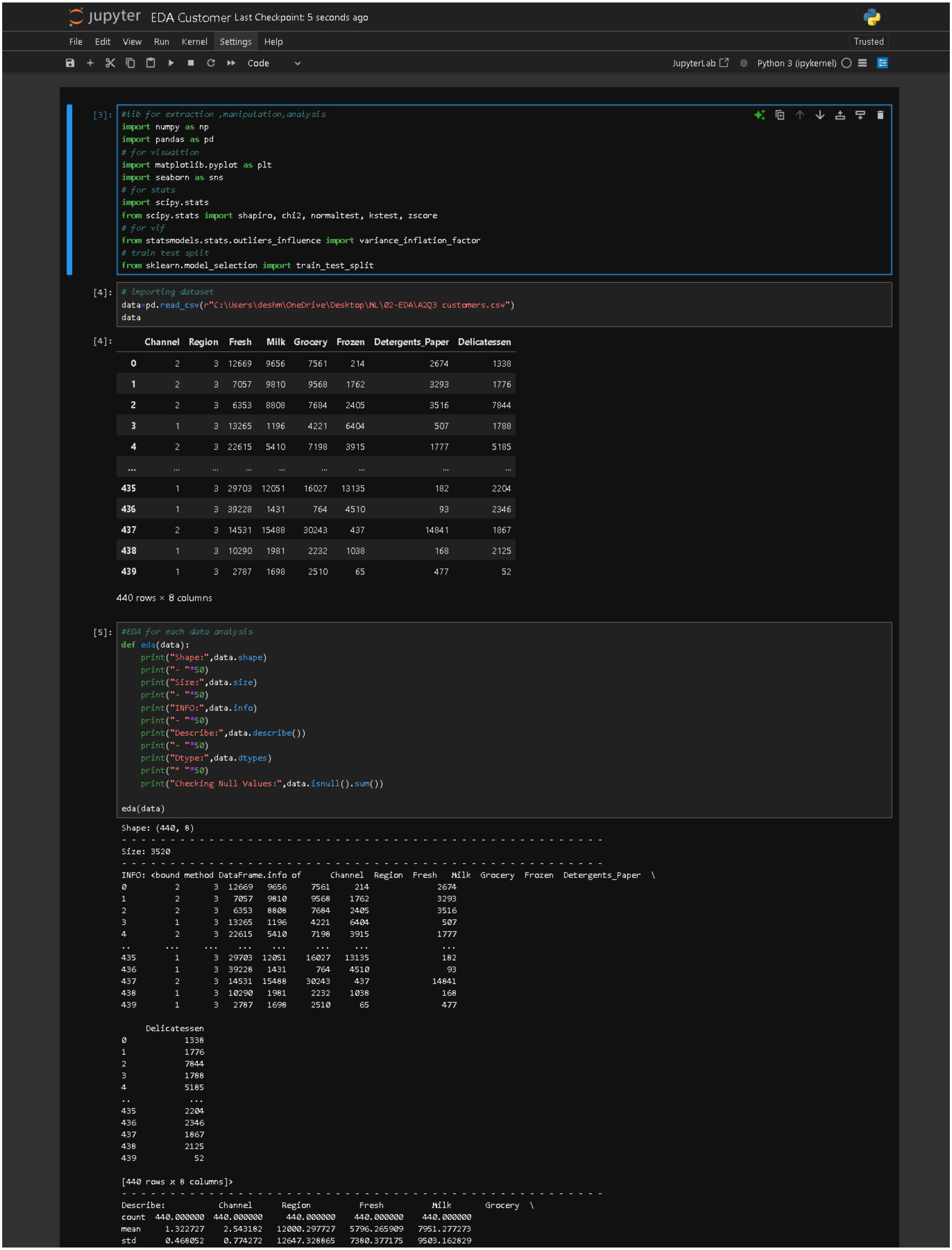

jupyter EDA Customer Last Checkpoint: 5 seconds ago
Trusted
File Edit View Run Kernel Settings Help
Code
JupyterLab
Python 3 (ipykernel)

[3]:
```python
#lib for extraction ,manipulation,analysis
import numpy as np
import pandas as pd
# for visualtion
import matplotlib.pyplot as plt
import seaborn as sns
# for stats
import scipy.stats
from scipy.stats import shapiro, chi2, normaltest, kstest, zscore
# for vif
from statsmodels.stats.outliers_influence import variance_inflation_factor
# train test split
from sklearn.model_selection import train_test_split
```

