
STATISTICAL METHODS FOR DECISION MAKING PROJECT REPORT

**BY: - CHETAN SHARMA
(PGPDSBA Dec_B'21 Group 4)**

TABLE OF CONTENT

1. INTRODUCTION	3
2. DATA DESCRIPTION	3
3. PROBLEM	4
4. PROBLEM 1(SOLUTION).....	5
5. PROBLEM 2.....	7
6. PROBLEM 2(SOLUTION).....	4

Problem 1

Cold Storage started its operations in Jan 2016. They are in the business of storing Pasteurized Fresh Whole or Skimmed Milk, Sweet Cream, Flavoured Milk Drinks. To ensure that there is no change of texture, body appearance, separation of fats the optimal temperature to be maintained is between 2° - 4° C.

In the first year of business, they outsourced the plant maintenance work to a professional company with stiff penalty clauses. It was agreed that if it was statistically proven that the probability of temperature going outside the 2° - 4° C during the one-year contract was above 2.5% and less than 5% then the penalty would be 10% of AMC (annual maintenance case). In case it exceeded 5% then the penalty would be 25% of the AMC fee. The average temperature data at the date level is given in the file "Cold_Storage_Temp_Data_.csv"

1. Find mean cold storage temperature for Summer, Winter, and Rainy Season. (7 marks)
2. Find the overall mean for the full year. (7 marks)
3. Find Standard Deviation for the full year. (7 marks)
4. Assume Normal distribution, what is the probability of temperature having fallen below 2° C? (7 marks)
5. Assume Normal distribution, what is the probability of temperature having gone above 4° C? (7 marks)
6. What will be the penalty for the AMC Company? (5 marks)

Dataset to be used for Problem 1:

Cold_Storage_Temp_Data_.csv

INTRODUCTION

A company hired a professional company with stiff penalty clauses. It was agreed that if it was statistically proven that the probability of temperature going outside the 2° - 4° C during the one-year contract was above 2.5% and less than 5% then the penalty would be 10% of AMC (annual maintenance case). In case it exceeded 5% then the penalty would be 25% of the AMC fee.

DATA DESCRIPTION

Variable name	Description	Data type
Season	Different season in a year	categorical
Month	Different month in a year	categorical
Date	Date of month when temp was noted	numeric
Temperature	Temp of the day	float

1. Find mean cold storage temperature for Summer, Winter, and Rainy Season.

Find mean cold storage temperature for Summer, Winter, and Rainy Season.
(

```
In [ ]: data["Season"].value_counts()
Out[ ]:
Winter    123
Rainy     122
Summer    120
Name: Season, dtype: int64

In [ ]: data.groupby(data["Season"]).mean()
Out[ ]:
```

	Date	Temperature
Season		
Rainy	15.754098	3.087705
Summer	15.525000	3.147500
Winter	15.878049	2.776423

Data consist of 365 rows and 4 columns. In winter has 123 rows, rainy season has 122 rows and summer has 120 rows. The mean of summer, winter and rainy are 3.14, 2.77 and 3.08 respectively.

2) Find the overall mean for the full year.

Find the overall mean for the full year.

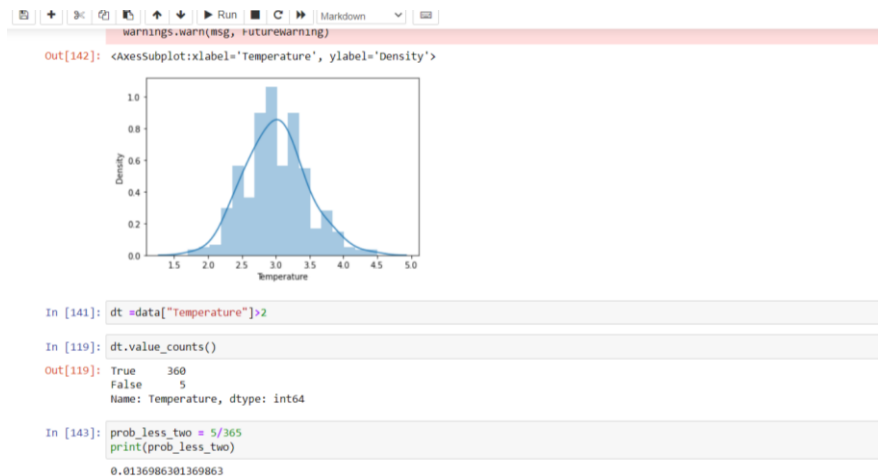
```
In [139]: data.describe()
Out[139]:
```

