In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

# DATA COLLECTION

In [2]:

```
a=pd.read_csv(r"C:\Users\user\Downloads\6_Salesworkload1 - 6_Salesworkload1.csv")
```

In [3]:

```
b=a.head(10)
b
```

Out[3]:

| | MonthYear | Time index | Country | StoreID | City | Dept_ID | Dept. Name | HoursOwn | HoursLease |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 1.0 | Dry | 3184.764 | 0.0 |
| **1** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 2.0 | Frozen | 1582.941 | 0.0 |
| **2** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 3.0 | other | 47.205 | 0.0 |
| **3** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 4.0 | Fish | 1623.852 | 0.0 |
| **4** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 5.0 | Fruits & Vegetables | 1759.173 | 0.0 |
| **5** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 6.0 | Meat | 8270.316 | 0.0 |
| **6** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 13.0 | Food | 16468.251 | 0.0 |
| **7** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 7.0 | Clothing | 4698.471 | 0.0 |
| **8** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 8.0 | Household | 1183.272 | 0.0 |
| **9** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 9.0 | Hardware | 2029.815 | 0.0 |

# DATA CLEANING AND PRE-PROCESSING

In [4]:

```
b.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   MonthYear      10 non-null     object 
 1   Time index     10 non-null     float64
 2   Country        10 non-null     object 
 3   StoreID        10 non-null     float64
 4   City           10 non-null     object 
 5   Dept_ID        10 non-null     float64
 6   Dept. Name     10 non-null     object 
 7   HoursOwn       10 non-null     object 
 8   HoursLease     10 non-null     float64
 9   Sales units    10 non-null     float64
 10  Turnover       10 non-null     float64
 11  Customer       0 non-null      float64
 12  Area (m2)      10 non-null     object 
 13  Opening hours  10 non-null     object 
dtypes: float64(7), object(7)
memory usage: 1.2+ KB
```

In [5]:

```
b.describe()
```

Out[5]:

| | Time index | StoreID | Dept_ID | HoursLease | Sales units | Turnover | Customer |
|---|---|---|---|---|---|---|---|
| **count** | 10.0 | 10.0 | 10.000000 | 10.0 | 1.000000e+01 | 1.000000e+01 | 0.0 |
| **mean** | 1.0 | 88253.0 | 5.800000 | 0.0 | 6.543725e+05 | 1.978511e+06 | NaN |
| **std** | 0.0 | 0.0 | 3.614784 | 0.0 | 9.914003e+05 | 2.861420e+06 | NaN |
| **min** | 1.0 | 88253.0 | 1.000000 | 0.0 | 5.491500e+04 | 2.904000e+05 | NaN |
| **25%** | 1.0 | 88253.0 | 3.250000 | 0.0 | 1.034225e+05 | 4.033612e+05 | NaN |
| **50%** | 1.0 | 88253.0 | 5.500000 | 0.0 | 2.615525e+05 | 5.770455e+05 | NaN |
| **75%** | 1.0 | 88253.0 | 7.750000 | 0.0 | 4.284400e+05 | 1.518067e+06 | NaN |
| **max** | 1.0 | 88253.0 | 13.000000 | 0.0 | 3.107935e+06 | 8.714679e+06 | NaN |

In [6]:

```
c=b.dropna(axis=1)
c
```

Out[6]:

| | MonthYear | Time index | Country | StoreID | City | Dept_ID | Dept. Name | HoursOwn | HoursLease |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 1.0 | Dry | 3184.764 | 0.0 |
| **1** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 2.0 | Frozen | 1582.941 | 0.0 |
| **2** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 3.0 | other | 47.205 | 0.0 |
| **3** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 4.0 | Fish | 1623.852 | 0.0 |
| **4** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 5.0 | Fruits & Vegetables | 1759.173 | 0.0 |
| **5** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 6.0 | Meat | 8270.316 | 0.0 |
| **6** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 13.0 | Food | 16468.251 | 0.0 |
| **7** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 7.0 | Clothing | 4698.471 | 0.0 |
| **8** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 8.0 | Household | 1183.272 | 0.0 |
| **9** | 10.2016 | 1.0 | United Kingdom | 88253.0 | London (I) | 9.0 | Hardware | 2029.815 | 0.0 |

In [7]:

```
c.columns
```

Out[7]:

```
Index(['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Area (m2)', 'Opening hours'],
      dtype='object')
```