[4]:
```python
# importing dataset
data=pd.read_csv(r"C:\Users\deshm\OneDrive\Desktop\ML\02-EDA\A2Q3 customers.csv")
data
```

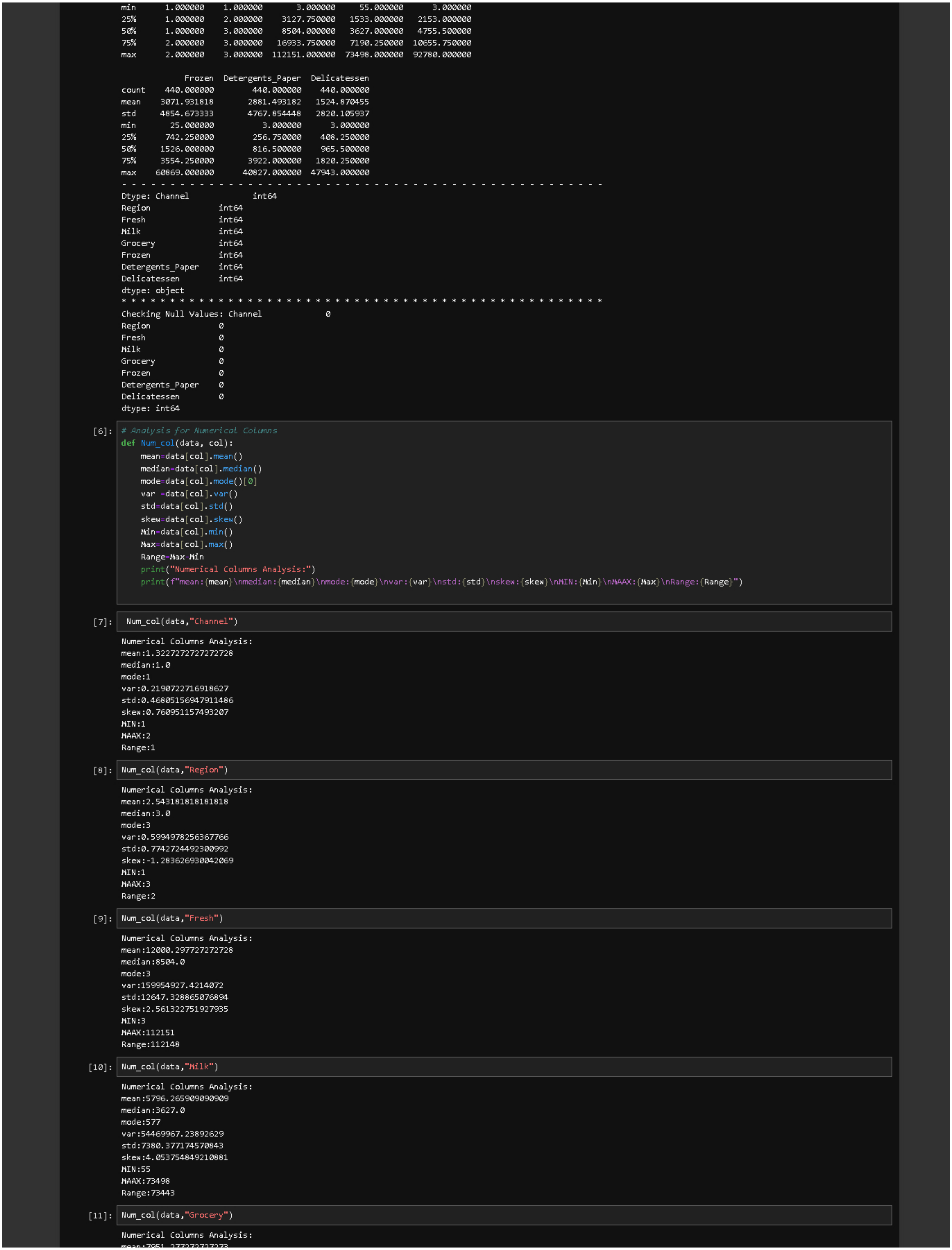
[4]:

	Channel	Region	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delicatessen
0	2	3	12669	9656	7561	214	2674	1338
1	2	3	7057	9810	9568	1762	3293	1776
2	2	3	6353	8808	7684	2405	3516	7844
3	1	3	13265	1196	4221	6404	507	1788
4	2	3	22615	5410	7198	3915	1777	5185
...	...	...	...	...	...	...	...	...
435	1	3	29703	12051	16027	13135	182	2204
436	1	3	39228	1431	764	4510	93	2346
437	2	3	14531	15488	30243	437	14841	1867
438	1	3	10290	1981	2232	1038	168	2125
439	1	3	2787	1698	2510	65	477	52

440 rows × 8 columns

[5]:
```python
#EDA for each data analysis
def eda(data):
    print("Shape:",data.shape)
    print("- "*50)
    print("Size:",data.size)
    print("- "*50)
    print("INFO:",data.info)
    print("- "*50)
    print("Describe:",data.describe())
    print("- "*50)
    print("Dtype:",data.dtypes)
    print("* "*50)
    print("Checking Null Values:",data.isnull().sum())

eda(data)
```

```
Shape: (440, 8)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - 
Size: 3520
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - 
INFO: <bound method DataFrame.info of      Channel  Region  Fresh   Milk  Grocery  Frozen  Detergents_Paper  \
0          2       3  12669   9656     7561     214              2674   
1          2       3   7057   9810     9568    1762              3293   
2          2       3   6353   8808     7684    2405              3516   
3          1       3  13265   1196     4221    6404               507   
4          2       3  22615   5410     7198    3915              1777   
..       ...     ...    ...    ...      ...     ...               ...   
435        1       3  29703  12051    16027   13135               182   
436        1       3  39228   1431      764    4510                93   
437        2       3  14531  15488    30243     437             14841   
438        1       3  10290   1981     2232    1038               168   
439        1       3   2787   1698     2510      65               477   

     Delicatessen  
0            1338  
1            1776  
2            7844  
3            1788  
4            5185  
..            ...  
435          2204  
436          2346  
437          1867  
438          2125  
439            52  

[440 rows x 8 columns]>
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - 
Describe:            Channel      Region          Fresh          Milk       Grocery  \
count  440.000000  440.000000     440.000000    440.000000    440.000000   
mean     1.322727    2.543182   12000.297727   5796.265909   7951.277273   
std      0.468052    0.774272   12647.328865   7380.377175   9503.162829   
```



```
min      1.000000    1.000000       3.000000     55.000000      3.000000
25%      1.000000    2.000000    3127.750000   1533.000000   2153.000000
50%      1.000000    3.000000    8504.000000   3627.000000   4755.500000
75%      2.000000    3.000000   16933.750000   7190.250000  10655.750000
max      2.000000    3.000000  112151.000000  73498.000000  92780.000000

             Frozen  Detergents_Paper  Delicatessen
count    440.000000        440.000000    440.000000
mean    3071.931818       2881.493182   1524.870455
std     4854.673333       4767.854448   2820.105937
min       25.000000          3.000000      3.000000
25%      742.250000        256.750000    408.250000
50%     1526.000000        816.500000    965.500000
75%     3554.250000       3922.000000   1820.250000
max    60869.000000      40827.000000  47943.000000
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Dtype: Channel             int64
Region              int64
Fresh               int64
Milk                int64
Grocery             int64
Frozen              int64
Detergents_Paper    int64
Delicatessen        int64
dtype: object
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
Checking Null Values: Channel             0
Region              0
Fresh               0
Milk                0
Grocery             0
Frozen              0
Detergents_Paper    0
Delicatessen        0
dtype: int64
```

[6]:

```
# Analysis for Numerical Columns
def Num_col(data, col):
    mean=data[col].mean()
    median=data[col].median()
    mode=data[col].mode()[0]
    var =data[col].var()
    std=data[col].std()
    skew=data[col].skew()
    Min=data[col].min()
    Max=data[col].max()
    Range=Max-Min
    print("Numerical Columns Analysis:")
    print(f"mean:{mean}\nmedian:{median}\nmode:{mode}\nvar:{var}\nstd:{std}\nskew:{skew}\nMIN:{Min}\nMAAX:{Max}\nRange:{Range}")
```

[7]:

```
 Num_col(data,"Channel")
```

```
Numerical Columns Analysis:
mean:1.3227272727272728
median:1.0
mode:1
var:0.2190722716918627
std:0.46805156947911486
skew:0.760951157493207
MIN:1
MAAX:2
Range:1
```