	Date	Temperature
count	365.000000	365.000000
mean	15.720548	3.002466
std	8.808321	0.465832
min	1.000000	1.700000
25%	8.000000	2.700000
50%	16.000000	3.000000
75%	23.000000	3.300000
max	31.000000	4.500000

overall mean is 3.002466

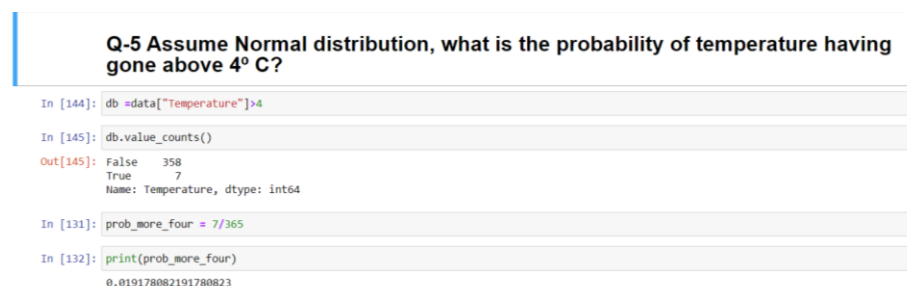
sd is .465832

3) Assume Normal distribution, what is the probability of temperature having fallen below 2° C?



There are only 5 entities that are fallen below 2 degree. And the probability is 0.0136986

Q-4) Assume Normal distribution, what is the probability of temperature having gone above 4° C?



There are only 7 values which are above than 4 degree and the probability is .01917

Q5) What will be the penalty for the AMC Company?

Ans) 10 % penalty

Problem 2)

In Mar 2018, Cold Storage started getting complaints from their clients that they have been getting complaints from end consumers of the dairy products going sour and often smelling. On getting these complaints, the supervisor pulls out data of the last 35 days' temperatures. As a safety measure, the Supervisor has been vigilant to maintain the mean temperature 3.9°C or below.

Assume 3.9°C as the upper acceptable mean temperature and at $\alpha = 0.1$ do you feel that there is a need for some corrective action in the Cold Storage Plant or is it that the problem is from the procurement side from where Cold Storage is getting the Dairy Products. The data of the last 35 days is in

“Cold_Storage_Mar2018_.csv”

1. Which Hypothesis test shall be performed to check if corrective action is needed at the cold storage plant? Justify your answer. (6 marks)
2. State the Hypothesis and do the necessary calculations to accept or reject the corresponding null hypothesis. (8 marks)
2. Give your inference. (6 marks)

1. Which Hypothesis test shall be performed to check if corrective action is needed at the cold storage plant?

Ans) The sample size of the data is small in size(total sample 35) In case of usage of z test performance , the results might be inappropriate and confusing and for such small sample size. It is ideal to use the T test hypothesis testing for specific results and small sample size.

2. State the Hypothesis and do the necessary calculations to accept or reject the corresponding null

2. State the Hypothesis and do the necessary calculations to accept or reject the corresponding null

hypothesis.

$H_0: \mu \leq 3.9$ $H_1: \mu > 3.9$

```
In [154]: dx = pd.read_csv("COLD.csv")
```

```
In [155]: dx.describe()
```

```
Out[155]:
```

	Date	Temperature	Unnamed: 4
count	35.000000	35.000000	0.0
mean	14.400000	3.974286	NaN
std	7.389181	0.159674	NaN
min	1.000000	3.800000	NaN
25%	9.500000	3.900000	NaN
50%	14.000000	3.900000	NaN
75%	19.500000	4.100000	NaN
max	28.000000	4.600000	NaN

assume mean = 3.9 obtain mean = 3.974286 std = .45 test stats value = .973968 p-value = .831524

henace p-value is greater than alpha value(.1), so we dont reject the null hypothesis

assume mean = 3.9 obtain mean = 3.974286 std = .45 test stats value = .973968 p-value = .831524
 henace p-value is greater than alpha value(.1). so we dont reject the null hypothesis

3 Give your inference

Accepting the T test result as proven true in the above instance, which is, the vigilant value of 3.9 degree Celsius to be kept at the Cold Storage Plant is crossed and goes higher than the specifications, in return which is creating adversities like catalyzing of dairy products go sour and smelly; leading to customer complaints. Strictly, some corrective action in the Cold Storage Plant is needed to get the process back in stable, safe and desired state.