2.22	7.53	11.97	12
11.5	4	3	6	3	3	5	6	4	5	12	13	5	5.75	0.96	2.12	3.63	7.87	8
12	3	0	0	4	4	4	3	12	4	9	2	1	3.83	1.01	2.23	1.60	6.06	6
13	1	1	2	0	3	2	1	0	0	4	3	2	1.58	0.38	0.83	0.75	2.42	2
14	2	6	3	3	5	3	2	1	0	1	2	1	2.42	0.50	1.10	1.32	3.52	4
15	0	0	0	1	1	0	4	0	0	0	0	2	0.67	0.36	0.78	-0.12	1.45	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0
Total	110	132	134	103	160	148	165	178	142	182	125	98						

Results

The 'Number of Pairs Required' column indicates the average monthly demand for each shoe size.

Method

-Applied t-statistic:as it pertains to a scenario involving a single population with an unknown population variance and a sample comprising 12 observations

-T-statistic is calculated based on a sample of 12 observations, with 11 degrees of freedom, and is used to establish a 95%
confidence interval.

-We determined the standard error and subsequently computed the margin of error (ME), then applied the confidence interval formula in this particular scenario

Comparison of two stores

Frequency distribution tables

By size and month

Women shoe sales

	Germany, GER1												Germany, GER2												Mean		Sample variance		Pooled variance	Margin of error	95% CI	
US	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	GER1	GER2	GER1	GER2				
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.5	0	0	0	0	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.42	0.08	0.81	0.08	0.45	0.57	-0.23	0.90
5	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.17	0.17	0.33	0.33	0.33	0.49	-0.49	0.49
5.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	0	1	0.08	0.33	0.08	0.42	0.25	0.43	-0.68	0.18
6	0	2	0	0	0	0	0	0	0	0	0	0	0	1	3	1	2	0	0	0	0	0	0	0	0.17	0.58	0.33	0.99	0.66	0.69	-1.11	0.27
6.5	3	3	1	2	1	0	2	0	2	1	3	4	2	0	2	1	1	2	0	1	2	1	3	0	1.83	1.25	1.61	0.93	1.27	0.95	-0.37	1.54
7	0	3	3	4	1	0	1	0	2	0	0	1	0	0	0	4	1	3	1	1	1	3	1	4	1.25	1.58	2.02	2.27	2.14	1.24	-1.57	0.91
7.5	1	2	4	1	2	6	4	3	5	8	2	1	2	1	1	3	2	7	9	8	14	8	6	3	3.25	5.33	4.93	16.06	10.50	2.74	-4.83	0.66
8	6	10	3	9	1	3	6	8	3	12	3	9	13	6	5	13	5	3	11	6	6	9	8	3	6.08	7.33	12.27	12.24	12.25	2.96	-4.21	1.71
8.5	10	10	10	7	14	4	7	7	4	8	7	9	8	5	10	4	5	5	9	7	3	7	9	8	8.08	6.67	7.72	4.97	6.34	2.13	-0.72	3.55
9	1	3	8	6	3	1	4	4	0	2	4	2	5	2	2	9	3	1	1	7	2	1	4	2	3.17	3.25	5.06	6.57	5.81	2.04	-2.13	1.96
9.5	4	1	2	1	2	2	2	4	5	2	3	2	0	1	1	0	1	2	2	1	7	2	4	2	2.50	1.92	1.55	3.72	2.63	1.37	-0.79	1.96
10	0	1	1	1	1	1	3	1	0	0	0	1	0	1	1	0	0	0	2	3	0	2	0	0	0.83	0.75	0.70	1.11	0.91	0.81	-0.72	0.89
10.5	1	0	0	0	2	2	4	1	0	3	1	1	0	2	0	0	0	1	0	0	0	0	2	1	1.25	0.50	1.66	0.64	1.15	0.91	-0.16	1.66
11.5	0	0	0	2	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	0	0	0	0.17	0.50	0.33	2.09	1.21	0.93	-1.27	0.60
Total	26	35	32	33	28	22	35	28	21	36	25	30	30	19	30	35	20	24	35	38	35	36	37	24								

	GER1	GER2
n	12	12
$t_{22,0.0}$		2.07

Conclusion

-The table 95% CI clearly show that all confidence intervals start in the negatives and finish in the positives,this imply that we can not conclude that one shop sells more than the other for any size.
-These two shops are so balanced in terms of sales, they may be bundled together.