In [1]:
```
#to import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [81]:
```
#to import dataset
data=pd.read_csv(r"C:\Users\user\Downloads\6_Salesworkload1 - 6_Salesworkload1.cs
data
```

Out[81]:

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLeas
0	10.2016	1.0	United Kingdom	88253.0	London (I)	1.0	Dry	3184.764	0.
1	10.2016	1.0	United Kingdom	88253.0	London (I)	2.0	Frozen	1582.941	0.
2	10.2016	1.0	United Kingdom	88253.0	London (I)	3.0	other	47.205	0.
3	10.2016	1.0	United Kingdom	88253.0	London (I)	4.0	Fish	1623.852	0.
4	10.2016	1.0	United Kingdom	88253.0	London (I)	5.0	Fruits & Vegetables	1759.173	0.
...	...	...	...	...	...	...	...	...	.
7653	6.2017	9.0	Sweden	29650.0	Gothenburg	12.0	Checkout	6322.323	0.
7654	6.2017	9.0	Sweden	29650.0	Gothenburg	16.0	Customer Services	4270.479	0.
7655	6.2017	9.0	Sweden	29650.0	Gothenburg	11.0	Delivery	0	0.
7656	6.2017	9.0	Sweden	29650.0	Gothenburg	17.0	others	2224.929	0.
7657	6.2017	9.0	Sweden	29650.0	Gothenburg	18.0	all	39652.2	0.

7658 rows × 14 columns

In [82]:
```
#to display top 5 rows
data.head()
```

Out[82]:

	MonthYear	Time index	Country	StoreID	City	Dept_ID	Dept. Name	HoursOwn	HoursLease	S
0	10.2016	1.0	United Kingdom	88253.0	London (I)	1.0	Dry	3184.764	0.0	3985
1	10.2016	1.0	United Kingdom	88253.0	London (I)	2.0	Frozen	1582.941	0.0	827
2	10.2016	1.0	United Kingdom	88253.0	London (I)	3.0	other	47.205	0.0	4384
3	10.2016	1.0	United Kingdom	88253.0	London (I)	4.0	Fish	1623.852	0.0	3094
4	10.2016	1.0	United Kingdom	88253.0	London (I)	5.0	Fruits & Vegetables	1759.173	0.0	1655

DATA CLEANING AND PREPROCESSING

In [83]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7658 entries, 0 to 7657
Data columns (total 14 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   MonthYear      7658 non-null   object 
 1   Time index     7650 non-null   float64
 2   Country        7650 non-null   object 
 3   StoreID        7650 non-null   float64
 4   City           7650 non-null   object 
 5   Dept_ID        7650 non-null   float64
 6   Dept. Name     7650 non-null   object 
 7   HoursOwn       7650 non-null   object 
 8   HoursLease     7650 non-null   float64
 9   Sales units    7650 non-null   float64
 10  Turnover       7650 non-null   float64
 11  Customer       0 non-null      float64
 12  Area (m2)      7650 non-null   object 
 13  Opening hours  7650 non-null   object 
dtypes: float64(7), object(7)
memory usage: 837.7+ KB
```

In [84]:
```
#to display summary of statistics
data.describe()
```

Out[84]:

	Time index	StoreID	Dept_ID	HoursLease	Sales units	Turnover	Custome
count	7650.000000	7650.000000	7650.000000	7650.000000	7.650000e+03	7.650000e+03	0.
mean	5.000000	61995.220000	9.470588	22.036078	1.076471e+06	3.721393e+06	Nal
std	2.582158	29924.581631	5.337429	133.299513	1.728113e+06	6.003380e+06	Nal
min	1.000000	12227.000000	1.000000	0.000000	0.000000e+00	0.000000e+00	Nal
25%	3.000000	29650.000000	5.000000	0.000000	5.457125e+04	2.726798e+05	Nal
50%	5.000000	75400.500000	9.000000	0.000000	2.932300e+05	9.319575e+05	Nal
75%	7.000000	87703.000000	14.000000	0.000000	9.175075e+05	3.264432e+06	Nal
max	9.000000	98422.000000	18.000000	3984.000000	1.124296e+07	4.271739e+07	Nal

In [85]:
```
#to display the column heading
data.columns
```

Out[85]:
```
Index(['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Customer', 'Area (m2)', 'Opening hours'],
      dtype='object')
```