[8]:

```
Num_col(data,"Region")
```

```
Numerical Columns Analysis:
mean:2.543181818181818
median:3.0
mode:3
var:0.5994978256367766
std:0.7742724492300992
skew:-1.283626930042069
MIN:1
MAAX:3
Range:2
```

[9]:

```
Num_col(data,"Fresh")
```

```
Numerical Columns Analysis:
mean:12000.297727272728
median:8504.0
mode:3
var:159954927.4214072
std:12647.328865076894
skew:2.561322751927935
MIN:3
MAAX:112151
Range:112148
```

[10]:

```
Num_col(data,"Milk")
```

```
Numerical Columns Analysis:
mean:5796.265909090909
median:3627.0
mode:577
var:54469967.23892629
std:7380.377174570843
skew:4.053754849210881
MIN:55
MAAX:73498
Range:73443
```

[11]:

```
Num_col(data,"Grocery")
```

```
Numerical Columns Analysis:
mean:7951.277272727273
```

```
mean:7951.277272727273
median:4755.5
mode:683
var:90310103.75437982
std:9503.162828994346
skew:3.5874286903915453
MIN:3
MAAX:92780
Range:92777
```

[12]:
```
Num_col(data,"Frozen")
```

```
Numerical Columns Analysis:
mean:3071.931818181818
median:1526.0
mode:133
var:23567853.166183475
std:4854.673332592367
skew:5.9079856924559575
MIN:25
MAAX:60869
Range:60844
```

[13]:
```
Num_col(data,"Detergents_Paper")
```

```
Numerical Columns Analysis:
mean:2881.4931818181817
median:816.5
mode:3
var:22732436.036399864
std:4767.8544479042
skew:3.6318506306913645
MIN:3
MAAX:40827
Range:40824
```

[26]:
```
Num_col(data,"Delicatessen")
```

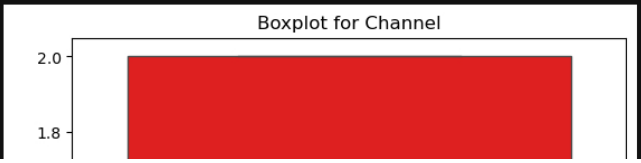
```
Numerical Columns Analysis:
mean:1524.8704545454545
median:965.5
mode:3
var:7952997.497986128
std:2820.1059373693975
skew:11.151586478906117
MIN:3
MAAX:47943
Range:47940
```

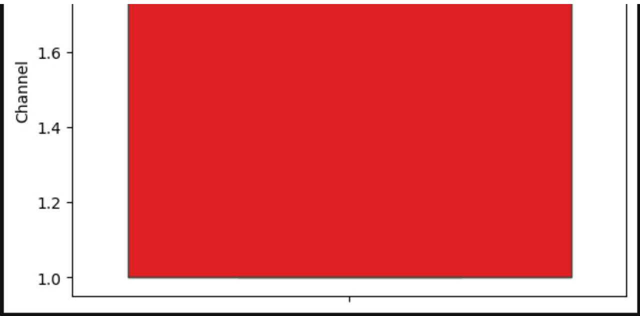
[30]:
```
def Checking_and_Handling_Of_Outliers(data, col):
    sns.boxplot(data[col], color = "Red")
    plt.title(f"Boxplot for {col}")
    plt.show()

    q1 = data[col].quantile(0.25)
    q3 = data[col].quantile(0.75)

    iqr = q3 - q1

    LowerTail = q1 - 1.5*iqr
    UpperTail = q3 + 1.5*iqr

    print(f"25% Quantile q1 = {q1}\n75% Quantile q3 = {q3}\nIQR = {iqr}\n")
    print("-"*80)
    print(f"Lower Tail = {LowerTail}\nUpper Tail = {UpperTail}")
    print("-"*80)

    # Checking for Outliers
    Outliers = data[(data[col] < LowerTail) | (data[col] > UpperTail)]
    print("\nOutliers :\n",Outliers)
    print("-"*80)

    #HAndling of Outliers :
    data.loc[data[col] < LowerTail, col] = LowerTail # all outliers less than lowertail, assigned by lowertail value
    data.loc[data[col] > UpperTail, col] = UpperTail # all outliers greater than uppertail, assigned by uppertail value
    print("After handling of Outliers data:\n")
    print(data.head())
```

