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main

Sales-forecasting-using-ML / Code_20211108.ipynb

deependra00001 Update Code_20211108.ipynb

1 contributor

2208 lines (2208 sloc) | 436 KB

In [218…

```
########## Import All common Library and Setting up folder
import os
import time
import sys
from datetime import datetime

# Data science common library
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
import random
import csv
import sqlite3


# Common folder for all raw data
Path_Raw_Data=r'C:\Users\HP\Desktop\Data Scientist\DB_Sample_Data\\'

#update the folder name
Path=r'C:\Users\HP\Desktop\Resume\Jobs Applied\DME\Python'
Path_Data=Path+'\\Data\\'

# Changing path to currrent folder
os.chdir(Path)

# Setting sqlite3 DB
db_sqlite3=sqlite3.connect(Path_Data+'Python.db')

print(datetime.now())
```

```
2021-11-09 01:42:19.152558
```

In [219…

```
########## Data Loading
print(datetime.now())

df_sales = pd.read_csv(Path_Data+'sales.csv',delimiter=',',quotechar='"'
                      #,dtype={'Store':str}
                      ,encoding='ISO-8859-1',low_memory=False
                     )
# write DFto DB as table
df_sales.to_sql('df_sales',db_sqlite3,if_exists='replace')

df_products = pd.read_csv(Path_Data+'products.csv',delimiter=',',quotechar
                      #,dtype={'Store':str}
                         #,parse_dates=["Date"]
                      ,encoding='ISO-8859-1',low_memory=False
                     )
# write DFto DB as table
df_products.to_sql('df_products',db_sqlite3,if_exists='replace')

df_price_changes = pd.read_csv(Path_Data+'price_changes.csv',delimiter=',
                      #,dtype={'Store':str}
                       #,parse_dates=["Date"]
                      ,encoding='ISO-8859-1',low_memory=False
                     )
# write DFto DB as table
df_price_changes.to_sql('df_price_changes',db_sqlite3,if_exists='replace'
```

```
'''
# reading from xls file
xls=pd.ExcelFile(Path_Data+'Test.xlsx')

Test=pd.read_excel(xls,'Sheet1',dtype={'custommerID':str})
# write DFto DB as table
Test.to_sql('Test',db_sqlite3,if_exists='replace')

'''
print(datetime.now())
```

```
2021-11-09 01:42:19.297554
2021-11-09 01:42:22.158354
```

Sneak Peek into the Data

Lets see how the tables look and get some basic information. i.e

- Data types
- No of Data (rows and column)
- Null Data
- few rows to understand the data

In [220…

```
print(datetime.now())

print('\n df_sales \n')
print(df_sales.info())
print('\n')
print(df_sales.head())
print('\n')
print('\n df_products \n')
print(df_products.info())
print('\n')
print(df_products.head())
print('\n')
print('\n df_price_changes \n')
print(df_price_changes.info())
print('\n')
print(df_price_changes.head())
print('\n')

print(datetime.now())
```

```
2021-11-09 01:42:22.202324

 df_sales

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 44167 entries, 0 to 44166
Data columns (total 13 columns):
ProductID                 44167 non-null object
Channel                   44167 non-null object
Country                   44167 non-null object
WeekKey                   44167 non-null int64
CSP                       44167 non-null float64
SalesVolume               44167 non-null int64
TotalStockVolume          44167 non-null int64
StoreStockVolume          44167 non-null int64
DepotStockVolume          44167 non-null int64
FutureCommitmentVolume    44167 non-null int64
```

```
IntakeVolume              44167 non-null int64
StoresWithStockCount      44167 non-null float64
StoresWithSalesCount      44167 non-null float64
dtypes: float64(3), int64(7), object(3)
memory usage: 4.4+ MB
None


  ProductID Channel Country  WeekKey     CSP  SalesVolume  TotalStockVolum
e  \
0  135fc45e  Stores       B   201502  18.984            3                3
9
1  1ff41410  Stores       A   201502  15.833            2
2
2  22125db2  Stores       B   201502  18.084            1
6
3  25e07883  Stores       B   201502  13.583            6
6
4  2729a59e  Stores       B   201502  14.483            8               11
7

   StoreStockVolume  DepotStockVolume  FutureCommitmentVolume  IntakeVolum
e  \
0                 6                33                       0
0
1                 2                 0                       0
0
2                 2                 3                       0
1
3                 2                 4                       0
0
4                 7                 8                     102
0

   StoresWithStockCount  StoresWithSalesCount
0               0.10100                0.0078
1               0.24100                0.0389
2               0.06220                0.0039
3               0.02328                0.0194
4               0.22930                0.0350
```

```
df_products
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9205 entries, 0 to 9204
Data columns (total 6 columns):
ProductID    9205 non-null object
Season       9205 non-null object
Group        9205 non-null object
SubGroup     9205 non-null object
Class        9205 non-null object
SubClass     9205 non-null object
dtypes: object(6)
memory usage: 431.6+ KB
None


  ProductID Season     Group  SubGroup     Class  SubClass
0  110e1664      L  606565a1  33de6bfe  57dedfae  e5db0621
1  11430072      L  bca94c97  44b005af  bb900370  fed6cf53
2  11660a96      L  606565a1  33de6bfe  8f5e4e2f  52fc415a
3  116e2878      L  26387251  14edd834  96d57a3c  62defb1f
```

```
4  1.19E+81      L  606565a1  33de6bfe  8f5e4e2f  52fc415a
```

```
df_price_changes
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25809 entries, 0 to 25808
Data columns (total 7 columns):
ProductID       25809 non-null object
WeekKey         25809 non-null int64
Channel         25809 non-null object
Country         25809 non-null object
OSP             25809 non-null float64
previous_CSP    25809 non-null float64
CSP             25809 non-null float64
dtypes: float64(3), int64(1), object(3)
memory usage: 1.4+ MB
None
```

```
  ProductID  WeekKey Channel Country     OSP  previous_CSP     CSP
0  100ba933   201603  Stores       B  18.084        18.084  14.033
1  100ba933   201609  Stores       B  18.084        14.033  12.683
2  101cfc62   201607  Stores       B  23.035        23.035  16.733
3  1021879c   201541  Online       B  13.583        14.483  13.583
4  10328ad7   201517  Online       B  15.383        15.383  13.133
```

```
2021-11-09 01:42:22.258289
```

