

untitled9-1

July 16, 2025

Coffee Sales

```
[2]: import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
from sklearn.preprocessing import StandardScaler
from sklearn.ensemble import RandomForestRegressor
import random
import os
from tqdm.notebook import tqdm

pd.options.display.float_format = '{:,.5f}'.format
pd.options.display.max_rows = None
import warnings
warnings.filterwarnings('ignore')
```

```
[6]: data = pd.read_csv('index.csv')
```

```
[170]: data.head()
```

```
[170]:
```

	date	datetime	cash_type	card	\
0	2024-03-01	2024-03-01 10:15:50.520	card	ANON-0000-0000-0001	
1	2024-03-01	2024-03-01 12:19:22.539	card	ANON-0000-0000-0002	
2	2024-03-01	2024-03-01 12:20:18.089	card	ANON-0000-0000-0002	
3	2024-03-01	2024-03-01 13:46:33.006	card	ANON-0000-0000-0003	
4	2024-03-01	2024-03-01 13:48:14.626	card	ANON-0000-0000-0004	

	money	coffee_name
0	38.70000	Latte
1	38.70000	Hot Chocolate
2	38.70000	Hot Chocolate
3	28.90000	Americano

4 38.70000 Latte

```
[6]: # Handling missing value
data.isnull().sum()
```

```
[6]: date          0
datetime        0
cash_type       0
card           89
money           0
coffee_name     0
dtype: int64
```

```
[133]: data.duplicated().sum()
```

```
[133]: 0
```

```
[135]: data.describe().T
```

```
[135]:
```

	count	mean	std	min	25%	50%	75%	max
money	1133.00000	33.10581	5.03537	18.12000	28.90000	32.82000	37.72000	40.00000

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1133 entries, 0 to 1132
Data columns (total 6 columns):
#   Column          Non-Null Count  Dtype
---  -
0   date            1133 non-null  object
1   datetime        1133 non-null  object
2   cash_type       1133 non-null  object
3   card            1044 non-null  object
4   money           1133 non-null  float64
5   coffee_name     1133 non-null  object
dtypes: float64(1), object(5)
memory usage: 53.2+ KB
```

```
[137]: data.loc[:,['cash_type','card','coffee_name']].describe().T
```

```
[137]:
```

	count	unique	top	freq
cash_type	1133	2	card	1044
card	1044	446	ANON-0000-0000-0012	88
coffee_name	1133	8	Americano with Milk	268

```
[ ]: # There are 1133 transactions in the data
# 89 missing value in the column card
```

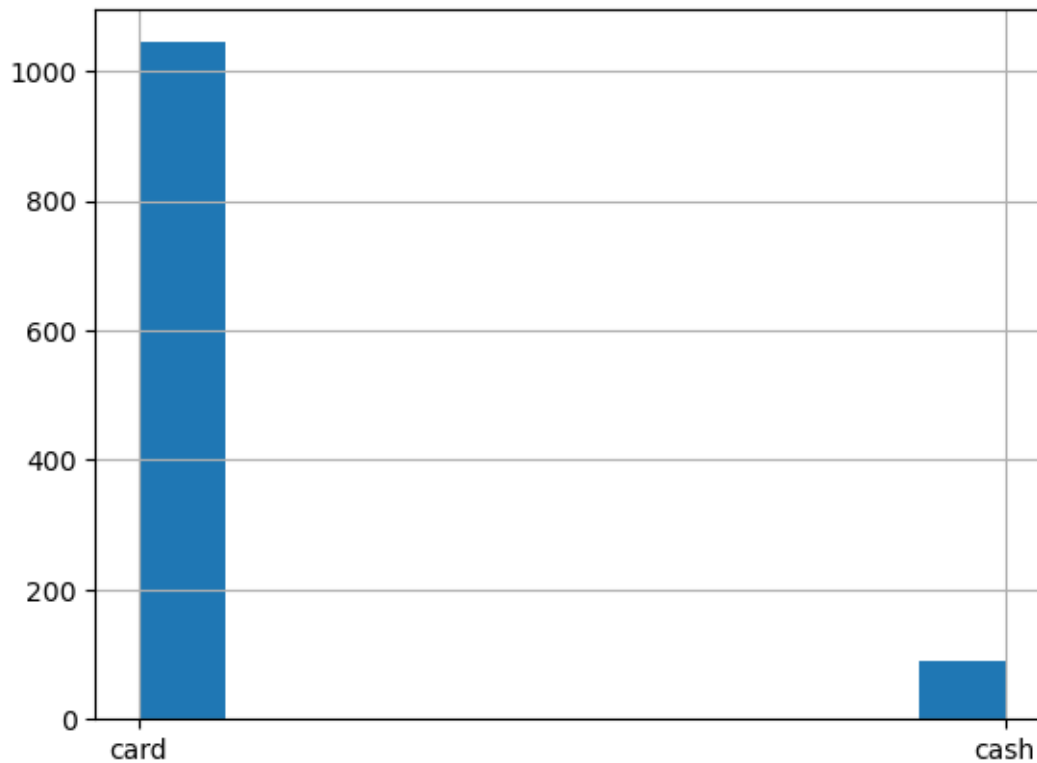
```
# No duplicates
# 2 unique values of cash_type
# 8 different coffee types with Americano with milk is the most popular product
```

```
[8]: # fill the missing values categorical column card with mode
data['card'].fillna(data['card'].mode()[0], inplace=True)
```

0.0.1 Exploratory Data Analysis

```
[95]: # all the transaction with null 'card' information from cash users
data['cash_type'].hist()
```

[95]: <Axes: >



```
[97]: # 92% of the transaction from cash card users
# 8% of the transaction from cash users
data['cash_type'].value_counts(normalize=True)
```

```
[97]: cash_type
card    0.92145
cash    0.07855
Name: proportion, dtype: float64
```

```
[99]: # Americano with milk and Latte are our most popular coffee product. In the
      ↪second tier are Cappuccino
      # Americano, Hot Chocolate and Cocoa are less popular

pd.DataFrame(data['coffee_name'].value_counts(normalize=True).
      ↪sort_values(ascending=False).round(4)*100)
```

```
[99]:
```

	proportion
coffee_name	
Americano with Milk	23.65000
Latte	21.45000
Cappuccino	17.30000
Americano	14.92000
Cortado	8.74000
Hot Chocolate	6.53000
Espresso	4.32000
Cocoa	3.09000

```
[14]: # Convert date and datetime to datetime format
data['date'] = pd.to_datetime(data['date'])
data['datetime'] = pd.to_datetime(data['datetime'])

# Creat column of Month, Weekdays, and Hour
# Feature Engineering
data['year'] = data['date'].dt.strftime('%Y-%m')
data['day'] = data['date'].dt.strftime('%w')
data['hour'] = data['date'].dt.strftime('%H')
```

```
[16]: data.head(2)
```

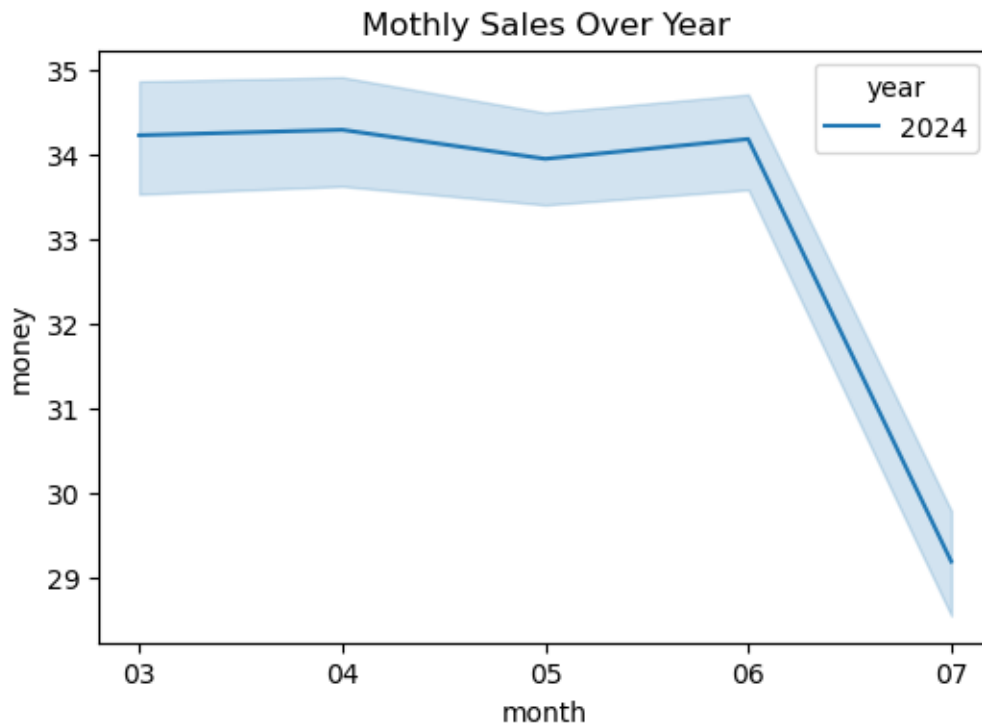
```
[16]:
```

	date	datetime	cash_type	card	money \
0	2024-03-01	2024-03-01 10:15:50.520	card	ANON-0000-0000-0001	38.70000
1	2024-03-01	2024-03-01 12:19:22.539	card	ANON-0000-0000-0002	38.70000

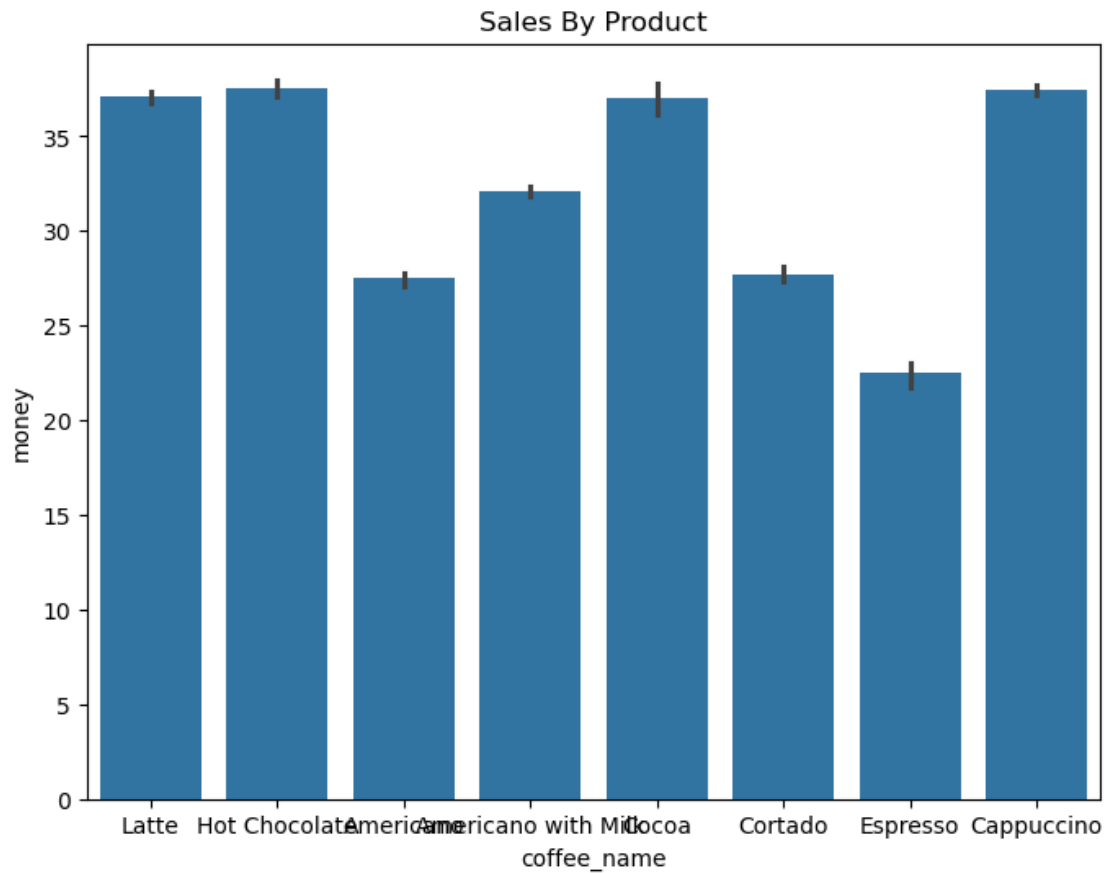
	coffee_name	year	day	hour	month
0	Latte	2024-03	5	00	03
1	Hot Chocolate	2024-03	5	00	03

```
[143]: # drop the original column
data.drop(columns=['date', 'datetime'], inplace=True)
```

```
[31]: plt.figure(figsize=(6,4))
sns.lineplot(data=data, x='month', y='money', hue='year')
plt.title('Monthly Sales Over Year')
plt.show()
```



```
[57]: # Sales By Product
plt.figure(figsize=(8,6))
sns.barplot(data=data,x='coffee_name',y='money')
plt.title('Sales By Product')
plt.show()
```



0.0.2 Machine Learning Modeling

```
[107]: # Define feature and target variable
X = data.drop('money',axis=1)
y = data['money']
```

```
[121]: data.head(2)
```

```
[121]:
```

	cash_type_cash	card_ANON-0000-0000-0002	card_ANON-0000-0000-0003	\
0	False	False	False	
1	False	True	False	

	card_ANON-0000-0000-0004	card_ANON-0000-0000-0005	\
0	False	False	
1	False	False	

	card_ANON-0000-0000-0006	card_ANON-0000-0000-0007	\
0	False	False	
1	False	False	

	card_ANON-0000-0000-0008	card_ANON-0000-0000-0009	\
0	False	False	
1	False	False	

	card_ANON-0000-0000-0010	...	day_1	day_2	day_3	day_4	day_5	day_6	\
0	False	...	False	False	False	False	True	False	
1	False	...	False	False	False	False	True	False	

	month_04	month_05	month_06	month_07
0	False	False	False	False
1	False	False	False	False

[2 rows x 463 columns]

```
[145]: data = pd.
        ↪get_dummies(data,columns=['cash_type','card','coffee_name'],drop_first=True)
```

```
[147]: X = data.drop('money',axis=1)
        y = data['money']
```

```
[149]: # Split the data training and test data
        X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.
        ↪2,random_state=42)
```

```
[117]: # Initelize the model
        model = LinearRegression()
```

```
[151]: # Train the model
        model.fit(X_train,y_train)
```

```
[151]: LinearRegression()
```

```
[153]: # Make prediction
        y_pred = model.predict(X_test)
```

```
[155]: y_pred
```

```
[155]: array([ 3.79405518e+01,  3.28218994e+01,  3.75185547e+01,  2.71915283e+01,
                2.66428223e+01,  2.92028809e+01,  3.30471191e+01,  2.92207031e+01,
                2.79117432e+01,  3.75292969e+01,  3.65764160e+01,  2.86809082e+01,
                3.76237793e+01,  2.66025391e+01,  2.55979004e+01,  3.56304932e+01,
                3.15101318e+01,  3.56802979e+01,  3.52753906e+01,  3.75887451e+01,
                1.30771130e+11,  2.82004395e+01,  3.28221436e+01,  4.02479455e+11,
                3.83923340e+01,  3.87246094e+01, -1.56296455e+11,  2.82004395e+01,
                2.83170166e+01, -8.64612528e+10,  3.31660156e+01,  3.25977783e+01,
                3.15092773e+01,  3.81118164e+01,  3.77796631e+01, -2.05753681e+11,
```

3.56113281e+01,	3.28175049e+01,	3.64906006e+01,	3.83547363e+01,
3.82912598e+01,	3.76363525e+01,	2.89211426e+01,	2.78796387e+01,
3.73704834e+01,	3.09212646e+01,	-8.64612528e+10,	3.76451416e+01,
3.01501465e+01,	3.18013916e+01,	3.34548340e+01,	3.28508301e+01,
2.92387695e+01,	3.86282959e+01,	3.65797119e+01,	3.46113281e+01,
2.79222412e+01,	3.56271973e+01,	3.94807129e+01,	3.64252930e+01,
2.89211426e+01,	3.26047363e+01,	3.45462646e+01,	3.76215820e+01,
3.59667969e+01,	3.30573730e+01,	3.81009521e+01,	2.71904297e+01,
3.85955811e+01,	3.76248779e+01,	2.25764160e+01,	3.86522217e+01,
3.87330322e+01,	3.29495850e+01,	2.77081299e+01,	3.99610596e+01,
2.91567383e+01,	3.62435303e+01,	2.66362305e+01,	2.99150391e+01,
3.33542480e+01,	-1.54759707e+11,	2.96302490e+01,	3.52709961e+01,
3.14425049e+01,	2.51757812e+01,	2.83972168e+01,	3.96302490e+01,
5.57623186e+10,	3.36099854e+01,	3.38251953e+01,	3.66148682e+01,
3.36055908e+01,	2.91005859e+01,	2.20452881e+01,	3.83137207e+01,
3.86933594e+01,	3.49155273e+01,	3.28658447e+01,	3.39415283e+01,
3.15112305e+01,	3.46124268e+01,	2.86159668e+01,	3.96077881e+01,
3.29075928e+01,	4.06326904e+01,	2.71904297e+01,	2.24630127e+01,
3.56304932e+01,	3.21602783e+01,	3.09223633e+01,	3.64862061e+01,
3.67167969e+01,	3.56047363e+01,	3.75249023e+01,	3.15932617e+01,
2.30196533e+01,	3.28243408e+01,	4.06113281e+01,	3.85501709e+01,
9.25669740e+09,	3.36099854e+01,	3.77181396e+01,	3.30819092e+01,
3.85966797e+01,	3.79702148e+01,	3.85360107e+01,	2.79222412e+01,
3.05013428e+01,	3.76451416e+01,	2.83325195e+01,	2.82165527e+01,
3.33542480e+01,	3.29648438e+01,	3.76193848e+01,	3.06392822e+01,
2.72877197e+01,	3.85966797e+01,	3.75495605e+01,	3.85966797e+01,
2.88723145e+01,	3.25126953e+01,	3.78569336e+01,	3.81267090e+01,
4.06157227e+01,	3.27578125e+01,	2.92398682e+01,	2.87399902e+01,
3.25344238e+01,	3.40594482e+01,	2.85174561e+01,	-3.01616773e+11,
3.25115967e+01,	3.79727783e+01,	3.31165771e+01,	4.06124268e+01,
2.79266357e+01,	2.72877197e+01,	2.79437256e+01,	3.52709961e+01,
3.30819092e+01,	3.76429443e+01,	3.25170898e+01,	2.82004395e+01,
3.29337158e+01,	3.56326904e+01,	3.29381104e+01,	3.29381104e+01,
3.71124268e+01,	3.52092285e+01,	3.66126709e+01,	3.38377686e+01,
2.72899170e+01,	3.59289551e+01,	3.82569580e+01,	3.56326904e+01,
3.23956299e+01,	3.62778320e+01,	3.66829834e+01,	3.62001953e+01,
2.87779541e+01,	3.45306396e+01,	3.19248047e+01,	-5.01474666e+11,
2.86273193e+01,	2.69564209e+01,	2.81971436e+01,	3.48909912e+01,
2.85843506e+01,	3.86315918e+01,	3.66181641e+01,	2.92990723e+01,
3.77327881e+01,	3.29370117e+01,	3.09223633e+01,	3.15943604e+01,
3.19270020e+01,	3.79449463e+01,	3.34548340e+01,	3.20086670e+01,
3.76473389e+01,	3.87702473e+11,	3.15910645e+01,	2.76103516e+01,
3.92343750e+01,	3.79261475e+01,	3.61958008e+01,	3.26021729e+01,
2.54549561e+01,	1.96263287e+11,	3.74874268e+01,	3.77045898e+01,
3.79459229e+01,	2.66003418e+01,	3.26043701e+01,	2.82944336e+01,
3.86260986e+01,	3.23458252e+01,	3.78352051e+01,	3.82967529e+01,
3.56080322e+01,	2.66058350e+01,	-2.14944471e+11,	2.00328369e+01,


```
3.60031738e+01, 3.85999756e+01, 3.78352051e+01])
```

```
[157]: # Evaluate the model
mse = mean_squared_error(y_test,y_pred)
r2 = r2_score(y_test,y_pred)
```

```
[159]: print(f"Mean Squared Error: {mse}")
print(f"R^2 Score: {r2}")
```

Mean Squared Error: 3.81248402804609e+21

R^2 Score: -2.047908952881462e+20

###Model Interpretation and Conclusion

```
[162]: coefficients = pd.DataFrame(model.coef_, X.columns,columns=['Coefficient'])
print(coefficients)
```

	Coefficient
year	-325004108.11365
day	-0.00109
hour	6469771735509.40137
month	-1.00676
cash_type_cash	1.39725
card_ANON-0000-0000-0002	-0.89877
card_ANON-0000-0000-0003	-0.32260
card_ANON-0000-0000-0004	-0.58948
card_ANON-0000-0000-0005	-1.16633
card_ANON-0000-0000-0006	-0.85514
card_ANON-0000-0000-0007	-1.18658
card_ANON-0000-0000-0008	-1.21222
card_ANON-0000-0000-0009	-0.33378
card_ANON-0000-0000-0010	-0.71188
card_ANON-0000-0000-0011	-1.10313
card_ANON-0000-0000-0012	-0.41992
card_ANON-0000-0000-0013	-0.76532
card_ANON-0000-0000-0014	-1.16175
card_ANON-0000-0000-0015	-0.96684
card_ANON-0000-0000-0016	-0.79803
card_ANON-0000-0000-0017	-0.68134
card_ANON-0000-0000-0018	-205753681527.84271
card_ANON-0000-0000-0019	-0.66137
card_ANON-0000-0000-0020	-1.10095
card_ANON-0000-0000-0021	-0.97962
card_ANON-0000-0000-0022	-154759707019.71988
card_ANON-0000-0000-0023	-0.94687
card_ANON-0000-0000-0024	-0.48781
card_ANON-0000-0000-0025	-0.17798
card_ANON-0000-0000-0026	-1.29403

card_ANON-0000-0000-0027	-0.89381
card_ANON-0000-0000-0028	-0.88296
card_ANON-0000-0000-0029	-0.93295
card_ANON-0000-0000-0030	-0.88604
card_ANON-0000-0000-0031	-0.89912
card_ANON-0000-0000-0032	-0.74287
card_ANON-0000-0000-0033	-0.40101
card_ANON-0000-0000-0034	-0.94140
card_ANON-0000-0000-0035	-0.99433
card_ANON-0000-0000-0036	387702473325.47742
card_ANON-0000-0000-0037	9256697358.34624
card_ANON-0000-0000-0038	-0.46723
card_ANON-0000-0000-0039	-0.67186
card_ANON-0000-0000-0040	-0.39709
card_ANON-0000-0000-0041	-214944471031.27359
card_ANON-0000-0000-0042	1.05815
card_ANON-0000-0000-0043	-0.83346
card_ANON-0000-0000-0044	-0.89265
card_ANON-0000-0000-0045	-0.49358
card_ANON-0000-0000-0046	-0.87328
card_ANON-0000-0000-0047	-0.94524
card_ANON-0000-0000-0048	-86461252830.80141
card_ANON-0000-0000-0049	-0.55925
card_ANON-0000-0000-0050	-0.70490
card_ANON-0000-0000-0051	-0.72421
card_ANON-0000-0000-0052	130771129929.76010
card_ANON-0000-0000-0053	-0.48045
card_ANON-0000-0000-0054	-0.48107
card_ANON-0000-0000-0055	-1.04525
card_ANON-0000-0000-0056	-1.15657
card_ANON-0000-0000-0057	-0.46004
card_ANON-0000-0000-0058	0.42331
card_ANON-0000-0000-0059	-1.78123
card_ANON-0000-0000-0060	-0.86916
card_ANON-0000-0000-0061	-0.91168
card_ANON-0000-0000-0062	-1.04893
card_ANON-0000-0000-0063	-0.79702
card_ANON-0000-0000-0064	0.25304
card_ANON-0000-0000-0065	-0.94281
card_ANON-0000-0000-0066	-501474665878.34143
card_ANON-0000-0000-0067	-301616772731.67847
card_ANON-0000-0000-0068	-0.92027
card_ANON-0000-0000-0069	-0.15117
card_ANON-0000-0000-0070	-1.16962
card_ANON-0000-0000-0071	-1.16236
card_ANON-0000-0000-0072	402479454607.62097
card_ANON-0000-0000-0073	-1.12806
card_ANON-0000-0000-0074	-1.26192

card_ANON-0000-0000-0075	-1.11295
card_ANON-0000-0000-0076	-1.01572
card_ANON-0000-0000-0077	-1.13432
card_ANON-0000-0000-0078	196263286715.18356
card_ANON-0000-0000-0079	-0.96796
card_ANON-0000-0000-0080	55762318519.51040
card_ANON-0000-0000-0081	-0.39328
card_ANON-0000-0000-0082	-1.14921
card_ANON-0000-0000-0083	-0.90120
card_ANON-0000-0000-0084	-0.80113
card_ANON-0000-0000-0085	-0.34711
card_ANON-0000-0000-0086	-0.89329
card_ANON-0000-0000-0087	-0.95189
card_ANON-0000-0000-0088	-0.94344
card_ANON-0000-0000-0089	-0.93958
card_ANON-0000-0000-0090	0.04771
card_ANON-0000-0000-0091	0.06392
card_ANON-0000-0000-0092	0.09125
card_ANON-0000-0000-0093	0.03247
card_ANON-0000-0000-0094	0.26928
card_ANON-0000-0000-0095	0.30028
card_ANON-0000-0000-0096	0.25595
card_ANON-0000-0000-0097	-0.41797
card_ANON-0000-0000-0098	0.08920
card_ANON-0000-0000-0099	-0.27126
card_ANON-0000-0000-0100	0.50045
card_ANON-0000-0000-0101	0.11469
card_ANON-0000-0000-0102	-0.17813
card_ANON-0000-0000-0103	0.03757
card_ANON-0000-0000-0104	0.02082
card_ANON-0000-0000-0105	0.30386
card_ANON-0000-0000-0106	0.04390
card_ANON-0000-0000-0107	0.08347
card_ANON-0000-0000-0108	-156296454905.95850
card_ANON-0000-0000-0109	0.03046
card_ANON-0000-0000-0110	0.29225
card_ANON-0000-0000-0111	0.08717
card_ANON-0000-0000-0112	0.08592
card_ANON-0000-0000-0113	0.02614
card_ANON-0000-0000-0114	0.23786
card_ANON-0000-0000-0115	0.06214
card_ANON-0000-0000-0116	-0.14931
card_ANON-0000-0000-0117	-0.29474
card_ANON-0000-0000-0118	0.20624
card_ANON-0000-0000-0119	0.52673
card_ANON-0000-0000-0120	0.05247
card_ANON-0000-0000-0121	0.25140
card_ANON-0000-0000-0122	-0.13435

card_ANON-0000-0000-0123	0.08341
card_ANON-0000-0000-0124	0.06471
card_ANON-0000-0000-0125	-0.11307
card_ANON-0000-0000-0126	-1.10334
card_ANON-0000-0000-0127	-0.90604
card_ANON-0000-0000-0128	-0.88558
card_ANON-0000-0000-0129	-1.14118
card_ANON-0000-0000-0130	-1.13266
card_ANON-0000-0000-0131	-1.12502
card_ANON-0000-0000-0132	-0.00000
card_ANON-0000-0000-0133	-0.10381
card_ANON-0000-0000-0134	-0.15663
card_ANON-0000-0000-0135	-0.00000
card_ANON-0000-0000-0136	-0.89311
card_ANON-0000-0000-0137	-0.90695
card_ANON-0000-0000-0138	-0.71513
card_ANON-0000-0000-0139	-0.68009
card_ANON-0000-0000-0140	-0.94945
card_ANON-0000-0000-0141	0.32013
card_ANON-0000-0000-0142	-0.99298
card_ANON-0000-0000-0143	0.60404
card_ANON-0000-0000-0144	0.07672
card_ANON-0000-0000-0145	0.09762
card_ANON-0000-0000-0146	0.12659
card_ANON-0000-0000-0147	-0.00000
card_ANON-0000-0000-0148	0.14528
card_ANON-0000-0000-0149	-0.12770
card_ANON-0000-0000-0150	0.28911
card_ANON-0000-0000-0151	0.05836
card_ANON-0000-0000-0152	0.31007
card_ANON-0000-0000-0153	-0.05634
card_ANON-0000-0000-0154	0.89085
card_ANON-0000-0000-0155	0.00000
card_ANON-0000-0000-0156	0.21471
card_ANON-0000-0000-0157	0.32572
card_ANON-0000-0000-0158	0.11879
card_ANON-0000-0000-0159	0.13641
card_ANON-0000-0000-0160	0.06682
card_ANON-0000-0000-0161	0.29432
card_ANON-0000-0000-0162	-0.14156
card_ANON-0000-0000-0163	-0.14816
card_ANON-0000-0000-0164	0.41771
card_ANON-0000-0000-0165	0.08010
card_ANON-0000-0000-0166	-0.02887
card_ANON-0000-0000-0167	0.11557
card_ANON-0000-0000-0168	0.10014
card_ANON-0000-0000-0169	0.28452
card_ANON-0000-0000-0170	0.55501

card_ANON-0000-0000-0171	0.07419
card_ANON-0000-0000-0172	-0.08293
card_ANON-0000-0000-0173	-0.00000
card_ANON-0000-0000-0174	0.15513
card_ANON-0000-0000-0175	0.12851
card_ANON-0000-0000-0176	0.09525
card_ANON-0000-0000-0177	-1.19985
card_ANON-0000-0000-0178	0.11306
card_ANON-0000-0000-0179	-2.72837
card_ANON-0000-0000-0180	0.47733
card_ANON-0000-0000-0181	-0.07684
card_ANON-0000-0000-0182	0.28469
card_ANON-0000-0000-0183	0.05376
card_ANON-0000-0000-0184	0.00000
card_ANON-0000-0000-0185	-0.14461
card_ANON-0000-0000-0186	0.10905
card_ANON-0000-0000-0187	-0.00000
card_ANON-0000-0000-0188	0.04426
card_ANON-0000-0000-0189	0.03828
card_ANON-0000-0000-0190	-0.00000
card_ANON-0000-0000-0191	0.48801
card_ANON-0000-0000-0192	0.59073
card_ANON-0000-0000-0193	0.08532
card_ANON-0000-0000-0194	-1.55725
card_ANON-0000-0000-0195	0.26127
card_ANON-0000-0000-0196	0.09032
card_ANON-0000-0000-0197	-1.34933
card_ANON-0000-0000-0198	-0.00000
card_ANON-0000-0000-0199	0.00000
card_ANON-0000-0000-0200	0.07936
card_ANON-0000-0000-0201	0.06642
card_ANON-0000-0000-0202	0.57651
card_ANON-0000-0000-0203	0.73090
card_ANON-0000-0000-0204	0.27433
card_ANON-0000-0000-0205	-1.83966
card_ANON-0000-0000-0206	0.37802
card_ANON-0000-0000-0207	0.09764
card_ANON-0000-0000-0208	-0.10855
card_ANON-0000-0000-0209	0.29968
card_ANON-0000-0000-0210	-0.09650
card_ANON-0000-0000-0211	0.12735
card_ANON-0000-0000-0212	-0.08940
card_ANON-0000-0000-0213	-0.08469
card_ANON-0000-0000-0214	0.00000
card_ANON-0000-0000-0215	0.26405
card_ANON-0000-0000-0216	-0.13386
card_ANON-0000-0000-0217	0.03873
card_ANON-0000-0000-0218	0.15710

card_ANON-0000-0000-0219	0.07684
card_ANON-0000-0000-0220	0.54951
card_ANON-0000-0000-0221	0.16142
card_ANON-0000-0000-0222	0.04613
card_ANON-0000-0000-0223	0.06087
card_ANON-0000-0000-0224	-0.12560
card_ANON-0000-0000-0225	-0.56236
card_ANON-0000-0000-0226	0.30066
card_ANON-0000-0000-0227	0.00000
card_ANON-0000-0000-0228	0.08315
card_ANON-0000-0000-0229	0.07597
card_ANON-0000-0000-0230	0.08693
card_ANON-0000-0000-0231	0.09664
card_ANON-0000-0000-0232	0.10528
card_ANON-0000-0000-0233	0.13082
card_ANON-0000-0000-0234	0.00000
card_ANON-0000-0000-0235	0.10098
card_ANON-0000-0000-0236	0.07252
card_ANON-0000-0000-0237	0.10529
card_ANON-0000-0000-0238	0.18846
card_ANON-0000-0000-0239	0.13097
card_ANON-0000-0000-0240	-0.25410
card_ANON-0000-0000-0241	0.09716
card_ANON-0000-0000-0242	-0.11208
card_ANON-0000-0000-0243	-0.00000
card_ANON-0000-0000-0244	0.10139
card_ANON-0000-0000-0245	-0.09297
card_ANON-0000-0000-0246	0.11452
card_ANON-0000-0000-0247	0.14950
card_ANON-0000-0000-0248	-0.24419
card_ANON-0000-0000-0249	-0.09824
card_ANON-0000-0000-0250	-0.35464
card_ANON-0000-0000-0251	0.91744
card_ANON-0000-0000-0252	0.76611
card_ANON-0000-0000-0253	1.08440
card_ANON-0000-0000-0254	1.11910
card_ANON-0000-0000-0255	1.10035
card_ANON-0000-0000-0256	1.14157
card_ANON-0000-0000-0257	-0.19117
card_ANON-0000-0000-0258	1.27131
card_ANON-0000-0000-0259	0.88342
card_ANON-0000-0000-0260	0.89067
card_ANON-0000-0000-0261	1.08276
card_ANON-0000-0000-0262	1.32232
card_ANON-0000-0000-0263	0.88756
card_ANON-0000-0000-0264	1.10263
card_ANON-0000-0000-0265	1.32468
card_ANON-0000-0000-0266	1.09120

card_ANON-0000-0000-0267	1.11897
card_ANON-0000-0000-0268	1.09579
card_ANON-0000-0000-0269	1.58525
card_ANON-0000-0000-0270	1.75983
card_ANON-0000-0000-0271	-0.00000
card_ANON-0000-0000-0272	1.08762
card_ANON-0000-0000-0273	1.04702
card_ANON-0000-0000-0274	1.55893
card_ANON-0000-0000-0275	1.05771
card_ANON-0000-0000-0276	-1.21426
card_ANON-0000-0000-0277	-0.00000
card_ANON-0000-0000-0278	1.05617
card_ANON-0000-0000-0279	0.86770
card_ANON-0000-0000-0280	1.28971
card_ANON-0000-0000-0281	1.07579
card_ANON-0000-0000-0282	1.12869
card_ANON-0000-0000-0283	1.08400
card_ANON-0000-0000-0284	0.88496
card_ANON-0000-0000-0285	1.10218
card_ANON-0000-0000-0286	1.11180
card_ANON-0000-0000-0287	0.88391
card_ANON-0000-0000-0288	0.00000
card_ANON-0000-0000-0289	1.07630
card_ANON-0000-0000-0290	-0.00000
card_ANON-0000-0000-0291	0.89858
card_ANON-0000-0000-0292	-0.00000
card_ANON-0000-0000-0293	0.90119
card_ANON-0000-0000-0294	-0.00000
card_ANON-0000-0000-0295	1.36316
card_ANON-0000-0000-0296	1.11169
card_ANON-0000-0000-0297	1.33437
card_ANON-0000-0000-0298	0.91466
card_ANON-0000-0000-0299	1.30648
card_ANON-0000-0000-0300	1.15713
card_ANON-0000-0000-0301	0.91979
card_ANON-0000-0000-0302	0.00000
card_ANON-0000-0000-0303	0.12257
card_ANON-0000-0000-0304	1.48478
card_ANON-0000-0000-0305	-0.00000
card_ANON-0000-0000-0306	1.13194
card_ANON-0000-0000-0307	0.00000
card_ANON-0000-0000-0308	1.26528
card_ANON-0000-0000-0309	1.27629
card_ANON-0000-0000-0310	1.28298
card_ANON-0000-0000-0311	1.04002
card_ANON-0000-0000-0312	1.32215
card_ANON-0000-0000-0313	0.92941
card_ANON-0000-0000-0314	1.16586

card_ANON-0000-0000-0315	1.34103
card_ANON-0000-0000-0316	1.58760
card_ANON-0000-0000-0317	-0.00000
card_ANON-0000-0000-0318	1.11934
card_ANON-0000-0000-0319	1.05132
card_ANON-0000-0000-0320	1.07051
card_ANON-0000-0000-0321	1.08794
card_ANON-0000-0000-0322	1.10197
card_ANON-0000-0000-0323	1.12261
card_ANON-0000-0000-0324	1.56035
card_ANON-0000-0000-0325	1.32122
card_ANON-0000-0000-0326	0.90947
card_ANON-0000-0000-0327	1.29991
card_ANON-0000-0000-0328	-1.91052
card_ANON-0000-0000-0329	1.08628
card_ANON-0000-0000-0330	0.91117
card_ANON-0000-0000-0331	-0.00000
card_ANON-0000-0000-0332	1.10223
card_ANON-0000-0000-0333	-3.00363
card_ANON-0000-0000-0334	1.10963
card_ANON-0000-0000-0335	1.14067
card_ANON-0000-0000-0336	0.00000
card_ANON-0000-0000-0337	1.51747
card_ANON-0000-0000-0338	2.06922
card_ANON-0000-0000-0339	-2.81079
card_ANON-0000-0000-0340	0.00000
card_ANON-0000-0000-0341	1.89504
card_ANON-0000-0000-0342	-0.00000
card_ANON-0000-0000-0343	2.07935
card_ANON-0000-0000-0344	1.90823
card_ANON-0000-0000-0345	2.55815
card_ANON-0000-0000-0346	0.00000
card_ANON-0000-0000-0347	-0.54570
card_ANON-0000-0000-0348	2.57424
card_ANON-0000-0000-0349	2.58182
card_ANON-0000-0000-0350	2.34415
card_ANON-0000-0000-0351	1.92121
card_ANON-0000-0000-0352	2.15339
card_ANON-0000-0000-0353	-3.02618
card_ANON-0000-0000-0354	-2.83501
card_ANON-0000-0000-0355	-3.17725
card_ANON-0000-0000-0356	-2.81745
card_ANON-0000-0000-0357	-2.83948
card_ANON-0000-0000-0358	-2.74998
card_ANON-0000-0000-0359	-3.02588
card_ANON-0000-0000-0360	-2.80074
card_ANON-0000-0000-0361	-2.59352
card_ANON-0000-0000-0362	-2.59462

card_ANON-0000-0000-0363	-3.00916
card_ANON-0000-0000-0364	-3.00813
card_ANON-0000-0000-0365	-2.68547
card_ANON-0000-0000-0366	-3.00543
card_ANON-0000-0000-0367	-2.88942
card_ANON-0000-0000-0368	-2.98207
card_ANON-0000-0000-0369	-2.75090
card_ANON-0000-0000-0370	-2.55598
card_ANON-0000-0000-0371	-2.59863
card_ANON-0000-0000-0372	-2.73404
card_ANON-0000-0000-0373	-2.81120
card_ANON-0000-0000-0374	-0.00000
card_ANON-0000-0000-0375	-2.60948
card_ANON-0000-0000-0376	-2.81429
card_ANON-0000-0000-0377	-2.81847
card_ANON-0000-0000-0378	-3.02019
card_ANON-0000-0000-0379	-2.93006
card_ANON-0000-0000-0380	-2.98502
card_ANON-0000-0000-0381	-2.30077
card_ANON-0000-0000-0382	-2.79192
card_ANON-0000-0000-0383	-2.74114
card_ANON-0000-0000-0384	-2.84802
card_ANON-0000-0000-0385	-2.99681
card_ANON-0000-0000-0386	-2.87416
card_ANON-0000-0000-0387	-2.54733
card_ANON-0000-0000-0388	-2.63812
card_ANON-0000-0000-0389	-2.75732
card_ANON-0000-0000-0390	-2.55060
card_ANON-0000-0000-0391	0.00000
card_ANON-0000-0000-0392	-2.84192
card_ANON-0000-0000-0393	-2.64062
card_ANON-0000-0000-0394	-2.81295
card_ANON-0000-0000-0395	-2.58667
card_ANON-0000-0000-0396	-2.79473
card_ANON-0000-0000-0397	0.00000
card_ANON-0000-0000-0398	-3.15026
card_ANON-0000-0000-0399	-2.78476
card_ANON-0000-0000-0400	-3.00495
card_ANON-0000-0000-0401	-3.00443
card_ANON-0000-0000-0402	-2.32866
card_ANON-0000-0000-0403	-2.79028
card_ANON-0000-0000-0404	-2.46094
card_ANON-0000-0000-0405	-3.13453
card_ANON-0000-0000-0406	-2.76878
card_ANON-0000-0000-0407	-2.59181
card_ANON-0000-0000-0408	-2.76579
card_ANON-0000-0000-0409	-2.76081
card_ANON-0000-0000-0410	-2.54941

card_ANON-0000-0000-0411	-2.79296
card_ANON-0000-0000-0412	-2.97105
card_ANON-0000-0000-0413	-2.97674
card_ANON-0000-0000-0414	-0.00000
card_ANON-0000-0000-0415	-2.78304
card_ANON-0000-0000-0416	-2.97445
card_ANON-0000-0000-0417	-2.77911
card_ANON-0000-0000-0418	-2.80718
card_ANON-0000-0000-0419	-3.02795
card_ANON-0000-0000-0420	0.00000
card_ANON-0000-0000-0421	-2.76477
card_ANON-0000-0000-0422	-0.00000
card_ANON-0000-0000-0423	-3.00956
card_ANON-0000-0000-0424	-2.62108
card_ANON-0000-0000-0425	-2.82153
card_ANON-0000-0000-0426	-2.46030
card_ANON-0000-0000-0427	-3.00804
card_ANON-0000-0000-0428	0.00000
card_ANON-0000-0000-0429	-3.01121
card_ANON-0000-0000-0430	-3.01290
card_ANON-0000-0000-0431	-2.78562
card_ANON-0000-0000-0432	-3.01963
card_ANON-0000-0000-0433	-2.81395
card_ANON-0000-0000-0434	-2.32631
card_ANON-0000-0000-0435	-2.79619
card_ANON-0000-0000-0436	-2.69992
card_ANON-0000-0000-0437	-2.99997
card_ANON-0000-0000-0438	-0.00000
card_ANON-0000-0000-0439	-2.61171
card_ANON-0000-0000-0440	-2.77944
card_ANON-0000-0000-0441	-2.60870
card_ANON-0000-0000-0442	-0.00000
card_ANON-0000-0000-0443	-2.66332
card_ANON-0000-0000-0444	-2.80001
card_ANON-0000-0000-0445	-2.79844
card_ANON-0000-0000-0446	0.00000
coffee_name_Americano with Milk	5.32446
coffee_name_Cappuccino	10.03369
coffee_name_Cocoa	10.37000
coffee_name_Cortado	0.03589
coffee_name_Espresso	-5.14627
coffee_name_Hot Chocolate	9.97272
coffee_name_Latte	10.01123

```
[174]: # The time range o this data set is from 2023-3-1 to 2024-7-31
```

```
[data['date'].min(),data['date'].max()]
```

```
[174]: ['2024-03-01', '2024-07-31']
```

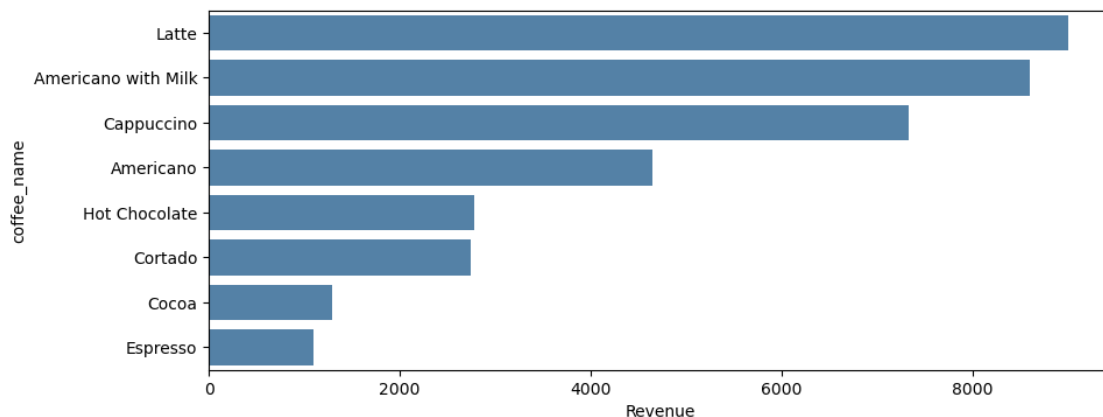
```
[180]: # check the overall revenue by product
revenue_data = data.groupby(['coffee_name']).sum(['money']).reset_index().
    ↪sort_values(by='money',ascending=False)
```

```
[186]: plt.figure(figsize=(10,4))

sns.barplot(data=revenue_data,x='money',y='coffee_name',color='steelblue')

plt.xlabel('Revenue')
```

```
[186]: Text(0.5, 0, 'Revenue')
```



```
[14]: # Lets check Monthly
monthly_sales = data.groupby(['coffee_name','month']).count()['date'].
    ↪reset_index().rename(columns={'date':'count'}).
    ↪pivot(index='month',columns='coffee_name',values='count').reset_index()

monthly_sales
```

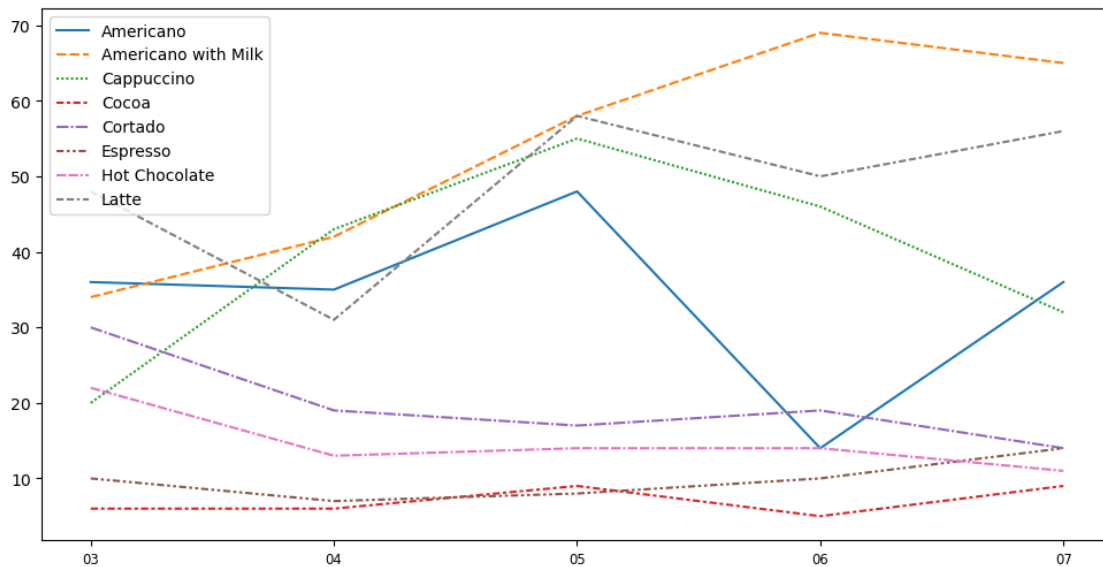
```
[14]: coffee_name month  Americano  Americano with Milk  Cappuccino  Cocoa  Cortado  \
0          03         36             34             20        6         30
1          04         35             42             43        6         19
2          05         48             58             55        9         17
3          06         14             69             46        5         19
4          07         36             65             32        9         14

coffee_name  Espresso  Hot Chocolate  Latte
0             10           22         48
1              7           13         31
2              8           14         58
```

3	10	14	50
4	14	11	56

```
[18]: # As the show in the line chart above, Americano with milk and Latte and
      ↪Cappuccino are stop selling coffee type, while Cocoa and
      # Espresso have lowest sales.

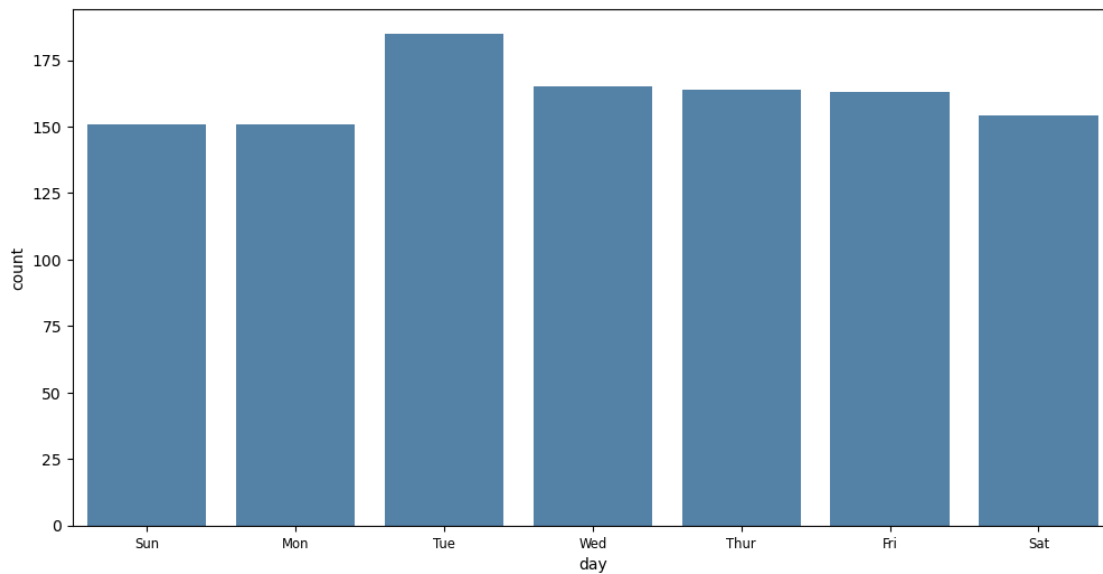
plt.figure(figsize=(12,6))
sns.lineplot(data=monthly_sales)
plt.legend(loc='upper left')
plt.
    ↪xticks(range(len(monthly_sales['month'])),monthly_sales['month'],size='small')
plt.show()
```



```
[23]: weekday_sales = data.groupby(['day']).count()['date'].reset_index().
      ↪rename(columns={'date':'count'})
weekday_sales
```

```
[23]:  day  count
0    0    151
1    1    151
2    2    185
3    3    165
4    4    164
5    5    163
6    6    154
```

```
[27]: # The Bar chart reveals that Tuesday has the highest sales of the week, while
      ↪ sales on the other days are relatively similar
      plt.figure(figsize=(12,6))
      sns.barplot(data=weekday_sales,x='day',y='count',color='steelblue')
      plt.
      ↪xticks(range(len(weekday_sales['day'])),['Sun','Mon','Tue','Wed','Thur','Fri','Sat'],size='
      plt.show()
```



```
[35]: # Lets check daily sales
daily_sales = data.groupby(['coffee_name','date']).count()['datetime'].
      ↪reset_index().rename(columns={'datetime':'count'}).
      ↪pivot(index='date',columns='coffee_name',values='count').reset_index().
      ↪fillna(0)
daily_sales
```

```
[35]: coffee_name    date  Americano  Americano with Milk  Cappuccino  Cocoa \
0      2024-03-01      1.00000      4.00000      0.00000  1.00000
1      2024-03-02      3.00000      3.00000      0.00000  0.00000
2      2024-03-03      1.00000      2.00000      0.00000  1.00000
3      2024-03-04      0.00000      1.00000      0.00000  0.00000
4      2024-03-05      0.00000      0.00000      0.00000  1.00000
5      2024-03-06      1.00000      1.00000      2.00000  0.00000
6      2024-03-07      1.00000      1.00000      0.00000  0.00000
7      2024-03-08      3.00000      1.00000      1.00000  0.00000
8      2024-03-09      3.00000      2.00000      3.00000  0.00000
9      2024-03-10      1.00000      2.00000      0.00000  0.00000
10     2024-03-11      2.00000      0.00000      2.00000  0.00000
```

11	2024-03-12	3.00000	1.00000	0.00000	0.00000
12	2024-03-13	3.00000	1.00000	0.00000	0.00000
13	2024-03-14	1.00000	2.00000	0.00000	0.00000
14	2024-03-15	1.00000	0.00000	0.00000	0.00000
15	2024-03-16	1.00000	2.00000	0.00000	0.00000
16	2024-03-17	0.00000	0.00000	0.00000	0.00000
17	2024-03-18	3.00000	0.00000	0.00000	0.00000
18	2024-03-19	0.00000	1.00000	0.00000	0.00000
19	2024-03-20	0.00000	0.00000	1.00000	1.00000
20	2024-03-21	1.00000	0.00000	2.00000	0.00000
21	2024-03-22	2.00000	2.00000	1.00000	0.00000
22	2024-03-23	0.00000	3.00000	1.00000	1.00000
23	2024-03-24	0.00000	0.00000	0.00000	0.00000
24	2024-03-25	0.00000	2.00000	1.00000	0.00000
25	2024-03-26	2.00000	0.00000	0.00000	1.00000
26	2024-03-27	1.00000	2.00000	1.00000	0.00000
27	2024-03-28	1.00000	0.00000	0.00000	0.00000
28	2024-03-29	0.00000	0.00000	3.00000	0.00000
29	2024-03-30	0.00000	1.00000	1.00000	0.00000
30	2024-03-31	1.00000	0.00000	1.00000	0.00000
31	2024-04-01	1.00000	4.00000	1.00000	0.00000
32	2024-04-02	1.00000	0.00000	1.00000	0.00000
33	2024-04-03	1.00000	0.00000	1.00000	0.00000
34	2024-04-04	0.00000	0.00000	1.00000	0.00000
35	2024-04-05	3.00000	1.00000	1.00000	1.00000
36	2024-04-06	1.00000	1.00000	1.00000	0.00000
37	2024-04-07	0.00000	1.00000	2.00000	0.00000
38	2024-04-08	2.00000	3.00000	3.00000	0.00000
39	2024-04-09	1.00000	0.00000	1.00000	0.00000
40	2024-04-10	0.00000	0.00000	1.00000	0.00000
41	2024-04-11	2.00000	1.00000	1.00000	0.00000
42	2024-04-12	0.00000	0.00000	0.00000	0.00000
43	2024-04-13	1.00000	0.00000	3.00000	0.00000
44	2024-04-14	3.00000	1.00000	3.00000	0.00000
45	2024-04-15	2.00000	2.00000	0.00000	0.00000
46	2024-04-16	1.00000	3.00000	1.00000	2.00000
47	2024-04-17	1.00000	0.00000	3.00000	0.00000
48	2024-04-18	2.00000	1.00000	2.00000	0.00000
49	2024-04-19	0.00000	2.00000	2.00000	1.00000
50	2024-04-20	1.00000	7.00000	3.00000	1.00000
51	2024-04-21	1.00000	0.00000	1.00000	0.00000
52	2024-04-22	1.00000	1.00000	1.00000	0.00000
53	2024-04-23	0.00000	3.00000	2.00000	0.00000
54	2024-04-24	0.00000	6.00000	1.00000	0.00000
55	2024-04-25	3.00000	0.00000	0.00000	0.00000
56	2024-04-26	3.00000	0.00000	1.00000	1.00000
57	2024-04-27	0.00000	0.00000	1.00000	0.00000

58	2024-04-28	2.00000	0.00000	1.00000	0.00000
59	2024-04-29	1.00000	1.00000	3.00000	0.00000
60	2024-04-30	1.00000	4.00000	1.00000	0.00000
61	2024-05-02	1.00000	2.00000	2.00000	0.00000
62	2024-05-03	0.00000	0.00000	0.00000	0.00000
63	2024-05-06	4.00000	1.00000	3.00000	0.00000
64	2024-05-07	1.00000	1.00000	3.00000	2.00000
65	2024-05-08	0.00000	0.00000	0.00000	0.00000
66	2024-05-09	4.00000	1.00000	1.00000	0.00000
67	2024-05-10	0.00000	1.00000	0.00000	0.00000
68	2024-05-11	0.00000	2.00000	2.00000	1.00000
69	2024-05-12	1.00000	4.00000	0.00000	0.00000
70	2024-05-13	2.00000	1.00000	0.00000	0.00000
71	2024-05-14	4.00000	2.00000	4.00000	0.00000
72	2024-05-15	5.00000	1.00000	1.00000	0.00000
73	2024-05-16	0.00000	3.00000	1.00000	0.00000
74	2024-05-17	2.00000	3.00000	2.00000	0.00000
75	2024-05-18	0.00000	4.00000	3.00000	0.00000
76	2024-05-19	3.00000	3.00000	4.00000	0.00000
77	2024-05-20	5.00000	5.00000	1.00000	1.00000
78	2024-05-21	1.00000	1.00000	2.00000	1.00000
79	2024-05-22	2.00000	3.00000	4.00000	0.00000
80	2024-05-23	0.00000	1.00000	9.00000	0.00000
81	2024-05-24	2.00000	1.00000	0.00000	0.00000
82	2024-05-25	3.00000	4.00000	0.00000	0.00000
83	2024-05-26	1.00000	2.00000	4.00000	0.00000
84	2024-05-27	4.00000	2.00000	1.00000	1.00000
85	2024-05-28	2.00000	3.00000	3.00000	1.00000
86	2024-05-29	1.00000	0.00000	1.00000	1.00000
87	2024-05-30	0.00000	3.00000	2.00000	0.00000
88	2024-05-31	0.00000	4.00000	2.00000	1.00000
89	2024-06-01	0.00000	4.00000	2.00000	2.00000
90	2024-06-02	0.00000	3.00000	1.00000	0.00000
91	2024-06-03	0.00000	3.00000	1.00000	0.00000
92	2024-06-04	0.00000	5.00000	2.00000	0.00000
93	2024-06-05	1.00000	2.00000	2.00000	1.00000
94	2024-06-06	1.00000	4.00000	2.00000	0.00000
95	2024-06-07	0.00000	1.00000	1.00000	0.00000
96	2024-06-08	0.00000	1.00000	2.00000	0.00000
97	2024-06-09	1.00000	2.00000	3.00000	0.00000
98	2024-06-10	0.00000	0.00000	1.00000	0.00000
99	2024-06-11	0.00000	3.00000	0.00000	0.00000
100	2024-06-12	0.00000	1.00000	1.00000	0.00000
101	2024-06-13	1.00000	5.00000	0.00000	0.00000
102	2024-06-14	1.00000	1.00000	0.00000	0.00000
103	2024-06-15	1.00000	3.00000	1.00000	1.00000
104	2024-06-16	0.00000	6.00000	0.00000	0.00000

105	2024-06-17	3.00000	1.00000	4.00000	0.00000
106	2024-06-18	1.00000	2.00000	3.00000	0.00000
107	2024-06-19	1.00000	3.00000	2.00000	1.00000
108	2024-06-20	0.00000	1.00000	0.00000	0.00000
109	2024-06-21	2.00000	3.00000	4.00000	0.00000
110	2024-06-22	0.00000	2.00000	1.00000	0.00000
111	2024-06-23	0.00000	2.00000	2.00000	0.00000
112	2024-06-24	0.00000	1.00000	4.00000	0.00000
113	2024-06-25	0.00000	2.00000	1.00000	0.00000
114	2024-06-26	1.00000	1.00000	1.00000	0.00000
115	2024-06-27	0.00000	2.00000	1.00000	0.00000
116	2024-06-28	0.00000	1.00000	1.00000	0.00000
117	2024-06-29	0.00000	3.00000	3.00000	0.00000
118	2024-06-30	0.00000	1.00000	0.00000	0.00000
119	2024-07-01	0.00000	0.00000	2.00000	0.00000
120	2024-07-02	2.00000	3.00000	0.00000	0.00000
121	2024-07-03	0.00000	3.00000	3.00000	0.00000
122	2024-07-04	1.00000	1.00000	0.00000	0.00000
123	2024-07-05	3.00000	3.00000	1.00000	1.00000
124	2024-07-06	0.00000	1.00000	0.00000	0.00000
125	2024-07-07	0.00000	3.00000	4.00000	1.00000
126	2024-07-08	2.00000	1.00000	0.00000	0.00000
127	2024-07-09	0.00000	4.00000	1.00000	0.00000
128	2024-07-10	1.00000	1.00000	0.00000	0.00000
129	2024-07-11	1.00000	1.00000	0.00000	0.00000
130	2024-07-12	0.00000	0.00000	0.00000	0.00000
131	2024-07-13	0.00000	0.00000	0.00000	0.00000
132	2024-07-14	2.00000	1.00000	1.00000	0.00000
133	2024-07-15	0.00000	0.00000	1.00000	0.00000
134	2024-07-16	0.00000	1.00000	0.00000	0.00000
135	2024-07-17	0.00000	1.00000	0.00000	0.00000
136	2024-07-18	2.00000	1.00000	1.00000	0.00000
137	2024-07-19	1.00000	2.00000	0.00000	1.00000
138	2024-07-20	3.00000	0.00000	0.00000	0.00000
139	2024-07-21	0.00000	0.00000	1.00000	1.00000
140	2024-07-22	2.00000	1.00000	0.00000	0.00000
141	2024-07-23	4.00000	3.00000	0.00000	1.00000
142	2024-07-24	2.00000	3.00000	3.00000	0.00000
143	2024-07-25	2.00000	1.00000	2.00000	1.00000
144	2024-07-26	1.00000	4.00000	3.00000	0.00000
145	2024-07-27	0.00000	5.00000	4.00000	0.00000
146	2024-07-28	0.00000	1.00000	0.00000	0.00000
147	2024-07-29	3.00000	2.00000	2.00000	1.00000
148	2024-07-30	2.00000	12.00000	2.00000	0.00000
149	2024-07-31	2.00000	6.00000	1.00000	2.00000

coffee_name Cortado Espresso Hot Chocolate Latte

0	0.00000	0.00000	3.00000	2.00000
1	0.00000	0.00000	0.00000	1.00000
2	2.00000	0.00000	2.00000	2.00000
3	0.00000	1.00000	0.00000	2.00000
4	1.00000	0.00000	4.00000	3.00000
5	1.00000	0.00000	0.00000	0.00000
6	0.00000	0.00000	1.00000	3.00000
7	1.00000	0.00000	0.00000	2.00000
8	1.00000	1.00000	3.00000	1.00000
9	1.00000	1.00000	0.00000	2.00000
10	2.00000	0.00000	0.00000	2.00000
11	1.00000	0.00000	1.00000	1.00000
12	0.00000	4.00000	1.00000	0.00000
13	2.00000	2.00000	2.00000	3.00000
14	0.00000	0.00000	1.00000	1.00000
15	3.00000	0.00000	0.00000	0.00000
16	1.00000	0.00000	0.00000	1.00000
17	1.00000	0.00000	0.00000	0.00000
18	1.00000	0.00000	2.00000	2.00000
19	2.00000	0.00000	0.00000	2.00000
20	2.00000	0.00000	0.00000	1.00000
21	0.00000	1.00000	0.00000	0.00000
22	1.00000	0.00000	0.00000	2.00000
23	0.00000	0.00000	0.00000	2.00000
24	0.00000	0.00000	0.00000	3.00000
25	3.00000	0.00000	1.00000	4.00000
26	2.00000	0.00000	1.00000	1.00000
27	2.00000	0.00000	0.00000	1.00000
28	0.00000	0.00000	0.00000	1.00000
29	0.00000	0.00000	0.00000	3.00000
30	0.00000	0.00000	0.00000	0.00000
31	0.00000	0.00000	1.00000	0.00000
32	1.00000	0.00000	0.00000	1.00000
33	2.00000	0.00000	0.00000	0.00000
34	1.00000	0.00000	0.00000	3.00000
35	2.00000	1.00000	0.00000	2.00000
36	0.00000	0.00000	0.00000	1.00000
37	1.00000	1.00000	1.00000	1.00000
38	0.00000	1.00000	0.00000	1.00000
39	0.00000	0.00000	2.00000	1.00000
40	0.00000	2.00000	1.00000	1.00000
41	0.00000	0.00000	0.00000	1.00000
42	1.00000	0.00000	1.00000	0.00000
43	0.00000	0.00000	2.00000	2.00000
44	4.00000	0.00000	0.00000	2.00000
45	0.00000	1.00000	0.00000	0.00000
46	1.00000	0.00000	0.00000	0.00000

47	1.00000	1.00000	0.00000	0.00000
48	1.00000	0.00000	2.00000	2.00000
49	0.00000	0.00000	1.00000	1.00000
50	0.00000	0.00000	1.00000	1.00000
51	0.00000	0.00000	0.00000	1.00000
52	0.00000	0.00000	0.00000	2.00000
53	0.00000	0.00000	0.00000	0.00000
54	0.00000	0.00000	0.00000	1.00000
55	0.00000	0.00000	0.00000	1.00000
56	1.00000	0.00000	1.00000	2.00000
57	0.00000	0.00000	0.00000	0.00000
58	0.00000	0.00000	0.00000	2.00000
59	3.00000	0.00000	0.00000	0.00000
60	0.00000	0.00000	0.00000	2.00000
61	0.00000	0.00000	0.00000	2.00000
62	0.00000	0.00000	0.00000	3.00000
63	2.00000	0.00000	0.00000	0.00000
64	2.00000	0.00000	0.00000	1.00000
65	0.00000	0.00000	0.00000	1.00000
66	0.00000	0.00000	0.00000	3.00000
67	0.00000	0.00000	0.00000	3.00000
68	0.00000	0.00000	0.00000	3.00000
69	0.00000	0.00000	0.00000	3.00000
70	0.00000	0.00000	0.00000	0.00000
71	0.00000	0.00000	1.00000	1.00000
72	2.00000	2.00000	0.00000	1.00000
73	0.00000	0.00000	2.00000	3.00000
74	0.00000	0.00000	0.00000	2.00000
75	0.00000	0.00000	0.00000	1.00000
76	0.00000	2.00000	1.00000	0.00000
77	1.00000	0.00000	0.00000	4.00000
78	0.00000	1.00000	0.00000	3.00000
79	1.00000	0.00000	1.00000	0.00000
80	1.00000	1.00000	1.00000	3.00000
81	3.00000	0.00000	1.00000	0.00000
82	0.00000	0.00000	0.00000	1.00000
83	2.00000	0.00000	3.00000	3.00000
84	0.00000	0.00000	0.00000	3.00000
85	1.00000	0.00000	0.00000	1.00000
86	1.00000	0.00000	2.00000	5.00000
87	0.00000	2.00000	1.00000	3.00000
88	1.00000	0.00000	1.00000	5.00000
89	1.00000	0.00000	0.00000	2.00000
90	0.00000	0.00000	0.00000	2.00000
91	0.00000	0.00000	0.00000	3.00000
92	3.00000	0.00000	2.00000	2.00000
93	1.00000	0.00000	0.00000	2.00000

94	0.00000	0.00000	0.00000	4.00000
95	2.00000	1.00000	0.00000	0.00000
96	1.00000	0.00000	0.00000	0.00000
97	2.00000	1.00000	0.00000	4.00000
98	0.00000	0.00000	2.00000	3.00000
99	0.00000	0.00000	1.00000	2.00000
100	0.00000	0.00000	2.00000	2.00000
101	1.00000	2.00000	1.00000	2.00000
102	1.00000	0.00000	0.00000	1.00000
103	0.00000	1.00000	0.00000	1.00000
104	0.00000	1.00000	4.00000	1.00000
105	2.00000	0.00000	0.00000	0.00000
106	1.00000	0.00000	0.00000	0.00000
107	1.00000	0.00000	0.00000	3.00000
108	0.00000	0.00000	0.00000	5.00000
109	0.00000	1.00000	0.00000	2.00000
110	1.00000	0.00000	0.00000	1.00000
111	0.00000	0.00000	0.00000	1.00000
112	0.00000	0.00000	0.00000	1.00000
113	0.00000	0.00000	0.00000	1.00000
114	0.00000	1.00000	0.00000	2.00000
115	1.00000	0.00000	0.00000	0.00000
116	1.00000	1.00000	0.00000	1.00000
117	0.00000	0.00000	1.00000	1.00000
118	0.00000	1.00000	1.00000	1.00000
119	0.00000	1.00000	0.00000	0.00000
120	0.00000	0.00000	0.00000	1.00000
121	0.00000	1.00000	0.00000	2.00000
122	0.00000	0.00000	0.00000	0.00000
123	0.00000	2.00000	0.00000	0.00000
124	0.00000	0.00000	0.00000	4.00000
125	0.00000	0.00000	2.00000	1.00000
126	0.00000	0.00000	0.00000	2.00000
127	0.00000	0.00000	0.00000	0.00000
128	0.00000	0.00000	0.00000	1.00000
129	0.00000	0.00000	1.00000	1.00000
130	1.00000	0.00000	4.00000	0.00000
131	0.00000	0.00000	0.00000	2.00000
132	0.00000	0.00000	0.00000	2.00000
133	0.00000	0.00000	0.00000	0.00000
134	0.00000	0.00000	1.00000	0.00000
135	0.00000	0.00000	0.00000	0.00000
136	1.00000	1.00000	1.00000	4.00000
137	0.00000	0.00000	0.00000	4.00000
138	0.00000	0.00000	0.00000	4.00000
139	1.00000	0.00000	0.00000	1.00000
140	0.00000	0.00000	0.00000	1.00000

141	0.00000	0.00000	0.00000	4.00000
142	0.00000	2.00000	0.00000	2.00000
143	2.00000	1.00000	0.00000	1.00000
144	2.00000	1.00000	0.00000	5.00000
145	0.00000	2.00000	0.00000	2.00000
146	0.00000	1.00000	0.00000	1.00000
147	0.00000	0.00000	2.00000	1.00000
148	3.00000	2.00000	0.00000	3.00000
149	4.00000	0.00000	0.00000	7.00000

```
[37]: # This table provides us the information of how many of each products can be
      ↪ sold in each day
      daily_sales.iloc[:,1:].describe().T.loc[:,['min','max']]
```

```
[37]:
```

	min	max
coffee_name		
Americano	0.00000	5.00000
Americano with Milk	0.00000	12.00000
Cappuccino	0.00000	9.00000
Cocoa	0.00000	2.00000
Cortado	0.00000	4.00000
Espresso	0.00000	4.00000
Hot Chocolate	0.00000	4.00000
Latte	0.00000	7.00000

```
[18]: hourly_sales = data.groupby(['hour']).count()['date'].reset_index().
      ↪ rename(columns={'date': 'count'})
      hourly_sales
```

```
[18]:
```

hour	count
0	1133

```
[20]: hourly_sales_by_coffee = data.groupby(['coffee_name','hour']).count()['date'].
      ↪ reset_index().rename(columns={'date': 'count'}).
      ↪ pivot(index='hour',columns='coffee_name',values='count').fillna(0).
      ↪ reset_index()
      hourly_sales_by_coffee
```

```
[20]:
```

coffee_name	hour	Americano	Americano with Milk	Cappuccino	Cocoa	Cortado	\
0	00	169	268	196	35	99	
coffee_name	Espresso	Hot Chocolate	Latte				
0	49	74	243				

```
[22]: data['hour'].describe()
```

```
[22]: count      1133  
      unique        1  
      top           00  
      freq       1133  
      Name: hour, dtype: object
```

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