EDA and DATA VISUALIZATION

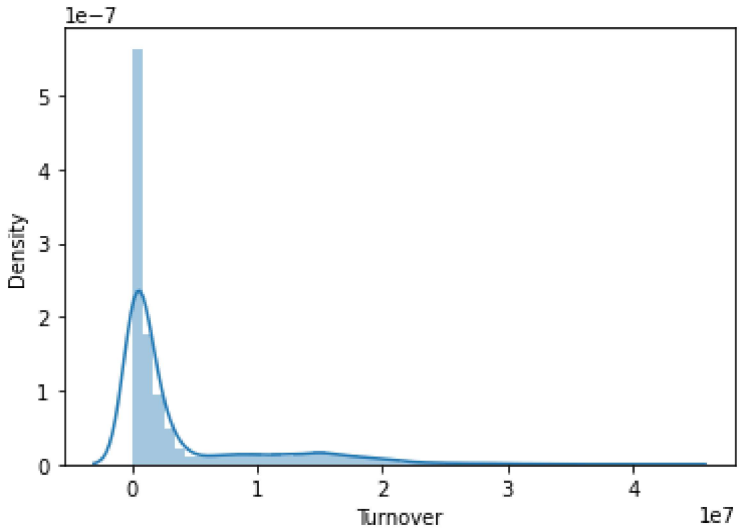
In [86]:
```
sns.pairplot(data)
```

Out[86]:
```
<seaborn.axisgrid.PairGrid at 0x1e5b2a7ed30>
```

In [88]:
```
sns.distplot(data['Turnover'])
```

```
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 function for histograms).
  warnings.warn(msg, FutureWarning)
```

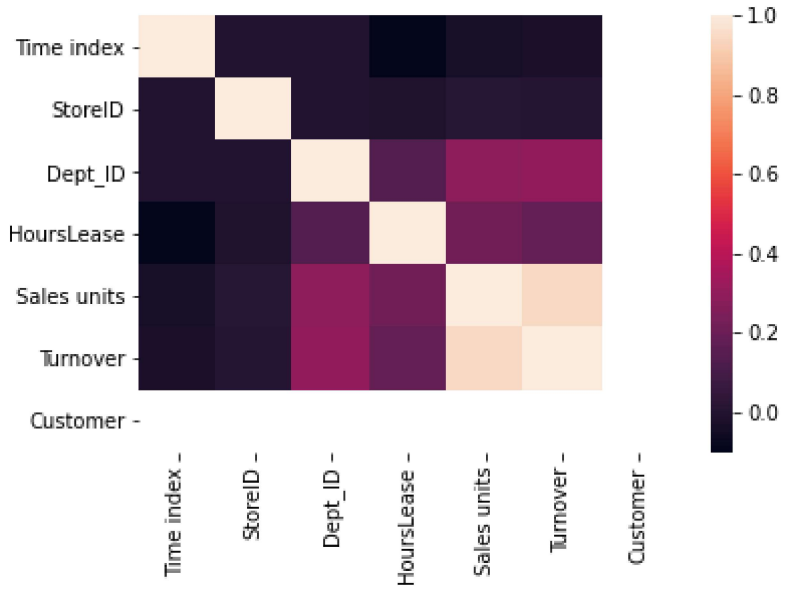
Out[88]: <AxesSubplot:xlabel='Turnover', ylabel='Density'>



In [95]:
```
df=data[['MonthYear', 'Time index', 'Country', 'StoreID', 'City', 'Dept_ID',
       'Dept. Name', 'HoursOwn', 'HoursLease', 'Sales units', 'Turnover',
       'Customer', 'Area (m2)', 'Opening hours']]
```

In [96]:
```
sns.heatmap(df.corr())
```

Out[96]: <AxesSubplot:>



MODEL TRAINNING

In [100]:
```
x=df[['MonthYear', 'Time index','StoreID', 'Dept_ID', 'HoursOwn', 'HoursLease',
       'Customer']]
y=df[['Turnover']]
```

In [101]:
```
#to split my dataset into trainning and test

from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
```

In [102]:
```
from sklearn.linear_model import LinearRegression

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

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-102-b0fd2c20cba9> in <module>
      2
      3 lr=LinearRegression()
----> 4 lr.fit(x_train,y_train)

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in fit
(self, X, y, sample_weight)
    516         accept_sparse = False if self.positive else ['csr', 'csc', 'co
o']
    517
--> 518         X, y = self._validate_data(X, y, accept_sparse=accept_sparse,
    519                                    y_numeric=True, multi_output=True)
    520

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py in _validate_data(se
lf, X, y, reset, validate_separately, **check_params)
    431                 y = check_array(y, **check_y_params)
    432             else:
--> 433                 X, y = check_X_y(X, y, **check_params)
    434             out = X, y
    435

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inner
_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in check
_X_y(X, y, accept_sparse, accept_large_sparse, dtype, order, copy, force_all_fi
nite, ensure_2d, allow_nd, multi_output, ensure_min_samples, ensure_min_feature
s, y_numeric, estimator)
    812         raise ValueError("y cannot be None")
    813
--> 814     X = check_array(X, accept_sparse=accept_sparse,
    815                     accept_large_sparse=accept_large_sparse,
    816                     dtype=dtype, order=order, copy=copy,

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inner
_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in check
```

```
_array(array, accept_sparse, accept_large_sparse, dtype, order, copy, force_all
_finite, ensure_2d, allow_nd, ensure_min_samples, ensure_min_features, estimato
r)
    614                     array = array.astype(dtype, casting="unsafe", copy=
False)
    615                 else:
--> 616                     array = np.asarray(array, order=order, dtype=dtype)
    617             except ComplexWarning as complex_warning:
    618                 raise ValueError("Complex data not supported\n"

C:\ProgramData\Anaconda3\lib\site-packages\numpy\core\_asarray.py in asarray(a,
dtype, order, like)
    100         return _asarray_with_like(a, dtype=dtype, order=order, like=lik
e)
    101
--> 102     return array(a, dtype, copy=False, order=order)
    103
    104

C:\ProgramData\Anaconda3\lib\site-packages\pandas\core\generic.py in __array__
(self, dtype)
   1897
   1898     def __array__(self, dtype=None) -> np.ndarray:
-> 1899         return np.asarray(self._values, dtype=dtype)
   1900
   1901     def __array_wrap__(

C:\ProgramData\Anaconda3\lib\site-packages\numpy\core\_asarray.py in asarray(a,
dtype, order, like)
    100         return _asarray_with_like(a, dtype=dtype, order=order, like=lik
e)
    101
--> 102     return array(a, dtype, copy=False, order=order)
    103
    104

ValueError: could not convert string to float: '- - - -'
```

In [77]:
```
#to find intercept
print(lr.intercept_)
```

```
[18.04819595]
```

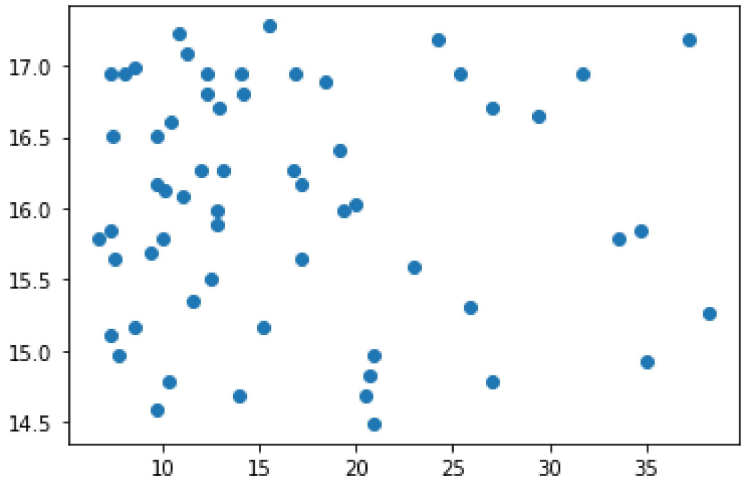
In [78]:
```
coeff = pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

Out[78]:

	Co-efficient
Age	-0.048056

In [79]:
```
prediction = lr.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[79]: <matplotlib.collections.PathCollection at 0x1e5b2a50910>



In [80]:
```
print(lr.score(x_test,y_test))
```

```
-0.022059454830758662
```