looking into the data I come to the conclusion that we can group sales and product data based on the ProductID . Also we can check how Season affecting sales.

Analysis Datewise

let explore data based on the timeline

- lets Merge Feature tables and sales tables based on the date
- we will convert WeeklySales in Millions
- we will modify column as the day is holiday or not

In [221…

```
df_products["Season"]=df_products["Season"].apply(lambda x: 1 if x=='R' e
```

In [222…

```
data_sales = pd.merge(df_sales,df_products ,  how='left', on=["ProductID"
data_sales.drop(['ProductID','Group','SubGroup','Class','SubClass'],axis=
```

In [223…

```
data_Week = data_sales.groupby(["WeekKey"]).agg({

                                                ,"SalesVolume":"sum"
                                                ,"TotalStockVolume":"sum"
```

```
                                                    })
data_Week = data_Week.sort_index()
print(data_Week.describe())


data_Week.to_csv("data_Week.csv",index = True,quotechar='"'
                 ,quoting=csv.QUOTE_ALL)
```

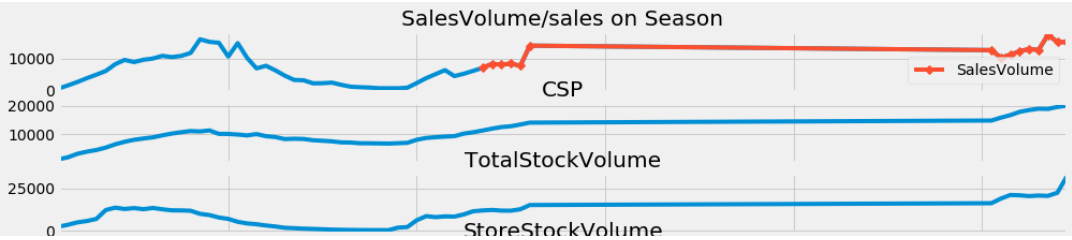
```
                CSP   SalesVolume  TotalStockVolume  StoreStockVolume  \
count     60.000000     60.000000         60.000000          60.00000
mean    9979.044267   7423.466667       9215.833333        4419.00000
std     4196.149938   4939.711501       7004.471171        3000.82021
min     1291.429000    444.000000        521.000000         470.00000
25%     7356.148500   2948.250000       2636.250000        1757.50000
50%     9280.880500   7403.000000       8645.000000        4245.00000
75%    11330.292000  10903.000000      12756.250000        6614.50000
max    19971.120000  17666.000000      31870.000000       10361.00000

       DepotStockVolume  FutureCommitmentVolume  IntakeVolume  \
count         60.000000               60.000000     60.000000
mean        2768.566667             1580.083333    448.183333
std         2896.016027             1404.710988    482.910614
min           21.000000                0.000000     -2.000000
25%          204.250000              312.000000      1.750000
50%         2517.500000             1192.000000    345.500000
75%         4204.500000             2640.250000    661.250000
max        17671.000000             4399.000000   2056.000000

       StoresWithStockCount  StoresWithSalesCount     Season
count             60.000000             60.000000  60.000000
mean             102.037767             33.457660   0.250000
std               49.753093             22.136072   0.436667
min               13.568130              1.695300   0.000000
25%               68.214669             13.381375   0.000000
50%              104.486240             34.413300   0.000000
75%              127.312806             52.694663   0.250000
max              219.972540             76.784150   1.000000
```