[32]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 440 entries, 0 to 439
Data columns (total 8 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Channel           440 non-null    int64
 1   Region            440 non-null    int64
 2   Fresh             440 non-null    int64
 3   Milk              440 non-null    int64
 4   Grocery           440 non-null    int64
 5   Frozen            440 non-null    int64
 6   Detergents_Paper  440 non-null    int64
 7   Delicatessen      440 non-null    int64
dtypes: int64(8)
memory usage: 27.6 KB
```

[34]:
```
Checking_and_Handling_Of_Outliers(data, "Channel")
```

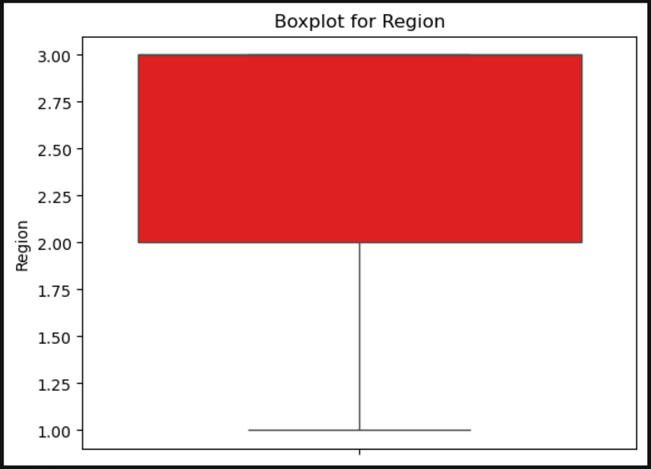




```
25% Quantile q1 = 1.0
75% Quantile q3 = 2.0
IQR = 1.0

--------------------------------------------------------------------------------
Lower Tail = -0.5
Upper Tail = 3.5
--------------------------------------------------------------------------------

Outliers :
 Empty DataFrame
Columns: [Channel, Region, Fresh, Milk, Grocery, Frozen, Detergents_Paper, Delicatessen]
Index: []
--------------------------------------------------------------------------------
After handling of Outliers data:

   Channel  Region  Fresh  Milk  Grocery  Frozen  Detergents_Paper  \
0      2.0       3  12669  9656     7561     214              2674   
1      2.0       3   7057  9810     9568    1762              3293   
2      2.0       3   6353  8808     7684    2405              3516   
3      1.0       3  13265  1196     4221    6404               507   
4      2.0       3  22615  5410     7198    3915              1777   

   Delicatessen  
0          1338  
1          1776  
2          7844  
3          1788  
4          5185  
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\4129211344.py:25: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error in a future version of pandas. Value '-0.5' has dtype incompatible with int64, please explicitly cast to a compatible dtype first.
  data.loc[data[col] < LowerTail, col] = LowerTail # all outliers less than lowertail, assigned by lowertail value
```

[36]:
```
Checking_and_Handling_Of_Outliers(data, "Region")
```

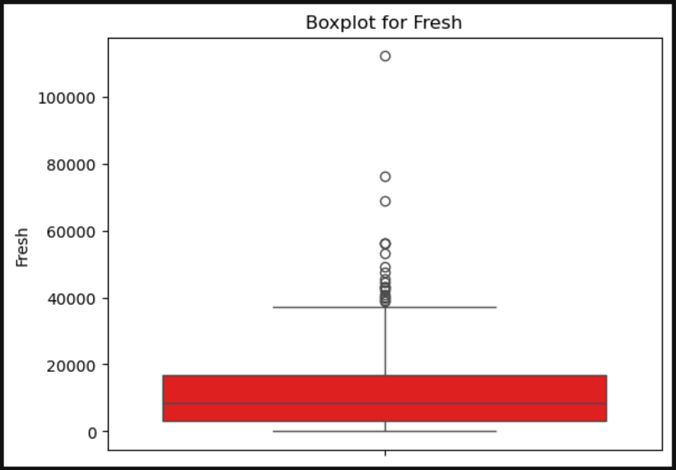

Boxplot for Region

```
25% Quantile q1 = 2.0
75% Quantile q3 = 3.0
IQR = 1.0

--------------------------------------------------------------------------------
Lower Tail = 0.5
Upper Tail = 4.5
--------------------------------------------------------------------------------

Outliers :
 Empty DataFrame
Columns: [Channel, Region, Fresh, Milk, Grocery, Frozen, Detergents_Paper, Delicatessen]
Index: []
--------------------------------------------------------------------------------
After handling of Outliers data:

   Channel  Region  Fresh  Milk  Grocery  Frozen  Detergents_Paper  \
0      2.0     3.0  12669  9656     7561     214              2674   
1      2.0     3.0   7057  9810     9568    1762              3293   
2      2.0     3.0   6353  8808     7684    2405              3516   
3      1.0     3.0  13265  1196     4221    6404               507   
4      2.0     3.0  22615  5410     7198    3915              1777   

   Delicatessen  
0          1338  
1          1776  
2          7844  
3          1788  
4          5185  
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\4129211344.py:25: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\4129211344.py:25: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error
in a future version of pandas. Value '0.5' has dtype incompatible with int64, please explicitly cast to a compatible dtype first.
  data.loc[data[col] < LowerTail, col] = LowerTail # all outliers less than lowertail, assigned by lowertail value
```

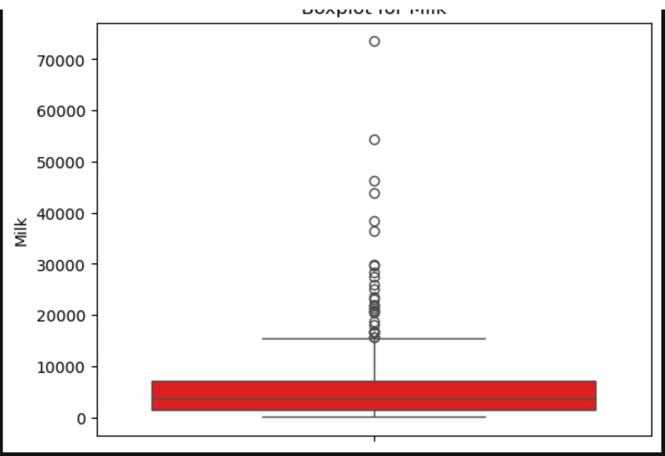
```
[38]: Checking_and_Handling_Of_Outliers(data, "Fresh")
```



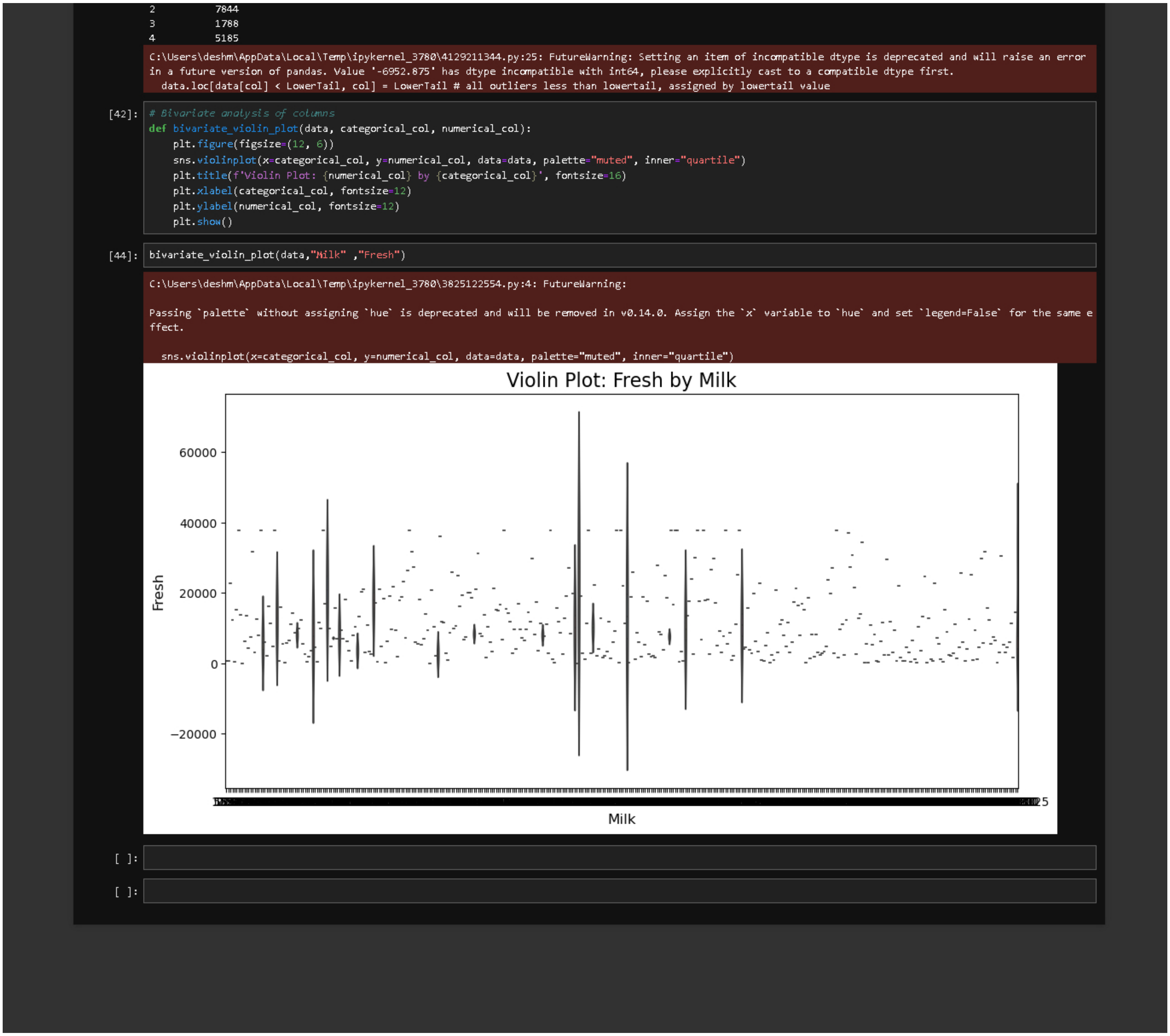
```
25% Quantile q1 = 3127.75
75% Quantile q3 = 16933.75
IQR = 13806.0