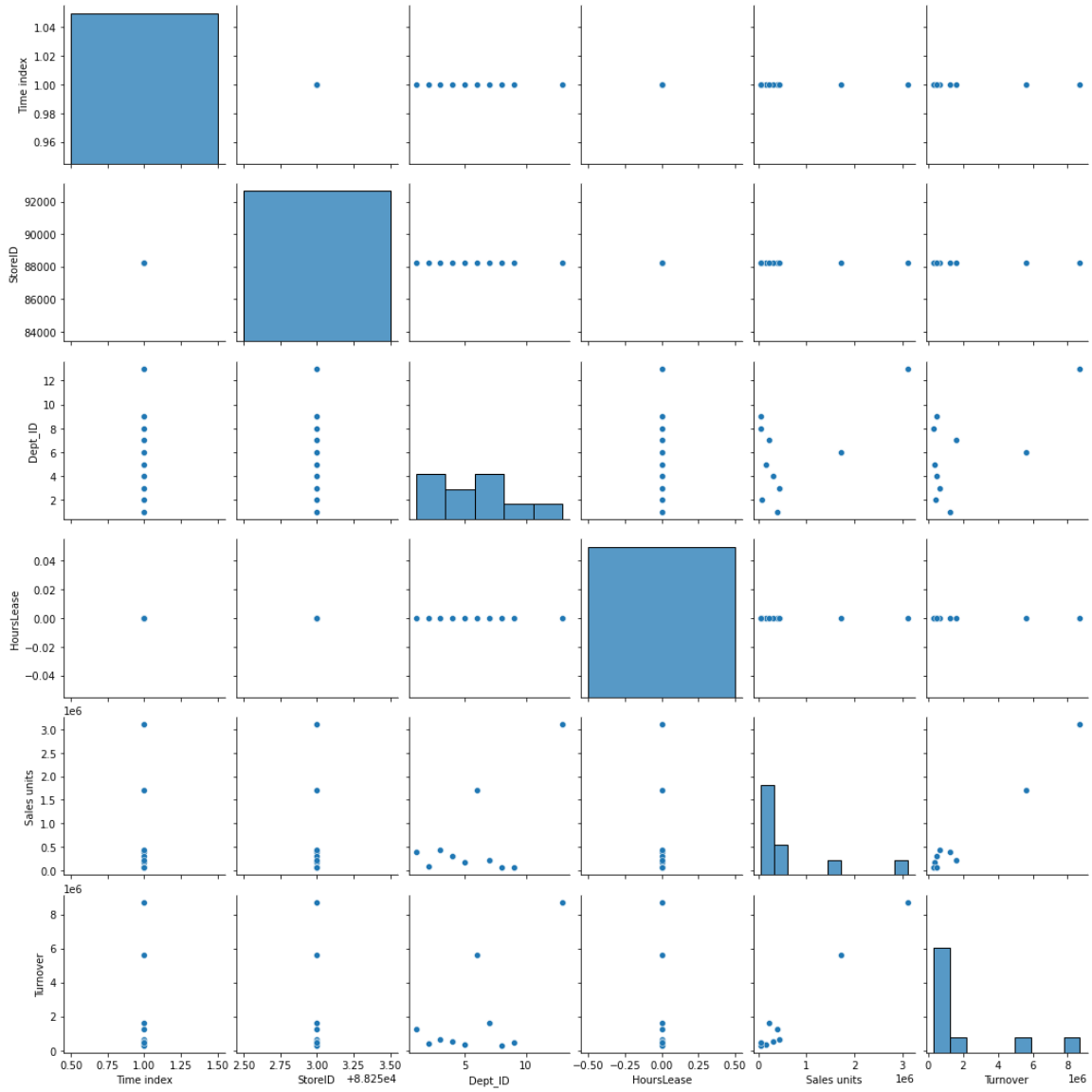
# EDA AND VISUALIZATION

In [8]:

```
sns.pairplot(c)
```

Out[8]:

```
<seaborn.axisgrid.PairGrid at 0x1ec84961520>
```



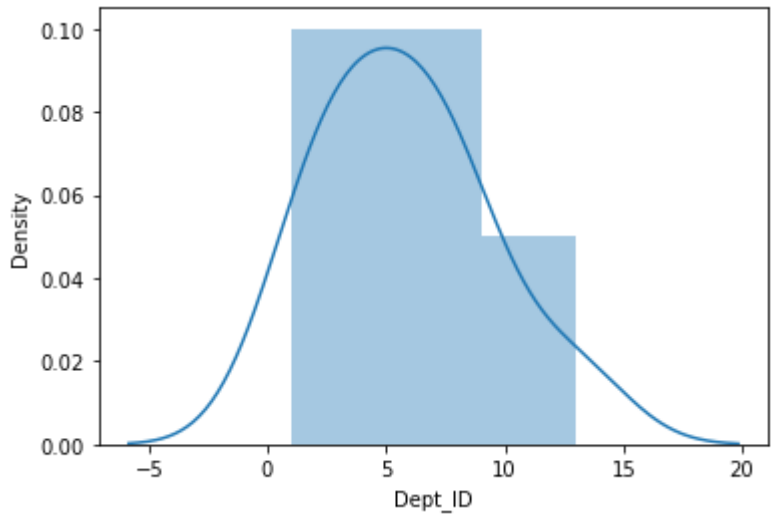
In [9]:

```
sns.distplot(c['Dept_ID'])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557:
FutureWarning: `distplot` is a deprecated function and will be removed in
a future version. Please adapt your code to use either `displot` (a figure
-level function with similar flexibility) or `histplot` (an axes-level fun
ction for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[9]:

```
<AxesSubplot:xlabel='Dept_ID', ylabel='Density'>
```




In [10]:

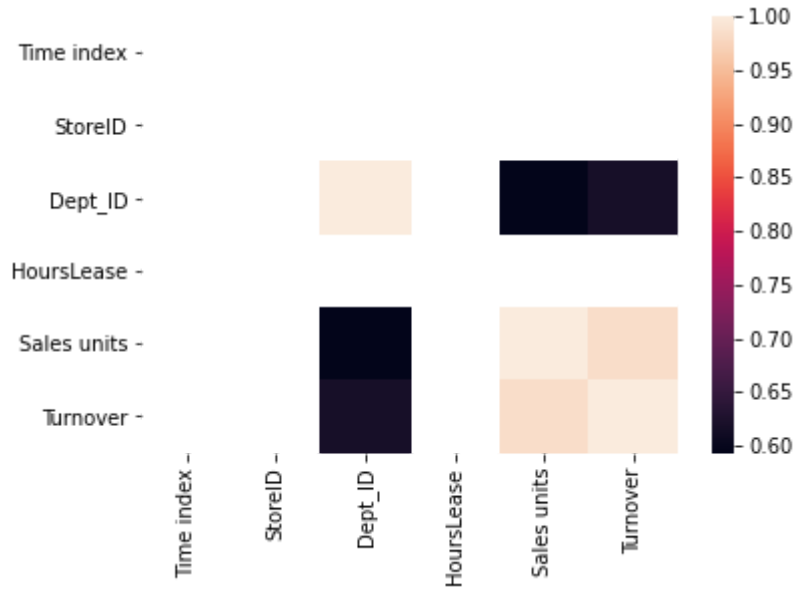
```
f=c[['MonthYear', 'Time index','StoreID','Dept_ID',
      'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Area (m2)']]
```

In [11]:

```
sns.heatmap(f.corr())
```

Out[11]:

```
<AxesSubplot:>
```




In [12]:

```
x=f[['MonthYear', 'Time index','StoreID',
      'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Area (m2)']]
y=f['Dept_ID']
```

In [13]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.5)
```

In [14]:

```
from sklearn.linear_model import LinearRegression

lr=LinearRegression()
lr.fit(x_train,y_train)
```

Out[14]:

```
LinearRegression()
```

In [15]:

```
print(lr.intercept_)
```

```
1.3169387406532111
```

In [16]:

```
r=pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
r
```

Out[16]:

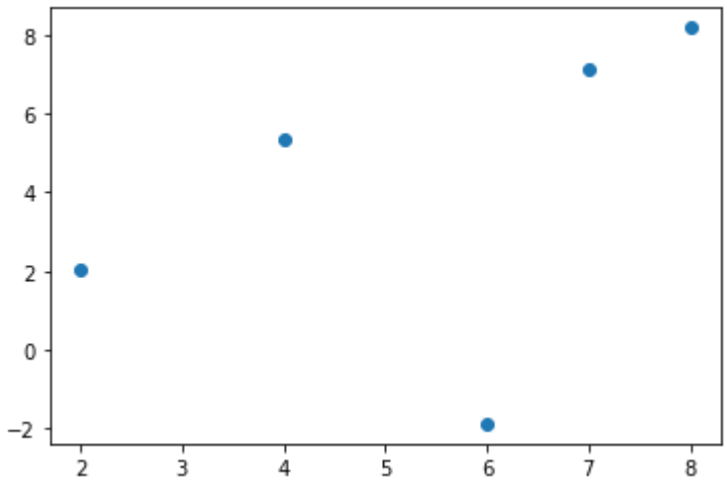
| | Co-efficient |
|---|---|
| **MonthYear** | 2.414383e-16 |
| **Time index** | -6.489289e-17 |
| **StoreID** | 2.168404e-19 |
| **HoursOwn** | 1.706467e-03 |
| **HoursLease** | 0.000000e+00 |
| **Sales units** | 1.767600e-05 |
| **Turnover** | -1.159834e-05 |
| **Area (m2)** | 1.496077e-03 |

In [17]:

```
u=lr.predict(x_test)
plt.scatter(y_test,u)
```

Out[17]:

```
<matplotlib.collections.PathCollection at 0x1ec87fd35e0>
```




In [18]:

```
print(lr.score(x_test,y_test))
```

```
-1.7550104677859864
```

In [19]:

```
lr.score(x_train,y_train)
```

Out[19]:

```
1.0
```

# RIDGE REGRESSION

In [20]:

```
from sklearn.linear_model import Ridge,Lasso
```

In [21]:

```
rr=Ridge(alpha=10)
rr.fit(x_train,y_train)
```

Out[21]:

```
Ridge(alpha=10)
```

In [22]:

```
rr.score(x_test,y_test)
```

Out[22]:

```
-1.7549246608726943
```

# LASSO REGRESSION

In [23]:

```
la=Lasso(alpha=10)
la.fit(x_train,y_train)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_coordinat
e_descent.py:530: ConvergenceWarning: Objective did not converge. You migh
t want to increase the number of iterations. Duality gap: 0.62465266670876
04, tolerance: 0.00928
  model = cd_fast.enet_coordinate_descent(
```

Out[23]:

```
Lasso(alpha=10)
```

In [24]:

```
la.score(x_test,y_test)
```

Out[24]:

```
0.5550668835047645
```

In [ ]:

```

```