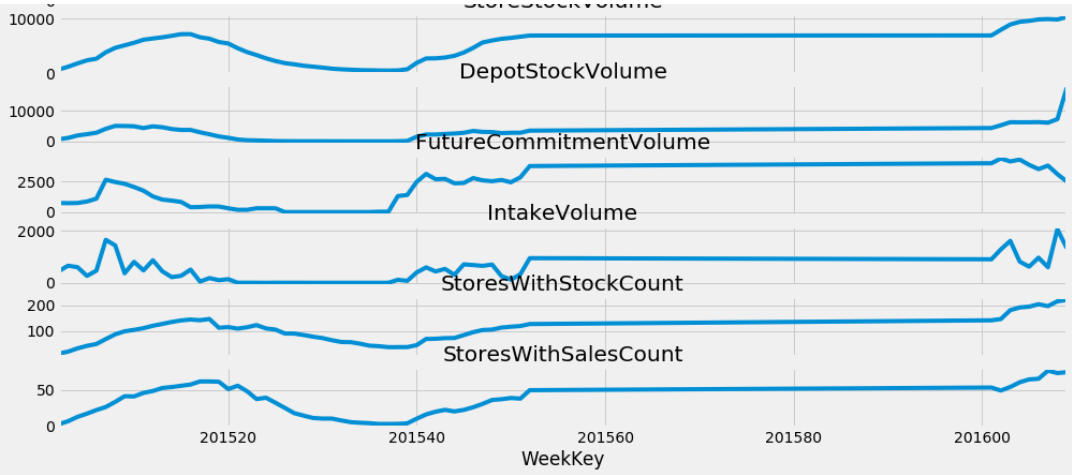
In [224…

```
plt.style.use('fivethirtyeight')
#plt.figure(figsize=(15,4))
fig, ax = plt.subplots(9,1,figsize=(15,10),sharex=True)
data_Week["SalesVolume"].plot(ax=ax[0],title="SalesVolume/sales on Season'
data_Week[data_Week.Season==1]["SalesVolume"].plot(marker="D",ax=ax[0],leg
data_Week["CSP"].plot(ax=ax[1], title="CSP")
data_Week["TotalStockVolume"].plot(ax=ax[2], title="TotalStockVolume")
data_Week["StoreStockVolume"].plot(ax=ax[3], title="StoreStockVolume")
data_Week["DepotStockVolume"].plot(ax=ax[4], title="DepotStockVolume")
data_Week["FutureCommitmentVolume"].plot(ax=ax[5], title="FutureCommitment
data_Week["IntakeVolume"].plot(ax=ax[6], title="IntakeVolume")
data_Week["StoresWithStockCount"].plot(ax=ax[7], title="StoresWithStockCou
data_Week["StoresWithSalesCount"].plot(ax=ax[8], title="StoresWithSalesCou
```

Out[224…

```
<matplotlib.axes._subplots.AxesSubplot at 0x1ccd07b7f08>
```



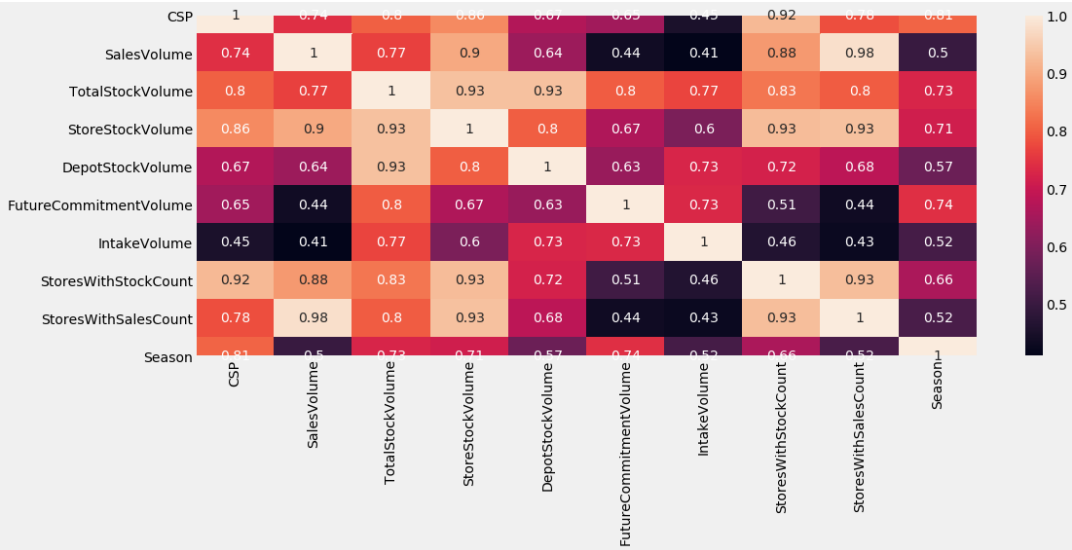


In [225…

```
plt.figure(figsize=(16,6))
sns.heatmap(data_Week.corr(),annot=True)
```