--------------------------------------------------------------------------------
Lower Tail = -17581.25
Upper Tail = 37642.75
--------------------------------------------------------------------------------

Outliers :
      Channel  Region   Fresh   Milk  Grocery  Frozen  Detergents_Paper  \
29        1.0     3.0   43088   2100     2609    1200              1107   
39        1.0     3.0   56159    555      902   10002               212   
47        2.0     3.0   44466  54259    55571    7782             24171   
52        2.0     3.0   40721   3916     5876     532              2587   
87        1.0     3.0   43265   5025     8117    6312              1579   
103       1.0     3.0   56082   3504     8906   18028              1480   
125       1.0     3.0   76237   3473     7102   16538               778   
129       1.0     3.0   42312    926     1510    1718               410   
176       1.0     3.0   45640   6958     6536    7368              1532   
181       1.0     3.0  112151  29627    18148   16745              4948   
239       1.0     1.0   47493   2567     3779    5243               828   
258       1.0     1.0   56083   4563     2124    6422               730   
259       1.0     1.0   53205   4959     7336    3012               967   
282       1.0     3.0   49063   3965     4252    5970              1041   
284       1.0     3.0   68951   4411    12609    8692               751   
285       1.0     3.0   40254    640     3600    1042               436   
289       1.0     3.0   42786    286      471    1388                32   
370       2.0     3.0   39679   3944     4955    1364               523   
377       1.0     3.0   38793   3154     2648    1034                96   
436       1.0     3.0   39228   1431      764    4510                93   

     Delicatessen  
29            823  
39           2916  
47           6465  
52           1278  
87          14351  
103          2498  
125           918  
129          1819  
176           230  
181          8550  
239          2253  
258          3321  
259           818  
282          1404  
284          2406  
285            18  
289            22  
370          2235  
377          1242  
436          2346  
--------------------------------------------------------------------------------
After handling of Outliers data:

   Channel  Region    Fresh  Milk  Grocery  Frozen  Detergents_Paper  \
0      2.0     3.0  12669.0  9656     7561     214              2674   
1      2.0     3.0   7057.0  9810     9568    1762              3293   
2      2.0     3.0   6353.0  8808     7684    2405              3516   
3      1.0     3.0  13265.0  1196     4221    6404               507   
4      2.0     3.0  22615.0  5410     7198    3915              1777   

   Delicatessen  
0          1338  
1          1776  
2          7844  
3          1788  
4          5185  
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\4129211344.py:25: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error
in a future version of pandas. Value '-17581.25' has dtype incompatible with int64, please explicitly cast to a compatible dtype first.
  data.loc[data[col] < LowerTail, col] = LowerTail # all outliers less than lowertail, assigned by lowertail value
```

```
[40]: Checking_and_Handling_Of_Outliers(data, "Milk")
```



```
25% Quantile q1 = 1533.0
75% Quantile q3 = 7190.25
IQR = 5657.25

--------------------------------------------------------------------------------
Lower Tail = -6952.875
Upper Tail = 15676.125
--------------------------------------------------------------------------------

Outliers :
      Channel  Region     Fresh   Milk  Grocery  Frozen  Detergents_Paper  \
23        2.0     3.0  26373.00  36423    22019    5154              4337   
28        2.0     3.0   4113.00  20484    25957    1158              8604   
38        2.0     3.0   4591.00  15729    16709      33              6956   
45        2.0     3.0   5181.00  22044    21531    1740              7353   
47        2.0     3.0  37642.75  54259    55571    7782             24171   
49        2.0     3.0   4967.00  21412    28921    1798             13583   
56        2.0     3.0   4098.00  29892    26866    2616             17740   
61        2.0     3.0  35942.00  38369    59598    3254             26701   
65        2.0     3.0     85.00  20959    45828      36             24231   
85        2.0     3.0  16117.00  46197    92780    1026             40827   
86        2.0     3.0  22925.00  73498    32114     987             20070   
92        2.0     3.0   9198.00  27472    32034    3232             18906   
109       2.0     3.0   1406.00  16729    28986     673               836   
163       2.0     3.0   5531.00  15726    26870    2367             13726   
171       2.0     3.0    200.00  25862    19816     651              8773   
181       1.0     3.0  37642.75  29627    18148   16745              4948   
183       1.0     3.0  36847.00  43950    20170   36534               239   
211       2.0     1.0  12119.00  28326    39694    4736             19410   
216       2.0     1.0   2532.00  16599    36486     179             13308   
251       2.0     1.0   6134.00  23133    33586    6746             18594   
254       1.0     1.0  10379.00  17972     4748    4686              1547   
265       1.0     1.0   5909.00  23527    13699   10155               830   
309       2.0     2.0    918.00  20655    13567    1465              6846   
319       2.0     2.0   9759.00  25071    17645    1128             12408   
325       1.0     2.0  32717.00  16784    13626   60869              1272   
358       1.0     3.0    759.00  18664     1660    6114               536   
384       1.0     3.0  10683.00  21858    15400    3635               282   
427       1.0     3.0  31012.00  16687     5429   15082               439   

     Delicatessen  
23          16523  
28           5206  
38            433  
45           4985  
47           6465  
49           1163  
56           1340  
61           2017  
65           1423  
85           2944  
86            903  
92           5130  
109             3  
163           446  
171          6250  
181          8550  
183         47943  
211          2870  
216           674  
251          5121  
254          3265  
265          3636  
309           806  
319          1625  
325          5609  
358          4100  
384          5120  
427          1163  
--------------------------------------------------------------------------------
After handling of Outliers data:

   Channel  Region    Fresh    Milk  Grocery  Frozen  Detergents_Paper  \
0      2.0     3.0  12669.0  9656.0     7561     214              2674   
1      2.0     3.0   7057.0  9810.0     9568    1762              3293   
2      2.0     3.0   6353.0  8808.0     7684    2405              3516   
3      1.0     3.0  13265.0  1196.0     4221    6404               507   
4      2.0     3.0  22615.0  5410.0     7198    3915              1777   

   Delicatessen  
0          1338  
1          1776  
```



```
2          7844
3          1788
4          5185
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\4129211344.py:25: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error
in a future version of pandas. Value '-6952.875' has dtype incompatible with int64, please explicitly cast to a compatible dtype first.
  data.loc[data[col] < LowerTail, col] = LowerTail # all outliers less than lowertail, assigned by lowertail value
```

[42]:

```
# Bivariate analysis of columns
def bivariate_violin_plot(data, categorical_col, numerical_col):
    plt.figure(figsize=(12, 6))
    sns.violinplot(x=categorical_col, y=numerical_col, data=data, palette="muted", inner="quartile")
    plt.title(f'Violin Plot: {numerical_col} by {categorical_col}', fontsize=16)
    plt.xlabel(categorical_col, fontsize=12)
    plt.ylabel(numerical_col, fontsize=12)
    plt.show()
```

[44]:

```
bivariate_violin_plot(data,"Milk" ,"Fresh")
```

```
C:\Users\deshm\AppData\Local\Temp\ipykernel_3780\3825122554.py:4: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same e
ffect.

  sns.violinplot(x=categorical_col, y=numerical_col, data=data, palette="muted", inner="quartile")
```