Untitled

October 13, 2020

[1]:
```
import pandas as pd
import pickle
import matplotlib.pyplot as plt
```

[3]:
```
cd Desktop/Iowa_Liquor_Sales/
```

```
/Users/adrienpeltzer/Desktop/Iowa_Liquor_Sales
```

[5]:
```
# Since our dataset has ~19M rows, let's start by loading just the first 100␣
↪rows and see what columns there are
df = pd.read_csv("Iowa_Liquor_Sales.csv",nrows=100)
```

[8]:
```
[i for i in zip(range(len(df.columns)),df.columns.tolist())]
```

[8]:
```
[(0, 'Invoice/Item Number'),
 (1, 'Date'),
 (2, 'Store Number'),
 (3, 'Store Name'),
 (4, 'Address'),
 (5, 'City'),
 (6, 'Zip Code'),
 (7, 'Store Location'),
 (8, 'County Number'),
 (9, 'County'),
 (10, 'Category'),
 (11, 'Category Name'),
 (12, 'Vendor Number'),
 (13, 'Vendor Name'),
 (14, 'Item Number'),
 (15, 'Item Description'),
 (16, 'Pack'),
 (17, 'Bottle Volume (ml)'),
 (18, 'State Bottle Cost'),
 (19, 'State Bottle Retail'),
 (20, 'Bottles Sold'),
 (21, 'Sale (Dollars)'),
 (22, 'Volume Sold (Liters)'),
```

```
 (23, 'Volume Sold (Gallons)')]
```

[9]:
```
# There are 24 columns, but some of them can be inferred from the rest. For␣
 ↪example,
# the 'Volume Sold (Liters)' column is just "Bottles Sold" multiplied by "Bottle␣
 ↪Volume (mL)"
# Clearly then, we shouldn't load the whole dataset
```

[10]:
```
# Let's find out what Categories of Liquor Sales there are:
C = pd.read_csv("Iowa_Liquor_Sales.csv",usecols=[10,11])
C=C.dropna().drop_duplicates().reset_index(drop=True)
```

[11]:
```
C.head()
```

[11]:

	Category	Category Name
0	1032200.0	Imported Flavored Vodka
1	1012100.0	Canadian Whiskies
2	1012200.0	Scotch Whiskies
3	1032100.0	Imported Vodkas
4	1011400.0	Tennessee Whiskies

[12]:
```
# We notice that the category codes are neatly grouped. If the code starts with␣
 ↪"103", for example, then it is a Vodka. We use modular arithmetic to slice␣
 ↪the frame:
lcodes={}

lcodes[101] = 'Whiskey'
lcodes[102] = 'Tequila'
lcodes[103] = 'Vodka'
lcodes[104] = 'Gin'
lcodes[105] = 'Brandies'
lcodes[106] = 'Rum'
lcodes[107] = "Cocktails"
lcodes[108] = "Liquers"
lcodes[109] = "Distilled Spirits"
lcodes[110] = ""
lcodes[150] = "High Proof Beer"
lcodes[170] = "Temporary and Specialty Packages"
lcodes[190] = "Special Order Items"

Vodka=C[C['Category'].apply(lambda x: x//10000)==103]
Whiskies=C[C['Category'].apply(lambda x: x//10000)==101]
```

[13]:
```
Vodka.head(20)
```

[13]:

	Category	Category Name
0	1032200.0	Imported Flavored Vodka

```
3    1032100.0          Imported Vodkas
6    1031100.0          American Vodkas
22   1031200.0  American Flavored Vodka
45   1031080.0           VODKA 80 PROOF
47   1031200.0           VODKA FLAVORED
55   1032080.0           IMPORTED VODKA
58   1031000.0           American Vodka
66   1032200.0    IMPORTED VODKA - MISC
67   1032000.0           Imported Vodka
75   1031100.0          100 PROOF VODKA
121  1031090.0        OTHER PROOF VODKA
128  1031110.0          LOW PROOF VODKA
133  1032230.0  IMPORTED VODKA - CHERRY
```

[14]:
```
# Even more, '1032' is imported vodka, '1031' is American vodka:
# We notice the fourth digit is 1 if its imported, 2 if its domestic, and 0 if␣
 ↪its a special order item
# Let's load some more columns and do more exploratory analysis...

df = pd.read_csv("Iowa_Liquor_Sales.
 ↪csv",usecols=[1,6,10,22],parse_dates=['Date'],date_parser=pd.
 ↪to_datetime,infer_datetime_format=True)
df=df.dropna()
df['is_imported'] = (df.Category.apply(lambda x: str(x)[3] == '2')).astype(int)
```

```
/Users/adrienpeltzer/anaconda3/lib/python3.8/site-
packages/IPython/core/interactiveshell.py:3071: DtypeWarning: Columns (6) have
mixed types.Specify dtype option on import or set low_memory=False.
  has_raised = await self.run_ast_nodes(code_ast.body, cell_name,
```

[15]:
```
print(df['is_imported'].mean())
```

```
0.4211277705865148
```

[16]:
```
# We see that about 42% of sales are of imported liquor, and this is consistent␣
 ↪throughout the years:
print(df.groupby(df.Date.dt.year)['is_imported'].mean())
```

```
Date
2012    0.419857
2013    0.418968
2014    0.420526
2015    0.420487
2016    0.425664
2017    0.429249
2018    0.423080
2019    0.418872
```

```
2020    0.411866
Name: is_imported, dtype: float64
```

[17]:
```
# Let's look at the top ten stores in terms of sales of liquour by volume.
df = pd.read_csv("Iowa_Liquor_Sales.
 ↪csv",usecols=[1,2,22],parse_dates=['Date'],date_parser=pd.
 ↪to_datetime,infer_datetime_format=True)
```

[18]:
```
S=df['Store Number'].value_counts().head(10)
print(S)
```

```
2633    168336
4829    137875
2190    132943
2512    120184
2515    103677
2603    102936
2614    102554
2572    102553
2648     97442
2501     96805
Name: Store Number, dtype: int64
```

[19]:
```
SS=df.groupby("Store Number")['Volume Sold (Liters)'].sum()
print(SS.sort_values(ascending = False).head(10))
```

```
Store Number
2633    5016658.23
4829    4094064.50
2512    2370292.65
3385    2205381.40
3420    2124792.70
3814    1762118.06
3354    1473726.15
3952    1447992.41
3494    1255362.15
2625    1193432.39
Name: Volume Sold (Liters), dtype: float64
```

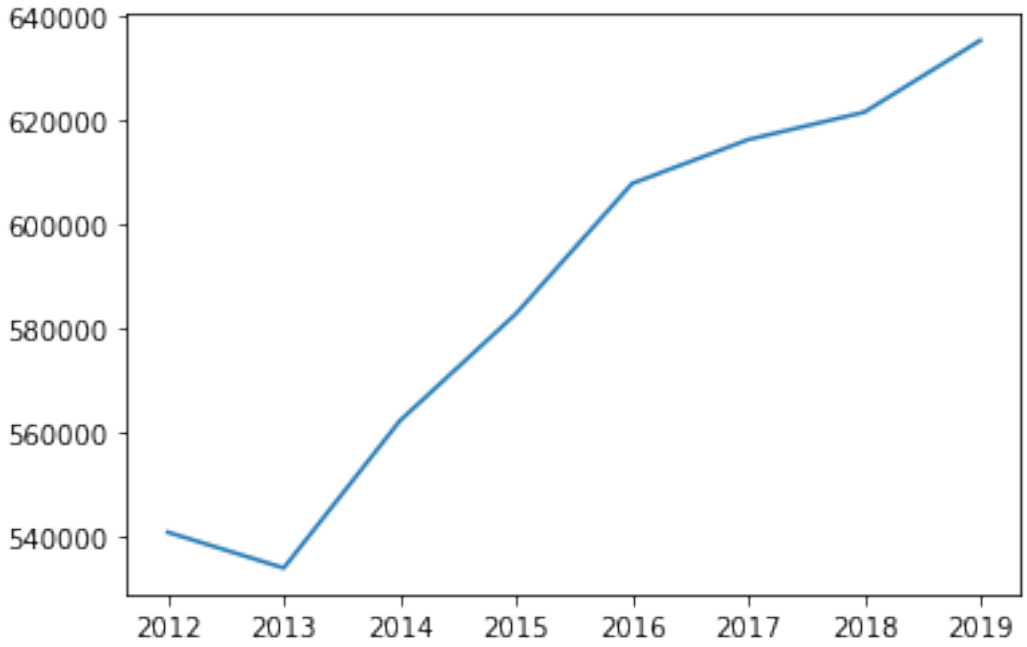
[20]:
```
# We see that, although Store 2190 sold the third most individual sales, it is␣
 ↪not in the top ten in sales by volume
stores = S.sort_values(ascending = False).head(10).index.tolist()
print(stores)
```

```
[2633, 4829, 2190, 2512, 2515, 2603, 2614, 2572, 2648, 2501]
```

[21]:
```
store = stores[0]
topstore=df[df['Store Number']==store]
# Let's look at how the top store fared over the years:
SS=topstore.groupby(topstore.Date.dt.year)['Volume Sold (Liters)'].sum()
print(SS)
```

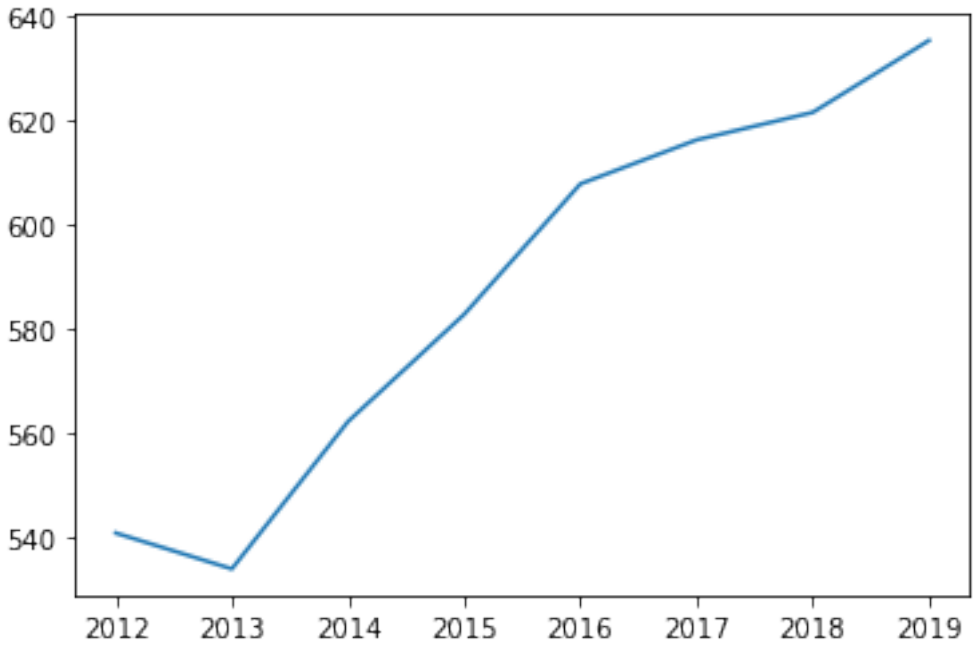
```
Date
2012    540869.60
2013    533980.29
2014    562285.76
2015    582860.61
2016    607905.45
2017    616355.09
2018    621632.30
2019    635444.28
2020    315324.85
Name: Volume Sold (Liters), dtype: float64
```

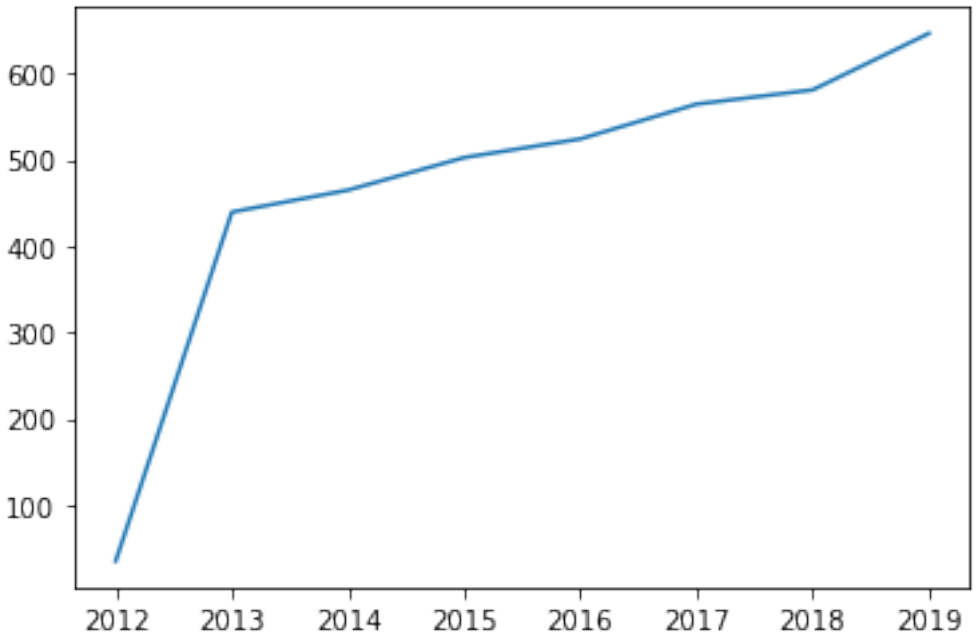
[22]:
```
plt.figure()
plt.plot(SS.iloc[:-1])
plt.show(block=False)
```

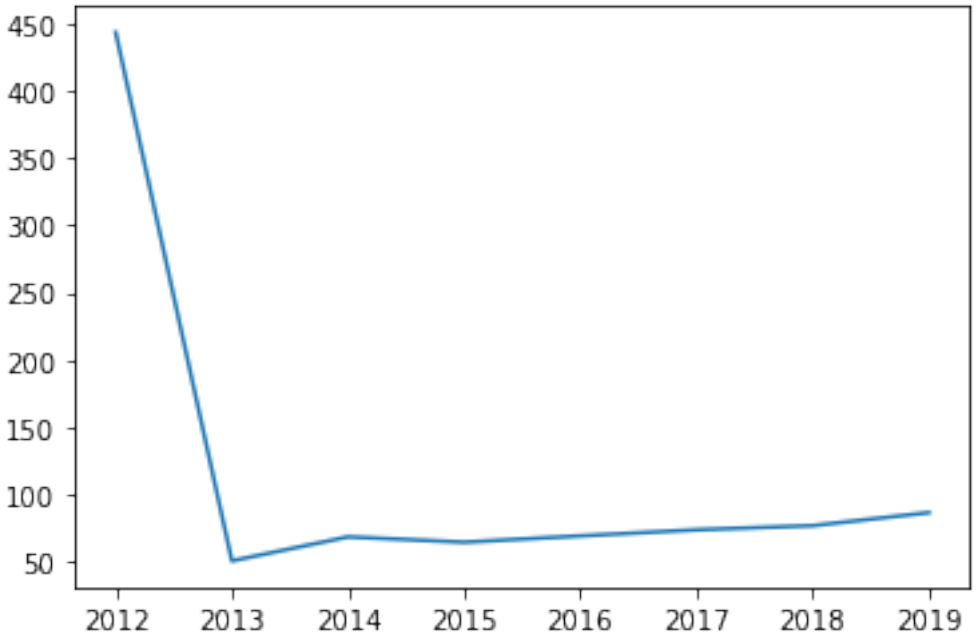


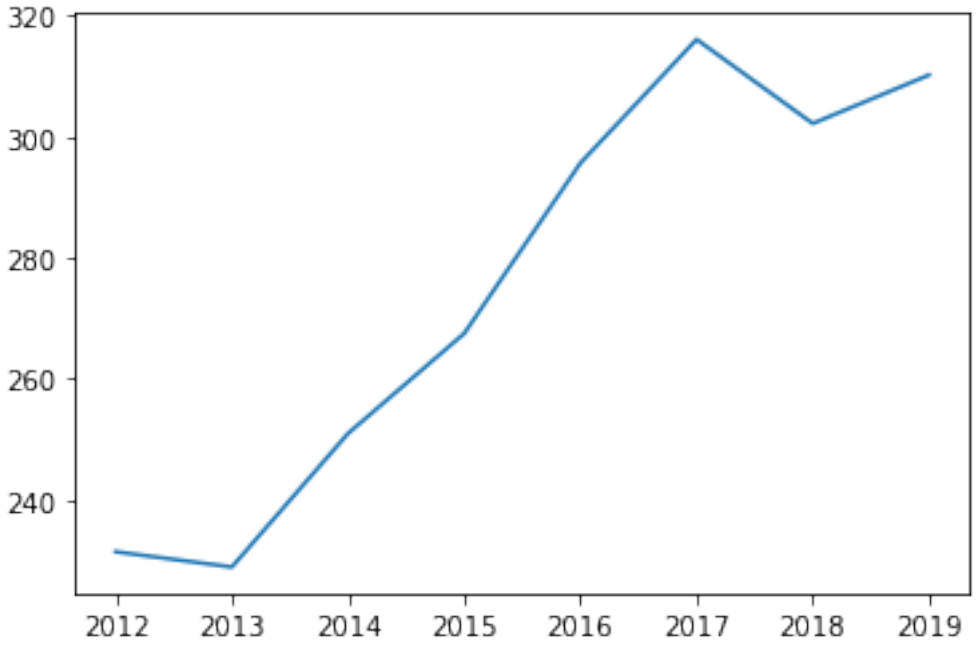
[ ]:
```
plt.close()
```

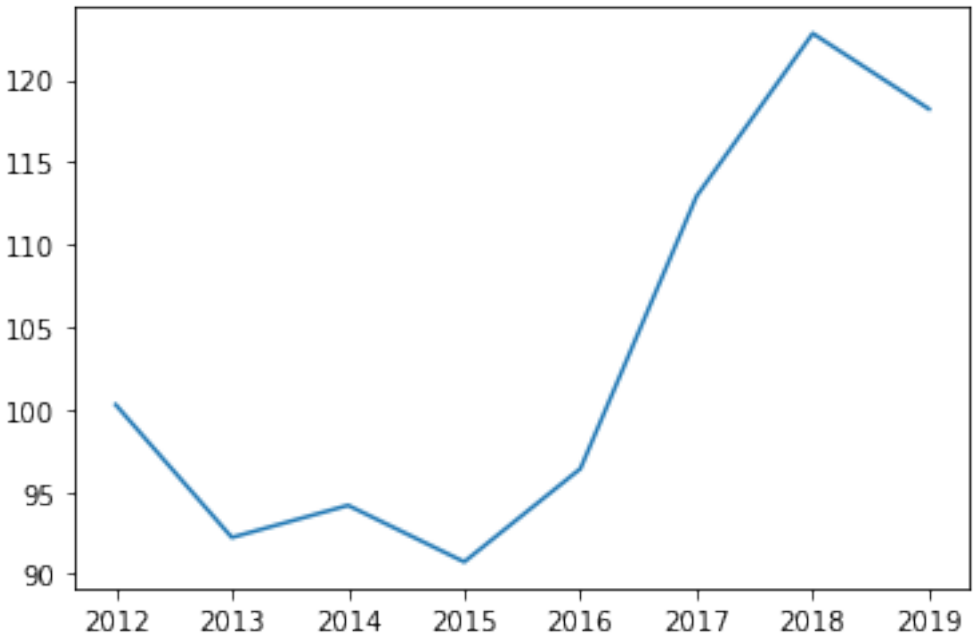
[24]:
```
for store in stores:
    s=df[df['Store Number']==store]
    SS=s.groupby(s.Date.dt.year)['Volume Sold (Liters)'].sum()
    plt.figure()
    plt.plot(SS.iloc[:-1]/1000)
    plt.show(block=False)
    plt.close()
```

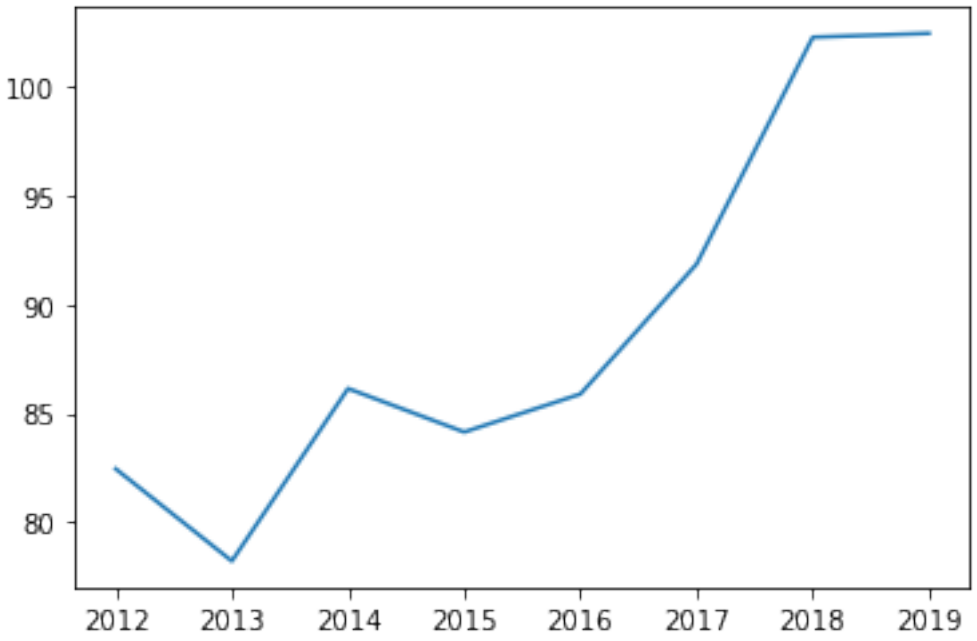


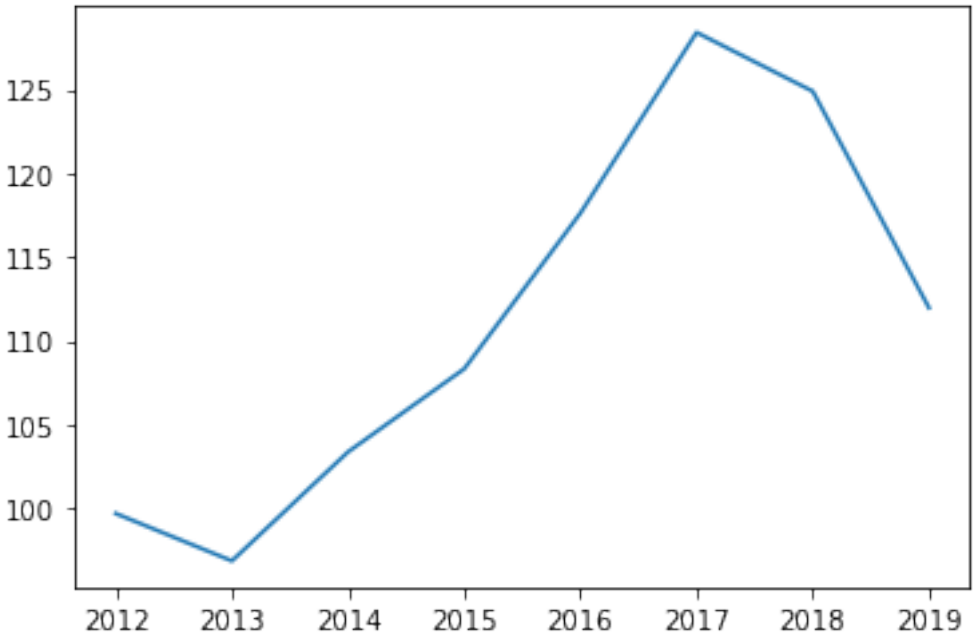

600
500
400
300
200
100
2012
2013
2014
2015
2016
2017
2018
2019

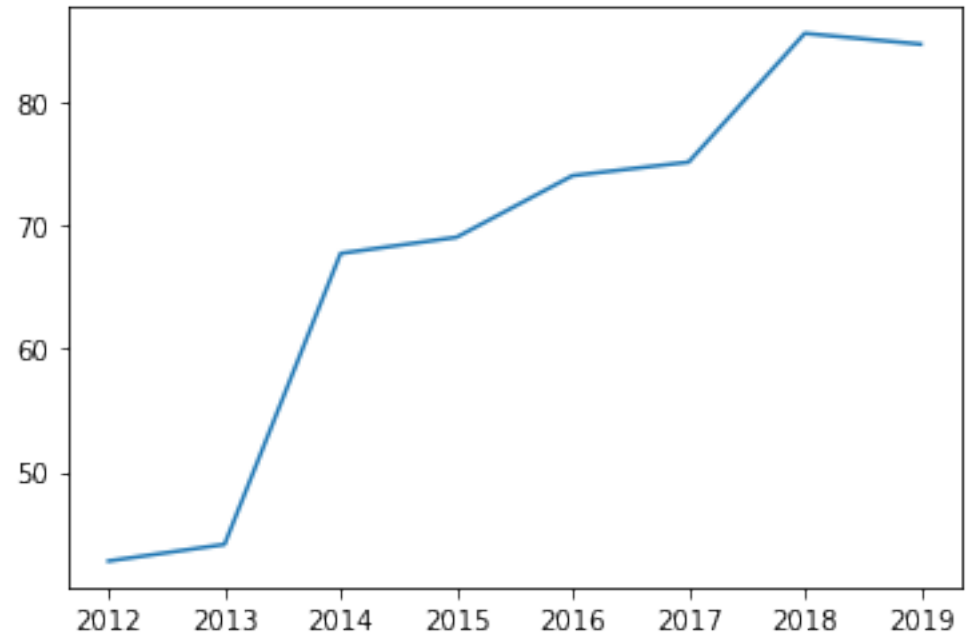

450
400
350
300
250
200
150
100
50
2012
2013
2014
2015
2016
2017
2018
2019

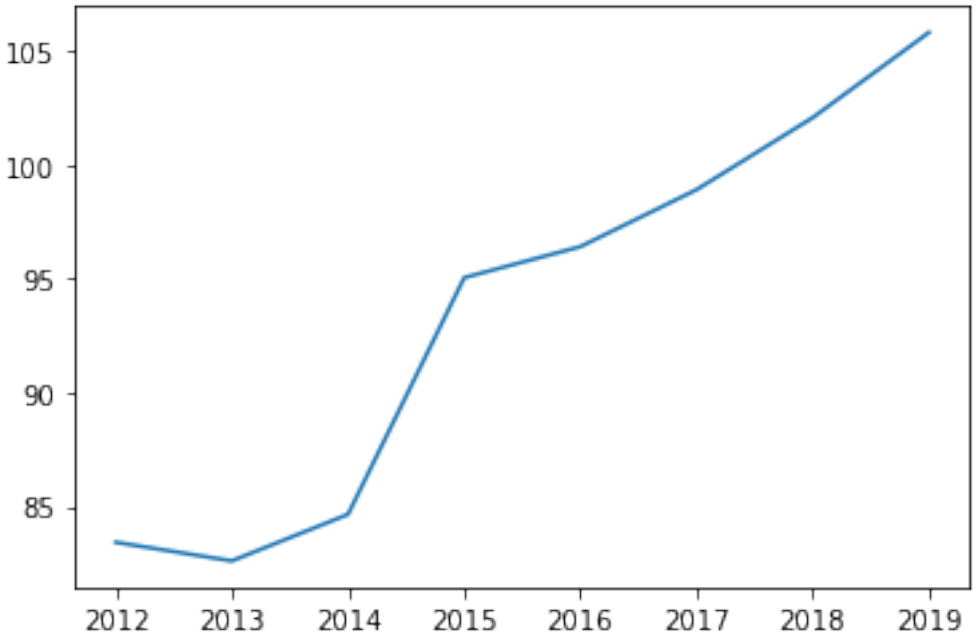

320
300
280
260
240
2012
2013
2014
2015
2016
2017
2018
2019

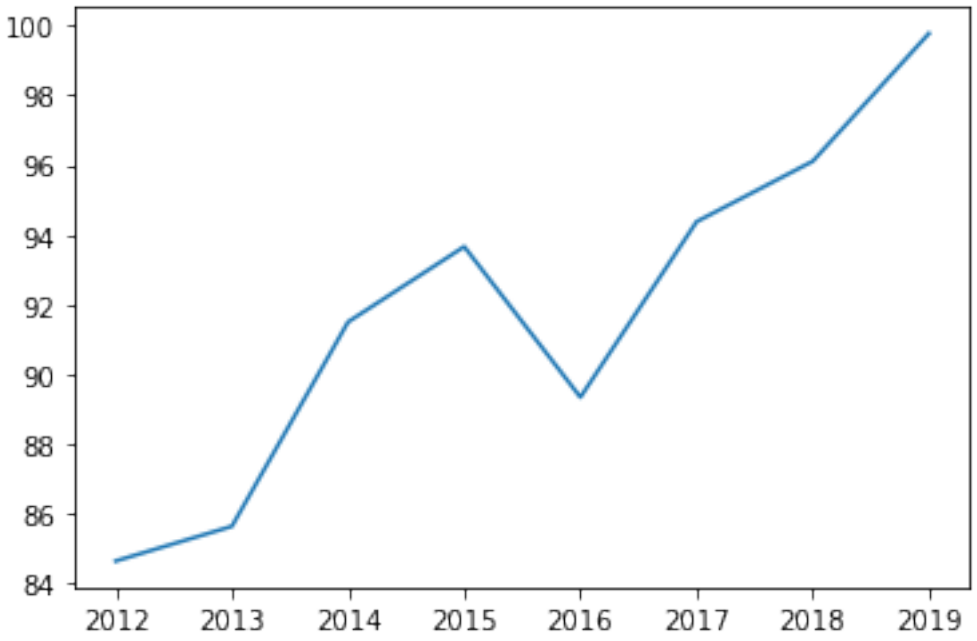

120
115
110
105
100
95
90
2012
2013
2014
2015
2016
2017
2018
2019


100
95
90
85
80
2012
2013
2014
2015
2016
2017
2018
2019


125
120
115
110
105
100
2012
2013
2014
2015
2016
2017
2018
2019


80
70
60
50
2012
2013
2014
2015
2016
2017
2018
2019


105
100
95
90
85
2012
2013
2014
2015
2016
2017
2018
2019



[25]:
```
# The Sales vary drastically by store. Let's find the name of these stores.
Stores = pd.read_csv("Iowa_Liquor_Sales.csv",usecols = [2,3])
```

[26]:
```
Stores = Stores.dropna()
Stores = Stores.groupby("Store Number").first()
```

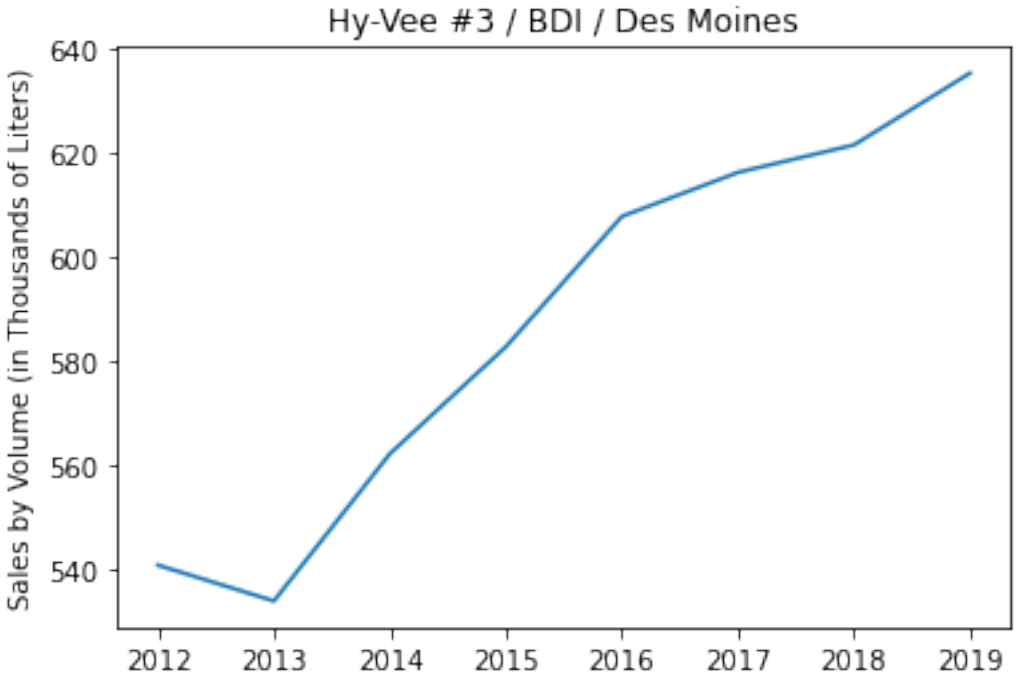
[27]:
```
Stores.loc[stores]
```

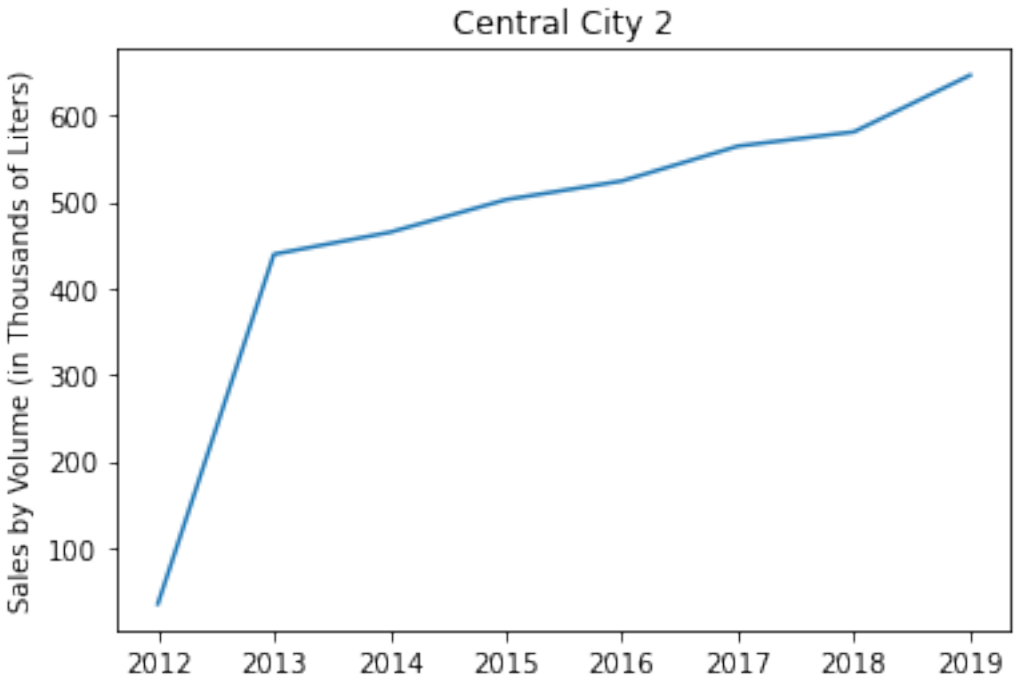
[27]:

Store Number	Store Name
2633	Hy-Vee #3 / BDI / Des Moines
4829	Central City 2
2190	Central City Liquor, Inc.
2512	Hy-Vee Wine and Spirits / Iowa City
2515	Hy-Vee Food Store #1 / Mason City
2603	Hy-Vee Wine and Spirits / Bettendorf
2614	Hy-Vee #3 Food & Drugstore / Davenport
2572	Hy-Vee Food Store / Cedar Falls
2648	Hy-Vee #4 / WDM
2501	Hy-Vee #2 / Ames

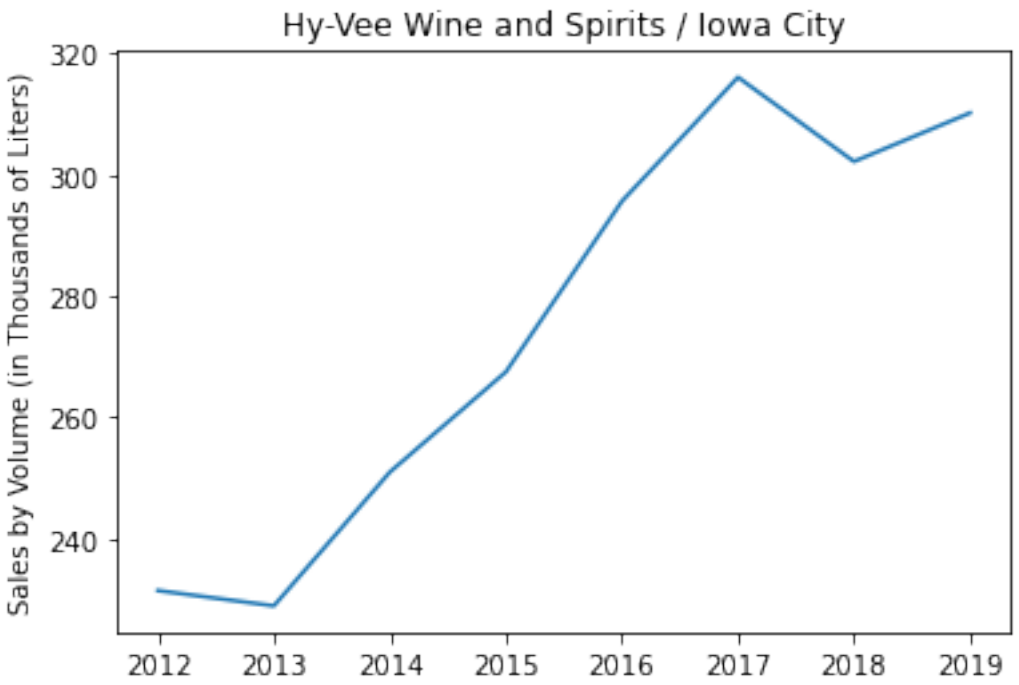
[31]:
```
# lets redo the plots
for store in stores:
    s=df[df['Store Number']==store]
    SS=s.groupby(s.Date.dt.year)['Volume Sold (Liters)'].sum()
    plt.figure()
```

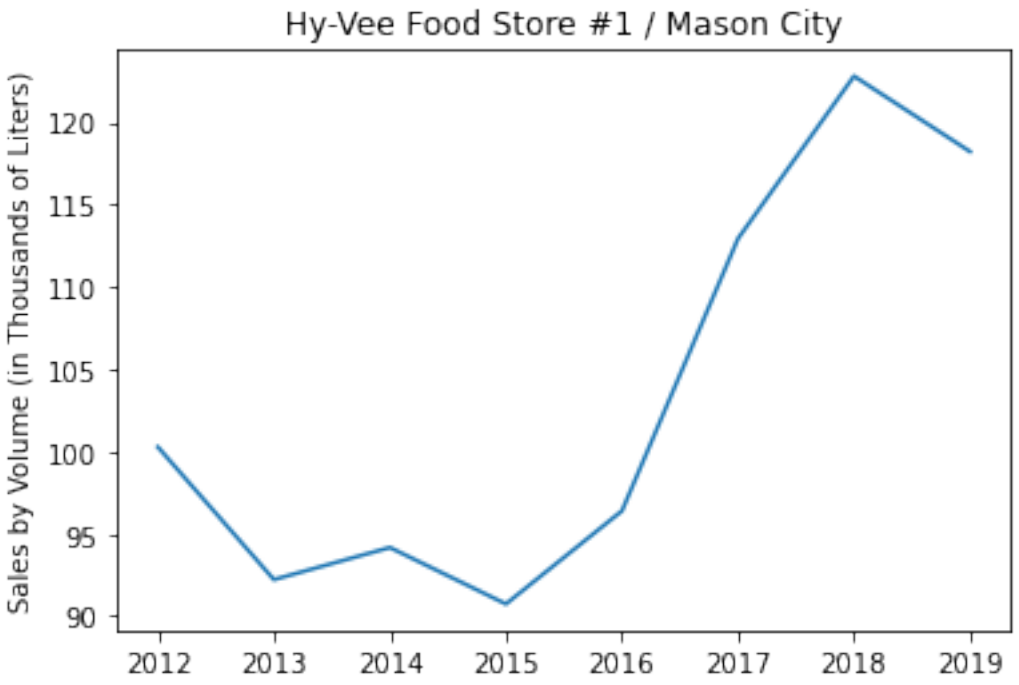
```
    sname = Stores.loc[store]
    plt.plot(SS.iloc[:-1]/1000)
    plt.title(sname.values[0])
    plt.ylabel("Sales by Volume (in Thousands of Liters)")
    plt.show(block=False)
    plt.close()
```

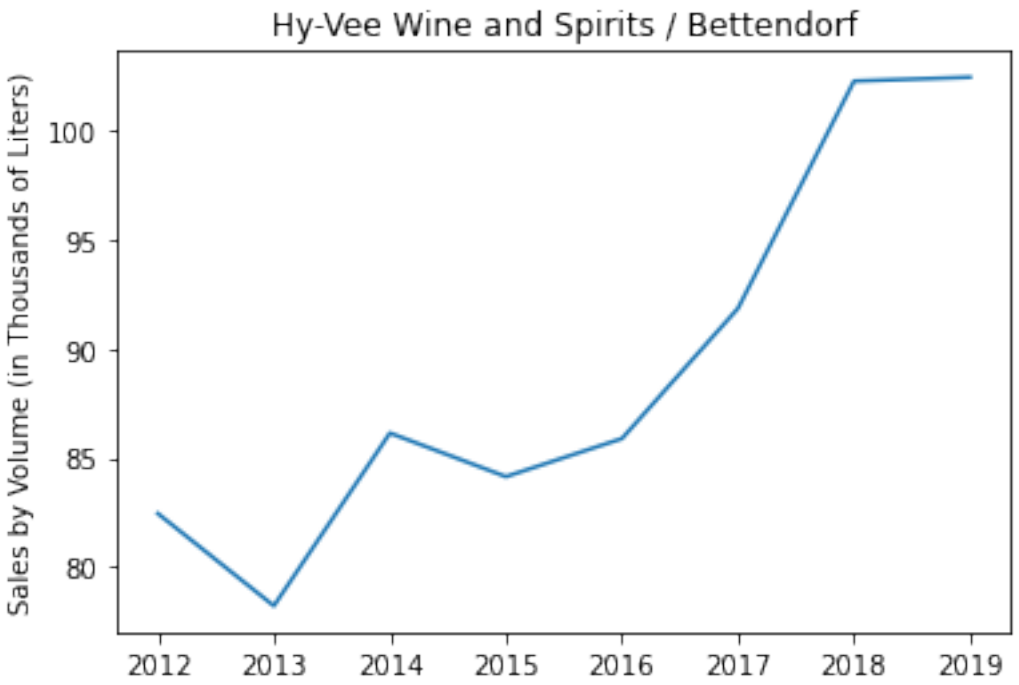


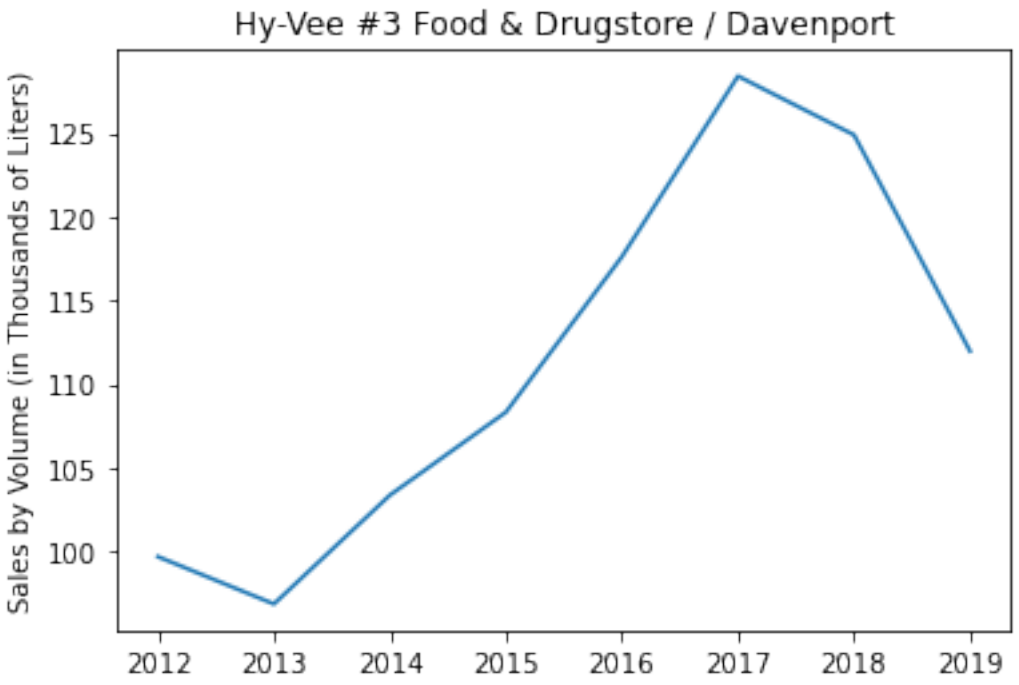

Central City 2
Sales by Volume (in Thousands of Liters)
600
500
400
300
200
100
2012
2013
2014
2015
2016
2017
2018
2019

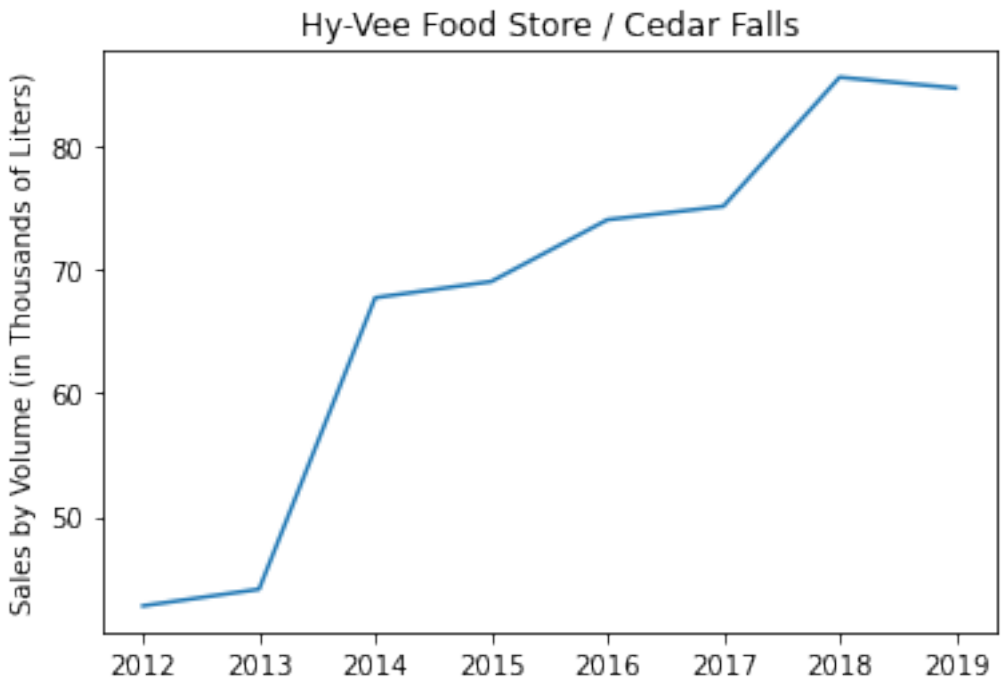

Central City Liquor, Inc.
Sales by Volume (in Thousands of Liters)
450
400
350
300
250
200
150
100
50
2012
2013
2014
2015
2016
2017
2018
2019

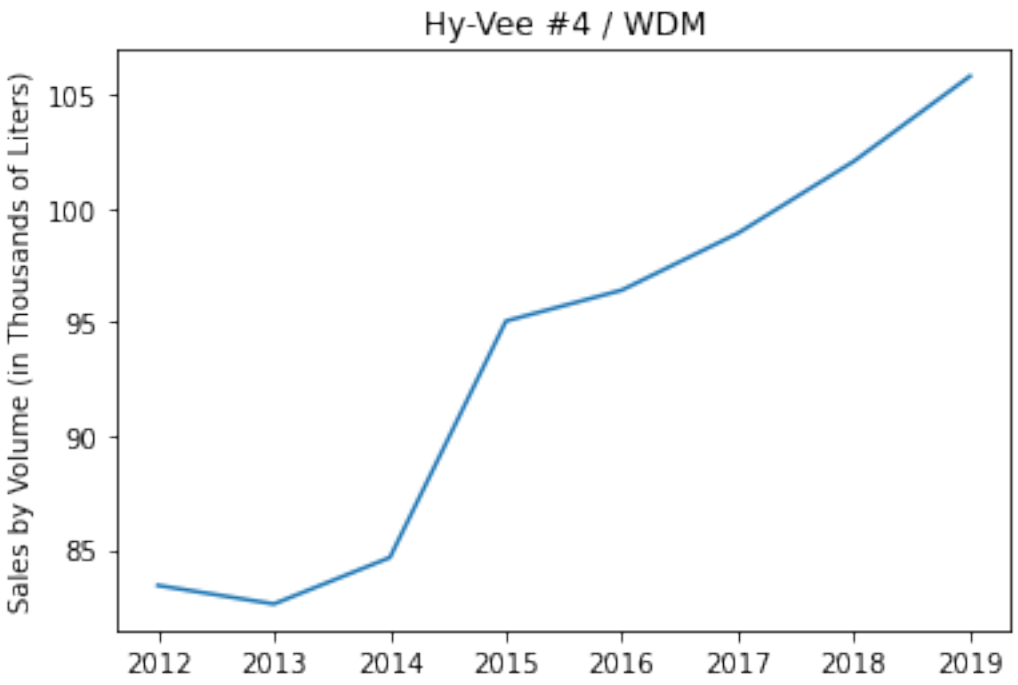

Hy-Vee Wine and Spirits / Iowa City
Sales by Volume (in Thousands of Liters)
320
300
280
260
240
2012
2013
2014
2015
2016
2017
2018
2019

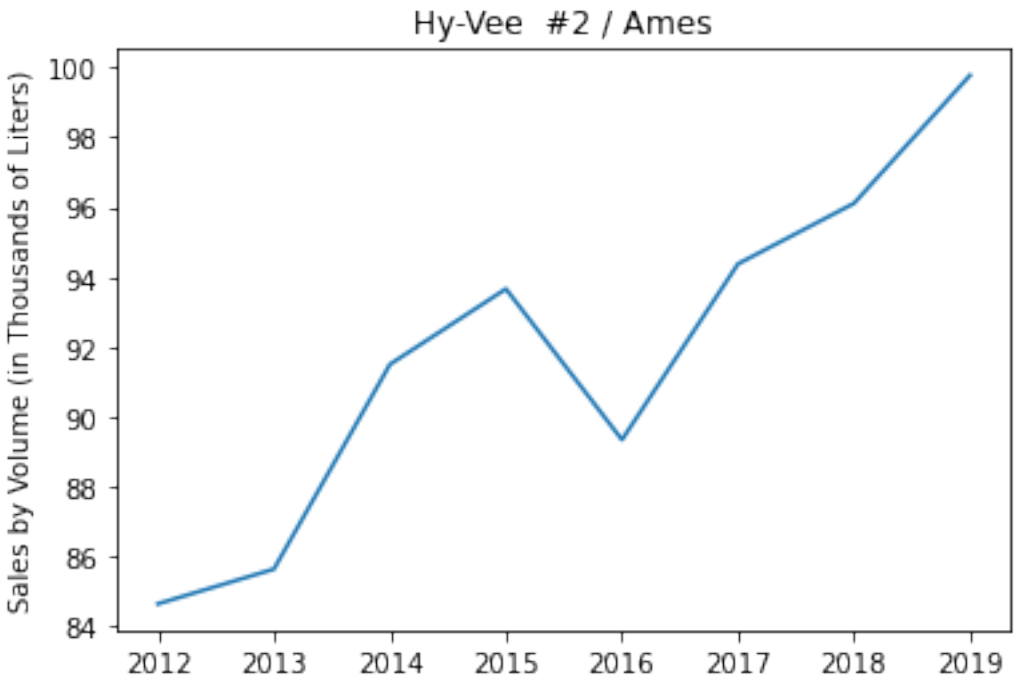

Hy-Vee Food Store #1 / Mason City
Sales by Volume (in Thousands of Liters)
120
115
110
105
100
95
90
2012
2013
2014
2015
2016
2017
2018
2019


Hy-Vee Wine and Spirits / Bettendorf
Sales by Volume (in Thousands of Liters)
100
95
90
85
80
2012
2013
2014
2015
2016
2017
2018
2019


Hy-Vee #3 Food & Drugstore / Davenport
Sales by Volume (in Thousands of Liters)
125
120
115
110
105
100
2012
2013
2014
2015
2016
2017
2018
2019


Hy-Vee Food Store / Cedar Falls
Sales by Volume (in Thousands of Liters)
80
70
60
50
2012
2013
2014
2015
2016
2017
2018
2019


Hy-Vee #4 / WDM
Sales by Volume (in Thousands of Liters)
105
100
95
90
85
2012
2013
2014
2015
2016
2017
2018
2019



[32]:
```
# Looking at Central City 2, and Central City Liquor, Inc., it looks like that␣
↪is the same store, that just underwent a name change.

# Also, Hy-Vee seems to make the most sales. This is a supermarket.
```

[33]:
```
# That's it for Exploratoy Analysis. We will continue later
```

[ ]:
```

```