Out[225…

```
<matplotlib.axes._subplots.AxesSubplot at 0x1ccd022ad08>
```



In [226…

```
data_sales
```

Out[226…

	Channel	Country	WeekKey	CSP	SalesVolume	TotalStockVolume	StoreStock
0	Stores	B	201502	18.984	3	39	
1	Stores	A	201502	15.833	2	2	
2	Stores	B	201502	18.084	1	6	
3	Stores	B	201502	13.583	6	6	
4	Stores	B	201502	14.483	8	117	
...	...	...	...	...	...	...	
44162	Stores	A	201609	10.270	0	0	
44163	Stores	B	201609	10.207	0	0	
44164	Stores	B	201609	12.683	0	0	
44165	Online	B	201609	15.383	5	2	
44166	Stores	B	201609	15.383	15	14	

44167 rows × 13 columns

Analysis Channel Type, Country and Year/Week Wise

In [227…

```
#################### Export ByYear
print(datetime.now())

query ='''
SELECT
Channel
,Country
,substr(WeekKey,1,4) as year
,substr(WeekKey,5,2) as week
,max(Season) Season
,sum(SalesVolume) SalesVolume
,sum(FutureCommitmentVolume) FutureCommitmentVolume
FROM df_sales a

left join (
select
ProductID
,case when Season  ='R' then 1 else 0 end Season
from df_products
)b on a.ProductID=b.ProductID

group by
Channel
,Country
,substr(WeekKey,1,4)
,substr(WeekKey,5,2)

'''
data_sales_Channel_country=pd.read_sql(query,db_sqlite3)
print(data_sales_Channel_country)
data_sales_Channel_country.to_csv("data_sales_Channel_country.csv",index =
                 ,quoting=csv.QUOTE_ALL)

print(datetime.now())
```

```
2021-11-09 01:42:27.366762
    Channel Country  year week  Season  SalesVolume  FutureCommitmentVolum
e
0    Online       B  2015   02       0           45
2
1    Online       B  2015   03       0          132
2
2    Online       B  2015   04       0          208
2
3    Online       B  2015   05       0          279
2
4    Online       B  2015   06       0          384
0
..      ...     ...   ...  ...     ...          ...
...
175  Stores       B  2016   05       1        11509                     387
5
176  Stores       B  2016   06       1        11037                     352
5
```

```
177  Stores        B  2016   07        1         14784                     381
3
178  Stores        B  2016   08        1         13345                     311
0
179  Stores        B  2016   09        1         13196                     251
0

[180 rows x 7 columns]
2021-11-09 01:42:27.727537
```

Prediction on Date and Store

In [333…

```
>>> # explicitly require this experimental feature
>>> from sklearn.experimental import enable_iterative_imputer  # noqa
>>> # now you can import normally from sklearn.impute
>>> from sklearn.impute import IterativeImputer

from sklearn.metrics import mean_squared_error

from sklearn.svm import SVR, LinearSVR, NuSVR
from sklearn.linear_model import ElasticNet, Lasso, RidgeCV,LinearRegressi
from sklearn.kernel_ridge import KernelRidge
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import GradientBoostingRegressor,AdaBoostRegressor,
import xgboost as xgb
import lightgbm as lgb
```

Clean up and preprocessing

In [334…

```
def createdummies(data,cols):
    for col in cols:
        one_hot = pd.get_dummies(data[col],prefix=col)
        data = data.join(one_hot)
        data.drop(col,axis = 1,inplace=True)

    return data
```

In [349…

```
data_table=data_sales_Channel_country
data_table.to_csv("data_table.csv",index = True,quotechar='"'
                  ,quoting=csv.QUOTE_ALL)
```

In [336…

```
data_table
```

Out[336…

	Channel	Country	year	week	Season	SalesVolume	FutureCommitmentVolume
0	Online	B	2015	02	0	45	2
1	Online	B	2015	03	0	132	2
2	Online	B	2015	04	0	208	2
3	Online	B	2015	05	0	279	2
4	Online	B	2015	06	0	384	0
…	…	…	…	…	…	…	…
175	Stores	B	2016	05	1	11509	3875

