Six Sigma Final Project

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Introduction

The Ritz Theater manager wants to set a foundation with data that was collected from the business processes in 2017. The goal is to organize, analyze, and recommend options for improving multiple aspects of the business overall to ensure sustainability of the historic venue. The data that was collected includes the date and month, beverage revenue, popcorn revenue, outside temperature, ticket revenue, total revenue, and the show type. 7 questions and demands that have been requested by the manager will be answered using this data.

Analysis

Two-Sample T-Test and CI: Beverage Revenue and Popcorn Revenue

Method

μ_1: mean of Beverage Revenue ($)
μ_2: mean of Popcorn Revenue ($)
Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
Beverage Revenue ($)	365	1002	144	7.6
Popcorn Revenue ($)	365	1093	183	9.6

Estimation for Difference

Difference	95% CI for Difference
-90.6	(-114.6, -66.7)

Test

Null hypothesis $H_0: \mu_1 - \mu_2 = 0$
Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
-7.43	690	0.000

The first question that is posed is if there is any significant difference statistically between the daily averages of beverage and popcorn revenue.The test concluded with a P-value of 0 which indicates that there is not a significant difference between these two strings of data.

Best Subsets Regression: Total Revenue versus Beverage Revenue, Popcorn Revenue, WH High Temp, and Ticket Revenue

Response is Total Revenue ($)

Vars	R-Sq	R-Sq (adj)	R-Sq (pred)	Mallows Cp	S	Beverage Revenue ($)	Popcorn Revenue ($)	WH High Temp	Ticket Revenue ($)
1	51.5	51.3	51.0	*	241.60				X
1	33.2	33.0	32.4	*	283.56		X		
2	82.9	82.8	82.6	*	143.48		X		X
2	72.2	72.1	71.8	*	182.98	X			X
3	100.0	100.0	100.0	*	0.000000000	X	X		X
3	83.0	82.8	82.6	*	143.58		X	X	X
4	100.0	100.0	100.0	*	0.000000000	X	X	X	X

The next question is which factors are the best predictors of total revenue. The manager specifically wants to use a minimum number of variables while still being able to predict total revenue effectively. According to the results, the best indicators for total revenue are beverage revenue, popcorn revenue, and ticket revenue.

Regression Analysis: Total Revenue versus Beverage Revenue, Popcorn Revenue, and Ticket Revenue

Regression Equation

Total Revenue ($) = -0.000000 + 1.000 Beverage Revenue ($) + 1.000 Popcorn Revenue ($) + 1.000 Ticket Revenue ($)

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.000000	0.000000	*	*	
Beverage Revenue ($)	1.000	0.000	*	*	1.02
Popcorn Revenue ($)	1.000	0.000	*	*	1.01
Ticket Revenue ($)	1.000	0.000	*	*	1.01

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0	100.00%	100.00%	100.00%

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	43669267	14556422	*	*
Beverage Revenue ($)	1	7452717	7452717	*	*
Popcorn Revenue ($)	1	12119711	12119711	*	*
Ticket Revenue ($)	1	24205861	24205861	*	*
Error	361	0	0		
Total	364	43669267			

Fits and Diagnostics for Unusual Observations

Obs	Total Revenue ($)	Fit	Resid	Std Resid	
10	5664	5664	0	*	X
102	7281	7281	0	*	X
124	7435	7435	0	*	X
208	6765	6765	0	*	X
292	7045	7045	0	*	X
317	6090	6090	0	*	X
329	6949	6949	0	*	X

X Unusual X

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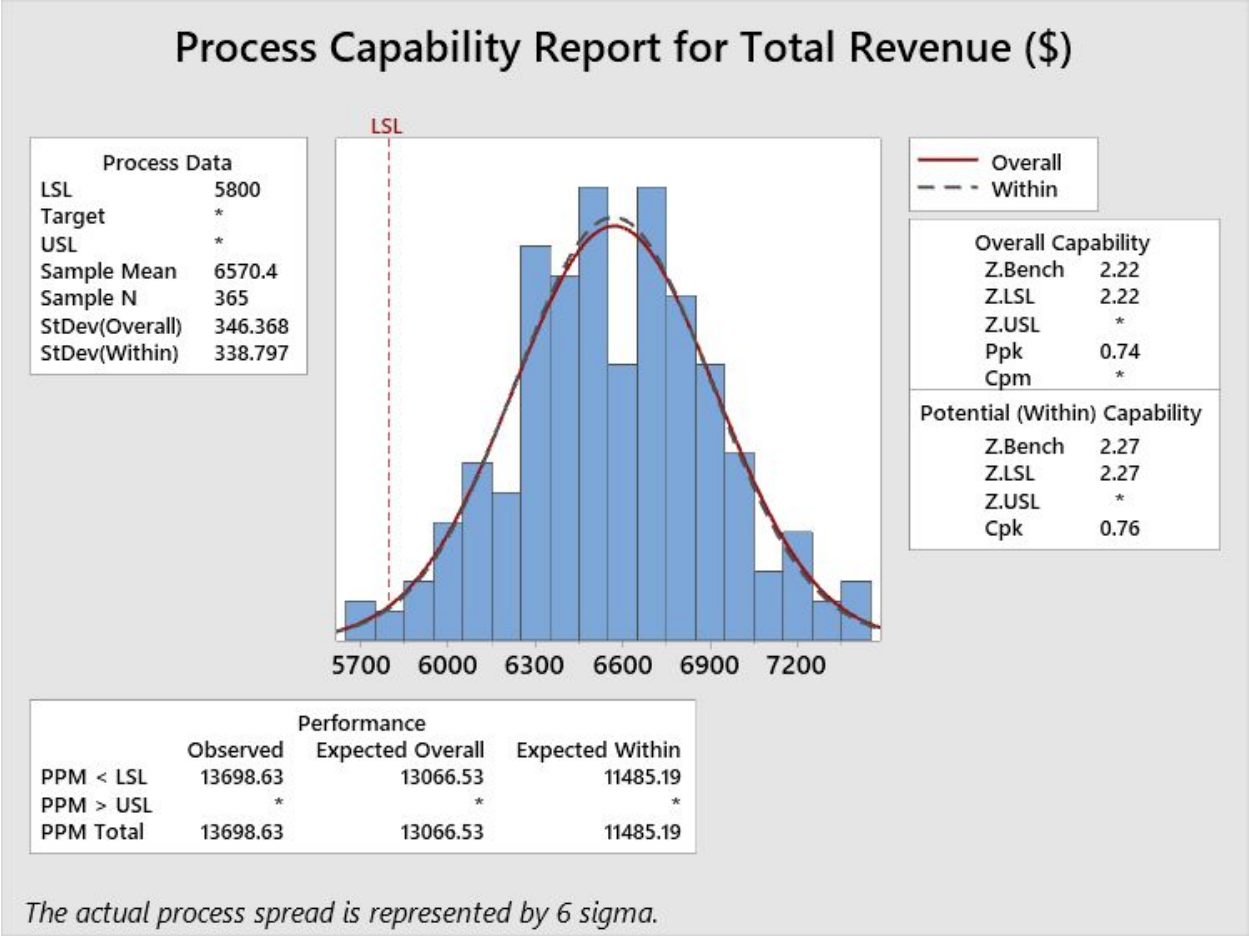
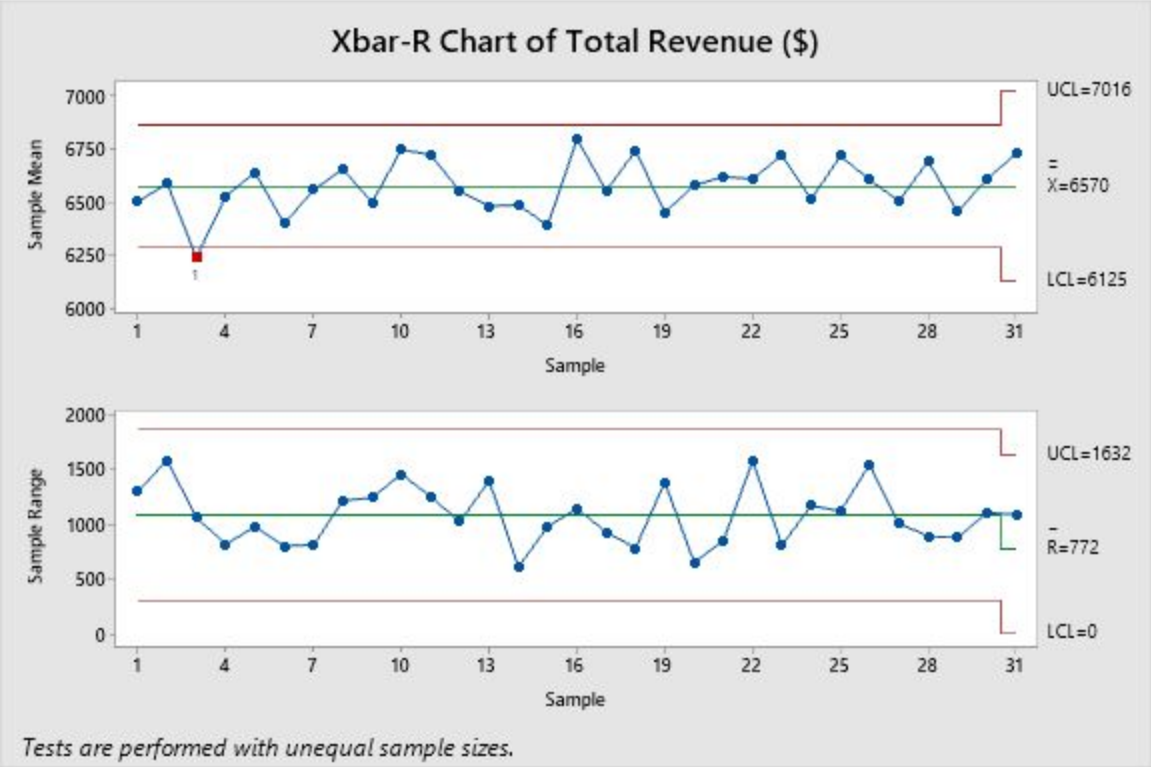
Process Capability Report for Total Revenue



The third question seeks to find the sigma level of the process for the total revenue target in 2017. Since there were 13,689.63 defects per million opportunities and the lower limit was $5,800, the sigma level falls in between a 3 sigma and a 4 sigma process making it a 3 sigma process in 2017.

Xbar-R Chart of Total Revenue



Test Results for Xbar Chart of Total Revenue ($)

TEST 1. One point more than 3.00 standard deviations from center line.
Test Failed at points: 3

The fourth question is about the stability of the ticket revenue in 2017 and if there were any periods of possible changes during the process. The Xbar-R chart shows that from month to month, the ticket revenue was stable with the exception of the third point. The fact that the third point was below the lower limit indicates that there was a period of possible changes during the process.

Two-Sample T-Test and CI: Ticket Revenue and Ticket Sales Method

Method

μ_1: mean of Ticket Revenue ($) when Ticket Sales Method = Box Office
μ_2: mean of Ticket Revenue ($) when Ticket Sales Method = Online
Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

Descriptive Statistics: Ticket Revenue ($)

Ticket Sales Method	N	Mean	StDev	SE Mean
Box Office	142	4469	272	23
Online	223	4480	251	17

Estimation for Difference

Difference	95% CI for Difference
-10.9	(-66.8, 44.9)

Test

Null hypothesis $H_0: \mu_1 - \mu_2 = 0$

Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
-0.39	282	0.700

One-Sample T: Total Revenue

Descriptive Statistics

N	Mean	StDev	SE Mean	95% CI for μ
365	6570.4	346.4	18.1	(6534.7, 6606.1)

μ: mean of Total Revenue ($)

Test

Null hypothesis $H_0: \mu = 6550$

Alternative hypothesis $H_1: \mu \neq 6550$

T-Value	P-Value
1.13	0.261