176	Stores	B	2016	06	1	11037	3525
177	Stores	B	2016	07	1	14784	3813
178	Stores	B	2016	08	1	13345	3110
179	Stores	B	2016	09	1	13196	2510

180 rows × 7 columns

In [351…

```
#create dummies out of categorical column
data_table = createdummies(data_table,["Channel","Country","year","week"])
data_table.to_csv("data_table_Final.csv",index = True,quotechar='"'
                  ,quoting=csv.QUOTE_ALL)
```

In [338…

```
data_table.columns
```

Out[338…

```
Index(['Season', 'SalesVolume', 'FutureCommitmentVolume', 'Channel_Onlin
e',
       'Channel_Stores', 'Country_A', 'Country_B', 'year_2015', 'year_201
6',
       'week_01', 'week_02', 'week_03', 'week_04', 'week_05', 'week_06',
       'week_07', 'week_08', 'week_09', 'week_10', 'week_11', 'week_12',
       'week_13', 'week_14', 'week_15', 'week_16', 'week_17', 'week_18',
       'week_19', 'week_20', 'week_21', 'week_22', 'week_23', 'week_24',
       'week_25', 'week_26', 'week_27', 'week_28', 'week_29', 'week_30',
       'week_31', 'week_32', 'week_33', 'week_34', 'week_35', 'week_36',
       'week_37', 'week_38', 'week_39', 'week_40', 'week_41', 'week_42',
       'week_43', 'week_44', 'week_45', 'week_46', 'week_47', 'week_48',
       'week_49', 'week_50', 'week_51', 'week_52'],
      dtype='object')
```

Data Split

In [339…

```
data_train = data_table.query('(year_2016!="1") & (week_08!="1" | week_09
data_train= data_table
data_test = data_table.query('(year_2016=="1") & (week_08=="1" | week_09==
X = data_train.drop('SalesVolume', axis=1)
y = data_train['SalesVolume']
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
```

In [340…

```
data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 61 columns):
Season                    180 non-null int64
SalesVolume               180 non-null int64
FutureCommitmentVolume    180 non-null int64
Channel_Online            180 non-null uint8
Channel_Stores            180 non-null uint8
Country_A                 180 non-null uint8
Country_B                 180 non-null uint8
year_2015                 180 non-null uint8
year_2016                 180 non-null uint8
week_01                   180 non-null uint8
week_02                   180 non-null uint8
week_03                   180 non-null uint8
week_04                   180 non-null uint8
```

```
week_05                   180 non-null uint8
week_06                   180 non-null uint8
week_07                   180 non-null uint8
week_08                   180 non-null uint8
week_09                   180 non-null uint8
week_10                   180 non-null uint8
week_11                   180 non-null uint8
week_12                   180 non-null uint8
week_13                   180 non-null uint8
week_14                   180 non-null uint8
week_15                   180 non-null uint8
week_16                   180 non-null uint8
week_17                   180 non-null uint8
week_18                   180 non-null uint8
week_19                   180 non-null uint8
week_20                   180 non-null uint8
week_21                   180 non-null uint8
week_22                   180 non-null uint8
week_23                   180 non-null uint8
week_24                   180 non-null uint8
week_25                   180 non-null uint8
week_26                   180 non-null uint8
week_27                   180 non-null uint8
week_28                   180 non-null uint8
week_29                   180 non-null uint8
week_30                   180 non-null uint8
week_31                   180 non-null uint8
week_32                   180 non-null uint8
week_33                   180 non-null uint8
week_34                   180 non-null uint8
week_35                   180 non-null uint8
week_36                   180 non-null uint8
week_37                   180 non-null uint8
week_38                   180 non-null uint8
week_39                   180 non-null uint8
week_40                   180 non-null uint8
week_41                   180 non-null uint8
week_42                   180 non-null uint8
week_43                   180 non-null uint8
week_44                   180 non-null uint8
week_45                   180 non-null uint8
week_46                   180 non-null uint8
week_47                   180 non-null uint8
week_48                   180 non-null uint8
week_49                   180 non-null uint8
week_50                   180 non-null uint8
week_51                   180 non-null uint8
week_52                   180 non-null uint8
dtypes: int64(3), uint8(58)
memory usage: 14.5 KB
```

Basic Model Creation

In [341…

```
classifiers = [
    LinearRegression(),
    ElasticNet(),
    RidgeCV(alphas=[1e-3, 1e-2, 1e-1, 1]),
    KernelRidge(alpha=0.6, kernel='polynomial', degree=3, coef0=2.5),
    Lasso(alpha =16, random_state=100),
    ElasticNet(alpha=0.8),
    DecisionTreeRegressor(),
    RandomForestRegressor(),
    GradientBoostingRegressor(),
```

```
    AdaBoostRegressor(),
    SVR(),
    LinearSVR(),
    NuSVR(),
    xgb.XGBRegressor(),
    lgb.LGBMRegressor()
    ]

name = []
score = []
models = []
rmse = []
i = 0
for classifier in classifiers:
    classifier.fit(X_train, y_train)
    name.append(type(classifier).__name__)
    score.append(classifier.score(X_test, y_test))
    models.append(classifier)
    rmse.append(np.sqrt(mean_squared_error(classifier.predict(X_test), y_t
```

Comparing Model Performance

In [348…

```
df_score = pd.DataFrame(list(zip(name,rmse, score, models)),columns=['name
df_score.set_index('name',inplace=True)
df_score.sort_values(by=['score'],inplace=True)
df_score.to_csv("score.csv",index = True,quotechar='"'
                ,quoting=csv.QUOTE_ALL)
df_score
```

Out[348…

name	rmse	score	
KernelRidge	31586.158947	-79.351766	KernelRidge(alpha=0.6, coef0=2.5, de
SVR	3803.448528	-0.165083	SVR(C=1.0, cache_size=200, cc de
NuSVR	3561.267016	-0.021435	NuSVR(C=1.0, cache_size=200, cc
LinearRegression	3018.242312	0.266314	LinearRegression(copy_X=True, fit_interc
LinearSVR	2690.252394	0.417108	LinearSVR(C=1.0, dual=True, epsilon=(
Lasso	2567.442230	0.469112	Lasso(alpha=16, copy_X=True, fit_interce
ElasticNet	2277.462823	0.582262	ElasticNet(alpha=1.0, copy_X=True, fit_
ElasticNet	2251.474295	0.591741	ElasticNet(alpha=0.8, copy_X=True, fit_
RidgeCV	2152.322624	0.626907	RidgeCV(alphas=array([0.001, 0.01 ,
AdaBoostRegressor	1683.204637	0.771821	(DecisionTreeRegressor(criterion='mse', r
GradientBoostingRegressor	1444.722228	0.831899	([DecisionTreeRegressor(criterion='friedn
XGBRegressor	1310.913784	0.861596	XGBRegressor(base_sc booster='g
DecisionTreeRegressor	1269.305606	0.870242	DecisionTreeRegressor(criterio m
RandomForestRegressor	1242.806601	0.875603	(DecisionTreeRegressor(criterion='mse', r
			LGBMRegressor(boosting_type

LGBMRegressor	1236.522405	0.876858	LGBMRegressor(boosting_typ clas

Prediction

In [344…

```
data_test.drop(['SalesVolume'],axis=1,inplace=True)
```

In [346…

```
model = df_score.loc["LGBMRegressor","model"]
predict = model.predict(data_test)
predict
```

Out[346…

```
array([ 1155.29989784,  1155.29989784,  1198.29151967,  1198.29151967,
       10281.90941904, 10281.90941904])
```

In [352…

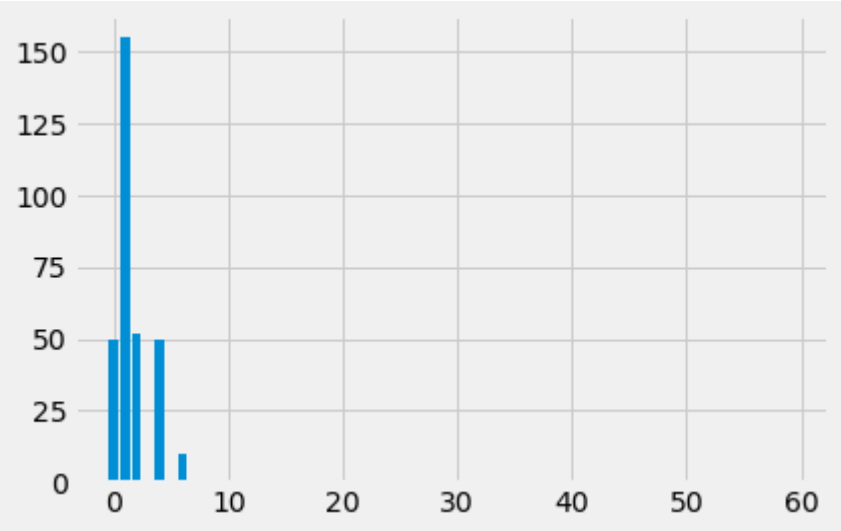
```
model.feature_importances_
```

Out[352…

```
array([ 50, 155,  52,   0,  50,   0,  10,   0,   0,   0,   0,   0,   0,
        0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
        0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
        0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
        0,   0,   0,   0,   0,   0,   0,   0])
```

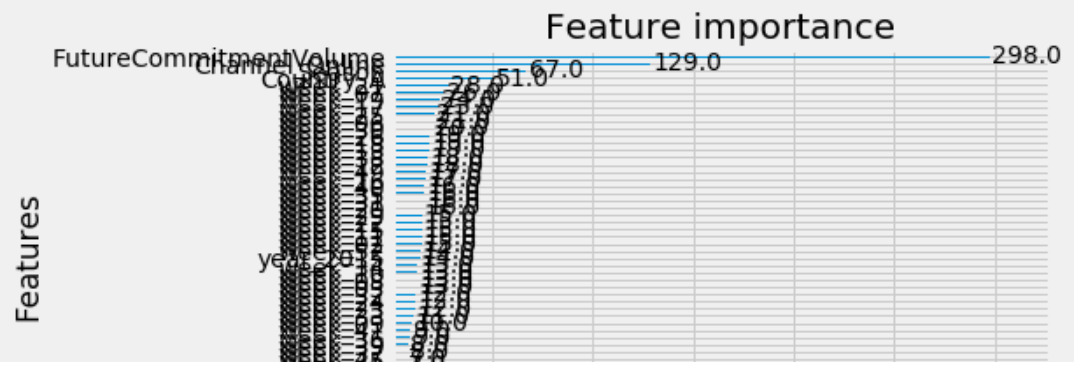
In [350…

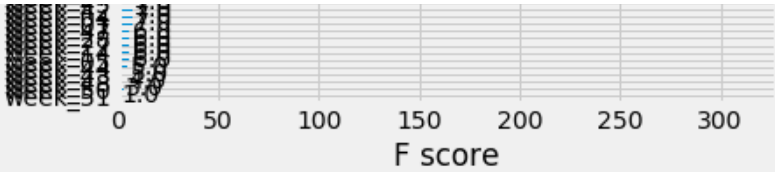
```
plt.bar(range(len(model.feature_importances_)), model.feature_importances_
plt.show()
```



In [326…

```
from xgboost import plot_importance
plot_importance(model)
plt.figure(figsize=(30,30))
plt.show()
```






```
<Figure size 2160x2160 with 0 Axes>
```

In [327…

```
plot_importance
```

Out[327…

```
<function xgboost.plotting.plot_importance(booster, ax=None, height=0.2, x
lim=None, ylim=None, title='Feature importance', xlabel='F score', ylabel
='Features', fmap='', importance_type='weight', max_num_features=None, gri
d=True, show_values=True, **kwargs)>
```

In [241…

```
data_test
```

Out[241…

	Season	FutureCommitmentVolume	Channel_Online	Channel_Stores	Country_A	C
56	1	2	1	0	0	
57	1	2	1	0	0	
58	1	3	1	0	0	
59	1	1	1	0	0	
116	1	0	0	1	1	
117	1	0	0	1	1	
118	1	0	0	1	1	
119	1	0	0	1	1	
176	1	3525	0	1	0	
177	1	3813	0	1	0	
178	1	3110	0	1	0	
179	1	2510	0	1	0	

12 rows × 60 columns

In [295…

```
##################### Pricing table
print(datetime.now())

db_sqlite3.execute("DROP TABLE IF EXISTS Pricing_trs")

query='''

CREATE TABLE Pricing_trs AS

select
a.ProductID
,a.WeekKey
,a.Channel
,a.Country
,a.OSP
,a.previous_CSP
,a.CSP
,c."Group"
```

```
,c.SubGroup
,c."Class"
,c.SubClass
,c.Season
-- ,d.WeekKey_Price_End
-- ,b.WeekKey as Sales_Week
,sum(b.SalesVolume) SalesVolume
from df_price_changes a

left join
(
select
ProductID
,WeekKey_Price_Start
,case when WeekKey_Price_End is null then '202101' else WeekKey_Price_End
from
(
select
ProductID
,WeekKey WeekKey_Price_Start
,LEAD (WeekKey) OVER (partition by ProductID ORDER BY WeekKey) AS WeekKey_
from df_price_changes a
group by
ProductID
,WeekKey
)a
) d on a.ProductID=d.ProductID and a.WeekKey =d.WeekKey_Price_Start

left join (
select
ProductID,WeekKey,Channel,Country
,sum(SalesVolume) SalesVolume
from df_sales
group by ProductID,WeekKey,Channel,Country
) b
on a.ProductID=b.ProductID
and b.WeekKey between a.WeekKey and d.WeekKey_Price_End
and a.Channel=b.Channel
and a.Country=b.Country

left join (

select
ProductID
,"Group"
,SubGroup
,"Class"
,SubClass
,case when Season  ='R' then 1 else 0 end Season
from df_products

)c on a.ProductID=c.ProductID

-- where a.ProductID='10516724'

group by

a.ProductID
,a.WeekKey
,a.Channel
,a.Country
,a.OSP
,a.previous_CSP
,a.CSP
,c."Group"
```

```
,c.SubGroup
,c."Class"
,c.SubClass
,c.Season

'''
db_sqlite3.execute(query)
print(datetime.now())
```

```
2021-11-09 08:52:56.518722
2021-11-09 08:52:58.661320
```

In [300…

```
##################### Export ByYear
print(datetime.now())

query ='''

select
a.*
,case when SalesVolume  >=1 then 'Won' else 'Not Won' end Won_Not_Won
,case
when SalesVolume  between 1 and 10 then 'Up to 10 coversion'
when SalesVolume  between 11 and 25 then '11 to 25 coversion'
when SalesVolume  between 26 and 50 then '26 to 50 coversion'
when SalesVolume  > 50 then '50+ coversion'
end as coversion
from Pricing_trs a

'''
price_changes=pd.read_sql(query,db_sqlite3)
print(price_changes)
price_changes.to_csv("price_changes_SQL.csv",index = False,quotechar='"'
                 ,quoting=csv.QUOTE_ALL)

print(datetime.now())
```

```
2021-11-09 09:25:22.340168
      ProductID  WeekKey Channel Country     OSP  previous_CSP     CSP  \
0      1.19E+81   201522  Online       B  12.683        12.683  11.782
1      1.82E+08   201526  Stores       A  11.670        11.670  10.824
2      1.82E+08   201526  Stores       B  11.332        11.332  10.657
3      1.82E+08   201546  Stores       A  11.670        10.824  10.261
4      1.82E+08   201546  Stores       B  11.332        10.657  10.207
...         ...      ...     ...     ...     ...           ...     ...
25804  ffdebf6c   201523  Stores       B  15.383        11.332  12.683
25805  ffdebf6c   201524  Stores       B  15.383        12.683  11.332
25806  ffe6e191   201524  Online       B  16.283        16.283  13.133
25807  fff06c1d   201521  Online       B  14.483        14.483  12.232
25808  fff06c1d   201522  Online       B  14.483        12.232  11.782

          Group  SubGroup     Class  SubClass  Season  SalesVolume  \
0      606565a1  33de6bfe  8f5e4e2f  52fc415a       0          NaN
1      606565a1  9d3d7fe0  7432d9ca  b37e83f9       0          NaN
2      606565a1  9d3d7fe0  7432d9ca  b37e83f9       0          NaN
3      606565a1  9d3d7fe0  7432d9ca  b37e83f9       0          NaN
4      606565a1  9d3d7fe0  7432d9ca  b37e83f9       0          NaN
...         ...       ...       ...       ...     ...          ...
25804  bca94c97  44b005af  4a5b1ef4  788e1264       0          NaN
25805  bca94c97  44b005af  4a5b1ef4  788e1264       0          NaN
25806  26387251  14edd834  96d57a3c  4e83142f       0         59.0
25807  bca94c97  8f7078c4  27441678  d09982e0       0          NaN
25808  bca94c97  8f7078c4  27441678  d09982e0       0          NaN
```

```
      Won_Not_Won      coversion
0         Not Won           None
1         Not Won           None
2         Not Won           None
3         Not Won           None
4         Not Won           None
...           ...            ...
25804     Not Won           None
25805     Not Won           None
25806         Won  50+ coversion
25807     Not Won           None
25808     Not Won           None

[25809 rows x 15 columns]
2021-11-09 09:25:22.874839
```

In [282…

```
##################### Export ByYear
print(datetime.now())

query ='''

select
ProductID,WeekKey,Channel,Country
,sum(SalesVolume) SalesVolume
from df_sales
group by ProductID,WeekKey,Channel,Country

'''
price_changes=pd.read_sql(query,db_sqlite3)
print(price_changes)
price_changes.to_csv("price_changes_SQL1.csv",index = False,quotechar='"'
                 ,quoting=csv.QUOTE_ALL)

print(datetime.now())
```

```
2021-11-09 03:19:24.268057
      ProductID  WeekKey Channel Country  SalesVolume
0      10516724   201515  Stores       A            2
1      10516724   201515  Stores       B           17
2      10516724   201516  Online       B            1
3      10516724   201516  Stores       A            4
4      10516724   201516  Stores       B           29
...         ...      ...     ...     ...          ...
44162  fffd6ecd   201605  Stores       B           29
44163  fffd6ecd   201606  Stores       B           28
44164  fffd6ecd   201607  Stores       B           20
44165  fffd6ecd   201608  Stores       B           16
44166  fffd6ecd   201609  Stores       B           15

[44167 rows x 5 columns]
2021-11-09 03:19:24.764748
```

In [ ]: