"Avocado Prices" dataset is used in this notebook :)

In [2]:
```
import numpy as np
import pandas as pd
%matplotlib inline
import matplotlib.pyplot as plt
```

# Creating DataFrames

- From a list of dictionaries (constructed row by row)

In [5]:
```
list_of_dicts = [
    {"name": 'Ginger', "breed":"Dachshund", "height_cm":22,
     "weight_kg":10, "date_of_birth": "2019-03-14"},
    {"name": "Scout", "breed": "Dalmatian", "height_cm": 59,"weight_kg": 25, "da
]
new_dogs = pd.DataFrame(list_of_dicts)
new_dogs
```

Out[5]:

| | name | breed | height_cm | weight_kg | date_of_birth |
|---|---|---|---|---|---|
| **0** | Ginger | Dachshund | 22 | 10 | 2019-03-14 |
| **1** | Scout | Dalmatian | 59 | 25 | 2019-05-09 |

- From a dictionary of lists (constructed column by column)

In [7]:
```
dict_of_lists = {
    "name": ["Ginger", "Scout"],
    "breed" : ["Dachshund", "Dalmation"],
    "height_cm": [22, 59],
    "weight_kg": [10, 25],
    "date_of_birth": ["2019-03-14", "2019-05-09"]  }
new_dogs = pd.DataFrame(dict_of_lists)
new_dogs
```

Out[7]:

| | name | breed | height_cm | weight_kg | date_of_birth |
|---|---|---|---|---|---|
| **0** | Ginger | Dachshund | 22 | 10 | 2019-03-14 |
| **1** | Scout | Dalmation | 59 | 25 | 2019-05-09 |

# Reading and writing CSVs

- CSV = comma-separated values
- Designed for DataFrame-like data
- Most database and spreadsheet programs can use them or create them

In [8]:
```
# read CSV from using pandas
avocado = pd.read_csv(r"c:\Users\Hanshu\Desktop\excel data_ML\avocado.csv")
# print the first few rows of the dataframe
avocado.head()
```

Out[8]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Sm B |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 | 8603 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 | 9408 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 | 8042 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 | 5677 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 | 5986 |

# Read CSV and assign index

You can assign columns as index using "index_col" attribute.

Since I want to index Date there is another helpful function called "parse_date" which will parse the date in the rows such that we can perform more complex subsetting(eg monthly, weekly etc).

In [9]:
```
# read CSV from using pandas and assigning Date as index of the dataframe
avocado = pd.read_csv(r"c:\Users\Hanshu\Desktop\excel data_ML\avocado.csv", inde
# print the first few rows of the dataframe
avocado.head()
```

Out[9]:

| Date | Unnamed: 0 | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Small Bags |
|---|---|---|---|---|---|---|---|---|
| **2015-12-27** | 0 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 | 8603.62 |
| **2015-12-20** | 1 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 | 9408.07 |
| **2015-12-13** | 2 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 | 8042.21 |
| **2015-12-06** | 3 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 | 5677.40 |
| **2015-11-29** | 4 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 | 5986.26 |

# Remove index from dataframe .reset_index(drop)

To reset the index use this function

In [11]:
```
avocado = avocado.reset_index(drop=True)
avocado.head()
```

Out[11]:

| | Unnamed: 0 | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Small Bags | L |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 | 8603.62 | 9 |
| **1** | 1 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 | 9408.07 | 9 |
| **2** | 2 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 | 8042.21 | 10 |
| **3** | 3 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 | 5677.40 | 13 |
| **4** | 4 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 | 5986.26 | 19 |

To write a CSV file function dataframe.to_csv(FILE_NAME)

In [12]:
```
avocado.to_csv("test_write.csv")
```

# Some useful pandas function

- **.head()** or **.head(x)** is used to get the first x rows of the DataFrame (x = 5 by default)

In [13]:
```
avocado = pd.read_csv(r"c:\Users\Hanshu\Desktop\excel data_ML\avocado.csv")
avocado.head()
```

Out[13]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Sm B |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 | 8603 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 | 9408 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 | 8042 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 | 5677 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 | 5986 |

- **.tail()** or **.tail(x)** is used to get the last x rows of the DataFrame (x = 5 by default)

In [14]:
```
avocado.tail(10)
```

Out[14]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | |
|---|---|---|---|---|---|---|---|---|---|
| **18239** | 2 | 2018-03-11 | 1.56 | 22128.42 | 2162.67 | 3194.25 | 8.93 | 16762.57 | 1 |
| **18240** | 3 | 2018-03-04 | 1.54 | 17393.30 | 1832.24 | 1905.57 | 0.00 | 13655.49 | 1 |
| **18241** | 4 | 2018-02-25 | 1.57 | 18421.24 | 1974.26 | 2482.65 | 0.00 | 13964.33 | 1 |
| **18242** | 5 | 2018-02-18 | 1.56 | 17597.12 | 1892.05 | 1928.36 | 0.00 | 13776.71 | 1 |
| **18243** | 6 | 2018-02-11 | 1.57 | 15986.17 | 1924.28 | 1368.32 | 0.00 | 12693.57 | 1 |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 | 1 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 | |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 | |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 | 1 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 | 1 |

- **.info()** is used to get a concise summary of the DataFrame

In [15]:
```
avocado.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18249 entries, 0 to 18248
Data columns (total 14 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Unnamed: 0    18249 non-null  int64  
 1   Date          18249 non-null  object 
 2   AveragePrice  18249 non-null  float64
 3   Total Volume  18249 non-null  float64
 4   4046          18249 non-null  float64
 5   4225          18249 non-null  float64
 6   4770          18249 non-null  float64
 7   Total Bags    18249 non-null  float64
 8   Small Bags    18249 non-null  float64
 9   Large Bags    18249 non-null  float64
 10  XLarge Bags   18249 non-null  float64
 11  type          18249 non-null  object 
 12  year          18249 non-null  int64  
 13  region        18249 non-null  object 
dtypes: float64(9), int64(2), object(3)
memory usage: 1.9+ MB
```

- **.shape** is used to get the dimensions of the DataFrame

```
In [16]: print(avocado.shape)
```

```
(18249, 14)
```

- **.describe()** is used to view some basic statistical details like percentile, mean, std etc. of a DataFrame

```
In [17]: avocado.describe()
```

Out[17]:

| | Unnamed: 0 | AveragePrice | Total Volume | 4046 | 4225 | |
|---|---|---|---|---|---|---|
| **count** | 18249.000000 | 18249.000000 | 1.824900e+04 | 1.824900e+04 | 1.824900e+04 | 1.824900 |
| **mean** | 24.232232 | 1.405978 | 8.506440e+05 | 2.930084e+05 | 2.951546e+05 | 2.283974 |
| **std** | 15.481045 | 0.402677 | 3.453545e+06 | 1.264989e+06 | 1.204120e+06 | 1.074641 |
| **min** | 0.000000 | 0.440000 | 8.456000e+01 | 0.000000e+00 | 0.000000e+00 | 0.000000 |
| **25%** | 10.000000 | 1.100000 | 1.083858e+04 | 8.540700e+02 | 3.008780e+03 | 0.000000 |
| **50%** | 24.000000 | 1.370000 | 1.073768e+05 | 8.645300e+03 | 2.906102e+04 | 1.849900 |
| **75%** | 38.000000 | 1.660000 | 4.329623e+05 | 1.110202e+05 | 1.502069e+05 | 6.243420 |
| **max** | 52.000000 | 3.250000 | 6.250565e+07 | 2.274362e+07 | 2.047057e+07 | 2.546439 |

- **.values** this attribute return a Numpy representation of the given DataFrame

```
In [18]: avocado.values
```

```
Out[18]: array([[0, '2015-12-27', 1.33, ..., 'conventional', 2015, 'Albany'],
                [1, '2015-12-20', 1.35, ..., 'conventional', 2015, 'Albany'],
                [2, '2015-12-13', 0.93, ..., 'conventional', 2015, 'Albany'],
                ...,
                [9, '2018-01-21', 1.87, ..., 'organic', 2018, 'WestTexNewMexico'],
                [10, '2018-01-14', 1.93, ..., 'organic', 2018, 'WestTexNewMexico'],
                [11, '2018-01-07', 1.62, ..., 'organic', 2018, 'WestTexNewMexico']],
               dtype=object)
```

- **.columns** this attribute return a Numpy representation of columns in the DataFrame

```
In [19]: print(avocado.columns)
```

```
Index(['Unnamed: 0', 'Date', 'AveragePrice', 'Total Volume', '4046', '4225',
       '4770', 'Total Bags', 'Small Bags', 'Large Bags', 'XLarge Bags', 'type',
       'year', 'region'],
      dtype='object')
```

# Appending & Concatenating Series

append(): Series & DataFrame method

- Invocation:
- s1.append(s2)
- Stacks rows of s2 below s1

concat(): pandas module function
* Invocation: * pd.concat([s1, s2, s3]) * Can stack row-wise or column-wise

In [25]:
```
even = pd.Series([2,4,6,8,10])
odd = pd.Series([1,3,5,7,9])

res = pd.concat([even,odd])
res
```

Out[25]:
```
0     2
1     4
2     6
3     8
4    10
0     1
1     3
2     5
3     7
4     9
dtype: int64
```

# Observe index got messed up

You can use .reset_index(drop=True) to fix it
Note: if drop = False then previous index will be added as a column

In [26]:
```
res.reset_index(drop=True)
```

Out[26]:
```
0     2
1     4
2     6
3     8
4    10
5     1
6     3
7     5
8     7
9     9
dtype: int64
```

# Sorting

syntax:

> DataFrame.sort_values(by, axis=0, ascending=True, inplace=False, kind='quicksort', na_position='last')

- by: Single/List of column names to sort Data Frame by.
- axis: 0 or 'index' for rows and 1 or 'columns' for Column.
- ascending: Boolean value which sorts Data frame in ascending order if True.
- inplace: Boolean value. Makes the changes in passed data frame itself if True.
- kind: String which can have three inputs('quicksort', 'mergesort' or 'heapsort') of algorithm used to sort data frame.
- na_position: Takes two string input 'last' or 'first' to set position of Null values. Default is 'last'.

In [27]:
```
# sort values based on "AveragePrice" (ascending) and "year" (descending)
avocado.sort_values(['AveragePrice', 'year'], ascending=[True, False])
```

Out[27]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | |
|---|---|---|---|---|---|---|---|---|
| **15261** | 43 | 2017-03-05 | 0.44 | 64057.04 | 223.84 | 4748.88 | 0.00 | 5 |
| **7412** | 47 | 2017-02-05 | 0.46 | 2200550.27 | 1200632.86 | 531226.65 | 18324.93 | 45 |
| **15473** | 43 | 2017-03-05 | 0.48 | 50890.73 | 717.57 | 4138.84 | 0.00 | 4 |
| **15262** | 44 | 2017-02-26 | 0.49 | 44024.03 | 252.79 | 4472.68 | 0.00 | 3 |
| **1716** | 0 | 2015-12-27 | 0.49 | 1137707.43 | 738314.80 | 286858.37 | 11642.46 | 10 |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **16720** | 18 | 2017-08-27 | 3.04 | 12656.32 | 419.06 | 4851.90 | 145.09 | |
| **16055** | 42 | 2017-03-12 | 3.05 | 2068.26 | 1043.83 | 77.36 | 0.00 | |
| **14124** | 7 | 2016-11-06 | 3.12 | 19043.80 | 5898.49 | 10039.34 | 0.00 | |
| **17428** | 37 | 2017-04-16 | 3.17 | 3018.56 | 1255.55 | 82.31 | 0.00 | |
| **14125** | 8 | 2016-10-30 | 3.25 | 16700.94 | 2325.93 | 11142.85 | 0.00 | |

18249 rows × 14 columns

## Sorting by index

use df.sort_index(ascending=True/False)

# Subsetting

Subsetting is used to get a slice of the original dataframe

In [28]:
```
# Subsetting columns
avocado['AveragePrice']
```

Out[28]:
```
0        1.33
1        1.35
2        0.93
3        1.08
4        1.28
         ...
18244    1.63
18245    1.71
18246    1.87
18247    1.93
18248    1.62
Name: AveragePrice, Length: 18249, dtype: float64
```

## Subsetting multiple columns

In [29]:
```
# Subsetting multiple columns
avocado[['AveragePrice', 'Date']]
```

Out[29]:

| | AveragePrice | Date |
|---|---|---|
| **0** | 1.33 | 2015-12-27 |
| **1** | 1.35 | 2015-12-20 |
| **2** | 0.93 | 2015-12-13 |
| **3** | 1.08 | 2015-12-06 |
| **4** | 1.28 | 2015-11-29 |
| **...** | ... | ... |
| **18244** | 1.63 | 2018-02-04 |
| **18245** | 1.71 | 2018-01-28 |
| **18246** | 1.87 | 2018-01-21 |
| **18247** | 1.93 | 2018-01-14 |
| **18248** | 1.62 | 2018-01-07 |

18249 rows × 2 columns

## Subsetting rows

In [30]:
```
# Subsetting rows
avocado['AveragePrice']<1
```

Out[30]:
```
0        False
1        False
2         True
3        False
4        False
         ...
18244    False
18245    False
18246    False
18247    False
18248    False
Name: AveragePrice, Length: 18249, dtype: bool
```

and then using it for subsetting the original dataframe

In [31]:
```
# This will print only the rows with price < 1
avocado[avocado['AveragePrice']<1]
```

Out[31]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Tot Ba |
|---|---|---|---|---|---|---|---|---|
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145. |
| **6** | 6 | 2015-11-15 | 0.99 | 83453.76 | 1368.92 | 73672.72 | 93.26 | 8318. |
| **7** | 7 | 2015-11-08 | 0.98 | 109428.33 | 703.75 | 101815.36 | 80.00 | 6829. |
| **13** | 13 | 2015-09-27 | 0.99 | 106803.39 | 1204.88 | 99409.21 | 154.84 | 6034. |
| **43** | 43 | 2015-03-01 | 0.99 | 55595.74 | 629.46 | 45633.34 | 181.49 | 9151. |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **17169** | 43 | 2017-03-05 | 0.99 | 155011.12 | 35367.23 | 5175.81 | 5.91 | 114462. |
| **17170** | 44 | 2017-02-26 | 0.99 | 171145.00 | 34520.03 | 6936.39 | 0.00 | 129688. |
| **17536** | 39 | 2017-04-02 | 0.98 | 402676.23 | 34093.33 | 58330.53 | 207.85 | 310044. |
| **17537** | 40 | 2017-03-26 | 0.90 | 456645.91 | 36169.35 | 51398.72 | 139.55 | 368938. |
| **17540** | 43 | 2017-03-05 | 0.99 | 367519.17 | 61166.48 | 55123.99 | 126.80 | 251101. |

2796 rows × 14 columns

## Subsetting based on text data

In [32]:
```
# it will print all the rows with "type" = "organic"
```

```
avocado[avocado['type']=='organic']
```

Out[32]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | |
|---|---|---|---|---|---|---|---|---|---|
| **9126** | 0 | 2015-12-27 | 1.83 | 989.55 | 8.16 | 88.59 | 0.00 | 892.80 | |
| **9127** | 1 | 2015-12-20 | 1.89 | 1163.03 | 30.24 | 172.14 | 0.00 | 960.65 | |
| **9128** | 2 | 2015-12-13 | 1.85 | 995.96 | 10.44 | 178.70 | 0.00 | 806.82 | |
| **9129** | 3 | 2015-12-06 | 1.84 | 1158.42 | 90.29 | 104.18 | 0.00 | 963.95 | |
| **9130** | 4 | 2015-11-29 | 1.94 | 831.69 | 0.00 | 94.73 | 0.00 | 736.96 | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 | 1 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 | |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 | |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 | 1 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 | 1 |

9123 rows × 14 columns

## Subsetting based on dates

In [33]:
```
# it will print all the rows with "Date" <= 2015-02-04
avocado[avocado['Date']<='2015-02-04']
```

Out[33]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **47** | 47 | 2015-02-01 | 0.99 | 70873.60 | 1353.90 | 60017.20 | 179.32 | 9323.18 |
| **48** | 48 | 2015-01-25 | 1.06 | 45147.50 | 941.38 | 33196.16 | 164.14 | 10845.82 |
| **49** | 49 | 2015-01-18 | 1.17 | 44511.28 | 914.14 | 31540.32 | 135.77 | 11921.05 |
| **50** | 50 | 2015-01-11 | 1.24 | 41195.08 | 1002.85 | 31640.34 | 127.12 | 8424.77 |
| **51** | 51 | 2015-01-04 | 1.22 | 40873.28 | 2819.50 | 28287.42 | 49.90 | 9716.46 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **11928** | 46 | 2015-02-01 | 1.77 | 7210.19 | 1634.42 | 3012.44 | 0.00 | 2563.33 |
| **11929** | 47 | 2015-01-25 | 1.63 | 7324.06 | 1934.46 | 3032.72 | 0.00 | 2356.88 |
| **11930** | 48 | 2015-01-18 | 1.71 | 5508.20 | 1793.64 | 2078.72 | 0.00 | 1635.84 |
| **11931** | 49 | 2015-01-11 | 1.69 | 6861.73 | 1822.28 | 2377.54 | 0.00 | 2661.91 |
| **11932** | 50 | 2015-01-04 | 1.64 | 6182.81 | 1561.30 | 2958.17 | 0.00 | 1663.34 |

540 rows × 14 columns

## Subsetting based on multiple conditions

You can use the logical operators to define a complex condition

- "&" and
- "|" or
- "~" not

> ** SEPERATE EACH CONDITION WITH PARENTHESES TO AVOID ERRORS**

In [34]:
```
# it will print all the rows with "Date" before 2015-02-04 and "type" == "organi
avocado[(avocado["Date"]<"2015-02-04") & (avocado["type"]=="organic")]
```

Out[34]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Sm Ba |
|---|---|---|---|---|---|---|---|---|---|
| **9173** | 47 | 2015-02-01 | 1.83 | 1228.51 | 33.12 | 99.36 | 0.0 | 1096.03 | 1096 |
| **9174** | 48 | 2015-01-25 | 1.89 | 1115.89 | 14.87 | 148.72 | 0.0 | 952.30 | 952 |
| **9175** | 49 | 2015-01-18 | 1.93 | 1118.47 | 8.02 | 178.78 | 0.0 | 931.67 | 931 |
| **9176** | 50 | 2015-01-11 | 1.77 | 1182.56 | 39.00 | 305.12 | 0.0 | 838.44 | 838 |
| **9177** | 51 | 2015-01-04 | 1.79 | 1373.95 | 57.42 | 153.88 | 0.0 | 1162.65 | 1162 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | |
| **11928** | 46 | 2015-02-01 | 1.77 | 7210.19 | 1634.42 | 3012.44 | 0.0 | 2563.33 | 2563 |
| **11929** | 47 | 2015-01-25 | 1.63 | 7324.06 | 1934.46 | 3032.72 | 0.0 | 2356.88 | 2320 |
| **11930** | 48 | 2015-01-18 | 1.71 | 5508.20 | 1793.64 | 2078.72 | 0.0 | 1635.84 | 1620 |
| **11931** | 49 | 2015-01-11 | 1.69 | 6861.73 | 1822.28 | 2377.54 | 0.0 | 2661.91 | 2656 |
| **11932** | 50 | 2015-01-04 | 1.64 | 6182.81 | 1561.30 | 2958.17 | 0.0 | 1663.34 | 1663 |

270 rows × 14 columns

# Subsetting using .isin()

isin() method helps in selecting rows with having a particular(or Multiple) value in a particular column

> Syntax: DataFrame.isin(values)
>
> Parameters: values: iterable, Series, List, Tuple, DataFrame or dictionary to check in the caller Series/Data Frame.
>
> Return Type: DataFrame of Boolean of Dimension.

In [35]:
```
# subset the avocado in the region Boston or SanDiego
regionFilter = avocado['region'].isin(['Boston', 'SanDiego'])
avocado[regionFilter]
```

Out[35]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Tot Ba |
|---|---|---|---|---|---|---|---|---|
| **208** | 0 | 2015-12-27 | 1.13 | 450816.39 | 3886.27 | 346964.70 | 13952.56 | 86012. |
| **209** | 1 | 2015-12-20 | 1.07 | 489802.88 | 4912.37 | 390100.99 | 5887.72 | 88901. |
| **210** | 2 | 2015-12-13 | 1.01 | 549945.76 | 4641.02 | 455362.38 | 219.40 | 89722. |
| **211** | 3 | 2015-12-06 | 1.02 | 488679.31 | 5126.32 | 407520.22 | 142.99 | 75889. |
| **212** | 4 | 2015-11-29 | 1.19 | 350559.81 | 3609.25 | 272719.08 | 105.86 | 74125. |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **18100** | 7 | 2018-02-04 | 1.81 | 17454.74 | 1158.41 | 7388.27 | 0.00 | 8908. |
| **18101** | 8 | 2018-01-28 | 1.91 | 17579.47 | 1145.64 | 8284.41 | 0.00 | 8149. |
| **18102** | 9 | 2018-01-21 | 1.95 | 18676.37 | 1088.49 | 9282.37 | 0.00 | 8305. |
| **18103** | 10 | 2018-01-14 | 1.81 | 21770.02 | 3285.98 | 14338.52 | 0.00 | 4145. |
| **18104** | 11 | 2018-01-07 | 2.06 | 16746.82 | 5150.82 | 9366.31 | 0.00 | 2229. |

676 rows × 14 columns

# %% md

## Multiple parameter Filtering

Use logical operators to combine different filters

In [38]:
```
# subset the avocado in the region Boston or SanDiego in the year 2016 or 2017
regionFilter = avocado["region"].isin(["Boston", "SanDiego"])
yearFilter = avocado["year"].isin(["2016", "2017"])
avocado[regionFilter & yearFilter]
```

Out[38]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Small Bags | Large Bags | XLa B |
|---|---|---|---|---|---|---|---|---|---|---|---|

# Detecting missing values .isna()

.isna() is a method used to find is there exist any NaN values in the

# Detecting missing values .isna()

.isna() is a method used to find is there exist any NaN values in the DataFrame

It will give a True bool value if a cell has a NaN value

In [39]:
```
avocado.isna()
```

Out[39]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags | Small Bags | Large Bags |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False |
| **1** | False | False | False | False | False | False | False | False | False | False |
| **2** | False | False | False | False | False | False | False | False | False | False |
| **3** | False | False | False | False | False | False | False | False | False | False |
| **4** | False | False | False | False | False | False | False | False | False | False |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **18244** | False | False | False | False | False | False | False | False | False | False |
| **18245** | False | False | False | False | False | False | False | False | False | False |
| **18246** | False | False | False | False | False | False | False | False | False | False |
| **18247** | False | False | False | False | False | False | False | False | False | False |
| **18248** | False | False | False | False | False | False | False | False | False | False |

18249 rows × 14 columns

## We can use .any() function to get a consise info

In [40]:
```
avocado.isna().any()
```

Out[40]:
```
Unnamed: 0      False
Date            False
AveragePrice    False
Total Volume    False
4046            False
4225            False
4770            False
Total Bags      False
Small Bags      False
Large Bags      False
XLarge Bags     False
type            False
year            False
region          False
dtype: bool
```

# Counting missing values

In [41]:
```
avocado.isna().sum()
```

Out[41]:
```
Unnamed: 0      0
Date            0
AveragePrice    0
Total Volume    0
4046            0
4225            0
4770            0
Total Bags      0
Small Bags      0
Large Bags      0
XLarge Bags     0
type            0
year            0
region          0
dtype: int64
```

# Removing missing values

- Drop NaN ** .dropna() **
- Fill NaN with value x ** .fillna(x) **

In [42]:
```
# Luckily we don't have any NaN but if we have we can use any of the two methods

avocado.dropna()

# OR

meanVal = avocado['AveragePrice'].mean()
avocado.fillna(meanVal)
```

Out[42]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 |

18249 rows × 14 columns

# Adding a new column

It can easily be done using the [ ] brackets

Lets add a new column to our dataframe called AveragePricePer100

In [43]:
```
avocado['AveragePricePer100'] = avocado['AveragePrice'] * 100
avocado
```

Out[43]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 |

18249 rows × 15 columns

# Deleting columns in DataFrame .drop(lst,axis = 1)

> dataFrame.drop(['COLUMN_NAME'], axis = 1)

- the first parameter is a list of columns to be deleted
- axis = 1 means delete column
- axis = 0 means delete row

In [44]:
```
avocado.drop(['AveragePricePer100'], axis = 1)
```

Out[44]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 |

18249 rows × 14 columns

# Summary statistics

Some of the functions availabe in pandas are:

> .median() .mode() .min() .max() .var() .std() .sum() .quantile()

In [45]:
```
# mean of the AveragePrice of avocado
avocado['AveragePrice'].mean()
```

Out[45]:
```
1.405978409775878
```

# Summarizing dates

To find the min or max date in a dataframe

In [46]:
```
avocado['Date'].max()
```

Out[46]: '2018-03-25'

# .agg() method

Pandas Series.agg() is used to pass a function or list of function to be applied on a series or even each element of series separately.

> Syntax: Series.agg(func, axis=0)
>
> Parameters: func: Function, list of function or string of function name to be called on Series. axis:0 or 'index' for row wise operation and 1 or 'columns' for column wise operation.
>
> Return Type: The return type depends on return type of function passed as parameter.

In [49]:
```
def pct30(column):
    #return the 0.3 quartile
    return column.quantile(0.3)
def pct50(column):
    return column.quantile(0.5)

avocado[["AveragePrice","Total Bags"]].agg([pct30,pct50])
```

Out[49]:

| | AveragePrice | Total Bags |
|---|---|---|
| **pct30** | 1.15 | 7316.634 |
| **pct50** | 1.37 | 39743.830 |

# Dropping duplicate names .drop_duplicates(lst)

Delete all the duplicate names from the dataframe

In [50]:
```
temp = avocado.drop_duplicates(subset=["year"])
temp
```

Out[50]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 |
| **2808** | 0 | 2016-12-25 | 1.52 | 73341.73 | 3202.39 | 58280.33 | 426.92 | 11432.09 |
| **5616** | 0 | 2017-12-31 | 1.47 | 113514.42 | 2622.70 | 101135.53 | 20.25 | 9735.94 |
| **8478** | 0 | 2018-03-25 | 1.57 | 149396.50 | 16361.69 | 109045.03 | 65.45 | 23924.33 |

# Count categorical data .value_counts()

Pandas Series.value_counts() function return a Series containing counts of unique values.

> Syntax: Series.value_counts(normalize=False, sort=True, ascending=False, bins=None, dropna=True)
>
> Parameter :

normalize : If True then the object returned will contain the relative frequencies of the unique values. sort : Sort by values. ascending : Sort in ascending order. bins : Rather than count values, group them into half-open bins, a convenience for pd.cut, only works with numeric data. dropna : Don't include counts of NaN.

> Returns : counts : Series

In [51]:
```
# count number of avocado in each year in descending order
avocado["year"].value_counts(sort=True, ascending = False)
```

Out[51]:
```
year
2017    5722
2016    5616
2015    5615
2018    1296
Name: count, dtype: int64
```

# Grouped summaries .groupby(col)

This function will group similar categories into one and then we can perform some summary statistics

> Syntax: DataFrame.groupby(by=None, axis=0, level=None, as_index=True, sort=True, group_keys=True, squeeze=False, **kwargs)
>
> Parameters : by : mapping, function, str, or iterable
> axis : int, default 0

> level : If the axis is a MultiIndex (hierarchical), group by a particular level or levels
> as_index : For aggregated output, return object with group labels as the index. Only relevant for DataFrame input. as_index=False is effectively "SQL-style" grouped output
> sort : Sort group keys. Get better performance by turning this off. Note this does not influence the order of observations within each group. groupby preserves the order of rows within each group.
> group_keys : When calling apply, add group keys to index to identify pieces
> squeeze : Reduce the dimensionality of the return type if possible, otherwise return a consistent type
>
> Returns : GroupBy object

In [52]:
```
# group by multiple columns and perform multiple summary statistic operations
avocado.groupby(["year","type"])["AveragePrice"].agg([min,max,np.mean,np.median])
```

```
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\3377443975.py:2: FutureWarnin
g: The provided callable <built-in function min> is currently using SeriesGroupB
y.min. In a future version of pandas, the provided callable will be used directl
y. To keep current behavior pass the string "min" instead.
  avocado.groupby(["year","type"])["AveragePrice"].agg([min,max,np.mean,np.media
n])
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\3377443975.py:2: FutureWarnin
g: The provided callable <built-in function max> is currently using SeriesGroupB
y.max. In a future version of pandas, the provided callable will be used directl
y. To keep current behavior pass the string "max" instead.
  avocado.groupby(["year","type"])["AveragePrice"].agg([min,max,np.mean,np.media
n])
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\3377443975.py:2: FutureWarnin
g: The provided callable <function mean at 0x000001FC71C88FE0> is currently using
SeriesGroupBy.mean. In a future version of pandas, the provided callable will be
used directly. To keep current behavior pass the string "mean" instead.
  avocado.groupby(["year","type"])["AveragePrice"].agg([min,max,np.mean,np.media
n])
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\3377443975.py:2: FutureWarnin
g: The provided callable <function median at 0x000001FC71DD7C40> is currently usi
ng SeriesGroupBy.median. In a future version of pandas, the provided callable wil
l be used directly. To keep current behavior pass the string "median" instead.
  avocado.groupby(["year","type"])["AveragePrice"].agg([min,max,np.mean,np.media
n])
```

Out[52]:

| year | type | min | max | mean | median |
|---|---|---|---|---|---|
| **2015** | **conventional** | 0.49 | 1.59 | 1.077963 | 1.08 |
| | **organic** | 0.81 | 2.79 | 1.673324 | 1.67 |
| **2016** | **conventional** | 0.51 | 2.20 | 1.105595 | 1.08 |
| | **organic** | 0.58 | 3.25 | 1.571684 | 1.53 |
| **2017** | **conventional** | 0.46 | 2.22 | 1.294888 | 1.30 |
| | **organic** | 0.44 | 3.17 | 1.735521 | 1.72 |
| **2018** | **conventional** | 0.56 | 1.74 | 1.127886 | 1.14 |
| | **organic** | 1.01 | 2.30 | 1.567176 | 1.55 |

# Pivot table

A pivot table is a table of statistics that summarizes the data of a more extensive table.

IMPORRANT paremeents to remember are
"index": it is the value that appeares on the left most side of the table (it can be a list)
"columns": these are the column you want to add to the pivot table
"aggfunc": it will call the function (it can be a list)
"values": it is the attribute which will be summarized in the table (values inside the table)

> Syntax
> pandas.pivot_table(data, values=None, index=None, columns=None,
> aggfunc='mean', fill_value=None, margins=False, dropna=True,
> margins_name='All')
>
> Parameters:

data : DataFrame
values : column to aggregate, optional
index: column, Grouper, array, or list of the previousv columns: column, Grouper, array, or list of the previous

> aggfunc: function, list of functions, dict, default numpy.mean

....If list of functions passed, the resulting pivot table will have hierarchical columns whose top level are the function names.
....If dict is passed, the key is column to aggregate and value is function or list of functions
fill_value[scalar, default None] : Value to replace missing values with
margins[boolean, default False] : Add all row / columns (e.g. for subtotal / grand totals)
dropna[boolean, default True] : Do not include columns whose entries are all NaN

margins_name[string, default 'All'] : Name of the row / column that will contain the totals when margins is True.

> Returns: DataFrame

In [53]:
```
# this is the same table we build in the previous cell but using pivot table
avocado.pivot_table(index=["year","type"], aggfunc=[min,max,np.mean,np.median],
```

```
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\2260399101.py:2: FutureWarnin
g: The provided callable <built-in function min> is currently using DataFrameGrou
pBy.min. In a future version of pandas, the provided callable will be used direct
ly. To keep current behavior pass the string "min" instead.
  avocado.pivot_table(index=["year","type"], aggfunc=[min,max,np.mean,np.median],
values="AveragePrice")
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\2260399101.py:2: FutureWarnin
g: The provided callable <built-in function max> is currently using DataFrameGrou
pBy.max. In a future version of pandas, the provided callable will be used direct
ly. To keep current behavior pass the string "max" instead.
  avocado.pivot_table(index=["year","type"], aggfunc=[min,max,np.mean,np.median],
values="AveragePrice")
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\2260399101.py:2: FutureWarnin
g: The provided callable <function mean at 0x000001FC71C88FE0> is currently using
DataFrameGroupBy.mean. In a future version of pandas, the provided callable will
be used directly. To keep current behavior pass the string "mean" instead.
  avocado.pivot_table(index=["year","type"], aggfunc=[min,max,np.mean,np.median],
values="AveragePrice")
C:\Users\Hanshu\AppData\Local\Temp\ipykernel_21868\2260399101.py:2: FutureWarnin
g: The provided callable <function median at 0x000001FC71DD7C40> is currently usi
ng DataFrameGroupBy.median. In a future version of pandas, the provided callable
will be used directly. To keep current behavior pass the string "median" instead.
  avocado.pivot_table(index=["year","type"], aggfunc=[min,max,np.mean,np.median],
values="AveragePrice")
```

Out[53]:

| | | min | max | mean | median |
|---|---|---|---|---|---|
| | | AveragePrice | AveragePrice | AveragePrice | AveragePrice |
| year | type | | | | |
| 2015 | conventional | 0.49 | 1.59 | 1.077963 | 1.08 |
| | organic | 0.81 | 2.79 | 1.673324 | 1.67 |
| 2016 | conventional | 0.51 | 2.20 | 1.105595 | 1.08 |
| | organic | 0.58 | 3.25 | 1.571684 | 1.53 |
| 2017 | conventional | 0.46 | 2.22 | 1.294888 | 1.30 |
| | organic | 0.44 | 3.17 | 1.735521 | 1.72 |
| 2018 | conventional | 0.56 | 1.74 | 1.127886 | 1.14 |
| | organic | 1.01 | 2.30 | 1.567176 | 1.55 |

# Explicit indexes

Indexes make subsetting simpler using .loc and .iloc

## Setting column as the index

In [54]:
```
regionIndex = avocado.set_index(['region'])
regionIndex
```

Out[54]:

| region | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4 |
|---|---|---|---|---|---|---|---|
| **Albany** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48 |
| **Albany** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58 |
| **Albany** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130 |
| **Albany** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72 |
| **Albany** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75 |
| **...** | ... | ... | ... | ... | ... | ... | |
| **WestTexNewMexico** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | ( |
| **WestTexNewMexico** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | ( |
| **WestTexNewMexico** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727 |
| **WestTexNewMexico** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727 |
| **WestTexNewMexico** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224 |

18249 rows × 14 columns

In [55]:
```
# insead of doing this
avocado[avocado["region"].isin(["Albany", "WestTexNewMexico"])]
```

Out[55]:

| | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4770 | Total Bags |
|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48.16 | 8696.87 |
| **1** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58.33 | 9505.56 |
| **2** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130.50 | 8145.35 |
| **3** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72.58 | 5811.16 |
| **4** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75.78 | 6183.95 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... |
| **18244** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | 0.00 | 13498.67 |
| **18245** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | 0.00 | 9264.84 |
| **18246** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727.94 | 9394.11 |
| **18247** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727.01 | 10969.54 |
| **18248** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224.53 | 12014.15 |

673 rows × 15 columns

In [56]:
```
# we can simply do
regionIndex.loc[["Albany", "WestTexNewMexico"]]
```

Out[56]:

| region | Unnamed: 0 | Date | AveragePrice | Total Volume | 4046 | 4225 | 4 |
|---|---|---|---|---|---|---|---|
| **Albany** | 0 | 2015-12-27 | 1.33 | 64236.62 | 1036.74 | 54454.85 | 48 |
| **Albany** | 1 | 2015-12-20 | 1.35 | 54876.98 | 674.28 | 44638.81 | 58 |
| **Albany** | 2 | 2015-12-13 | 0.93 | 118220.22 | 794.70 | 109149.67 | 130 |
| **Albany** | 3 | 2015-12-06 | 1.08 | 78992.15 | 1132.00 | 71976.41 | 72 |
| **Albany** | 4 | 2015-11-29 | 1.28 | 51039.60 | 941.48 | 43838.39 | 75 |
| **...** | ... | ... | ... | ... | ... | ... | |
| **WestTexNewMexico** | 7 | 2018-02-04 | 1.63 | 17074.83 | 2046.96 | 1529.20 | |
| **WestTexNewMexico** | 8 | 2018-01-28 | 1.71 | 13888.04 | 1191.70 | 3431.50 | |
| **WestTexNewMexico** | 9 | 2018-01-21 | 1.87 | 13766.76 | 1191.92 | 2452.79 | 727 |
| **WestTexNewMexico** | 10 | 2018-01-14 | 1.93 | 16205.22 | 1527.63 | 2981.04 | 727 |
| **WestTexNewMexico** | 11 | 2018-01-07 | 1.62 | 17489.58 | 2894.77 | 2356.13 | 224 |

673 rows × 14 columns

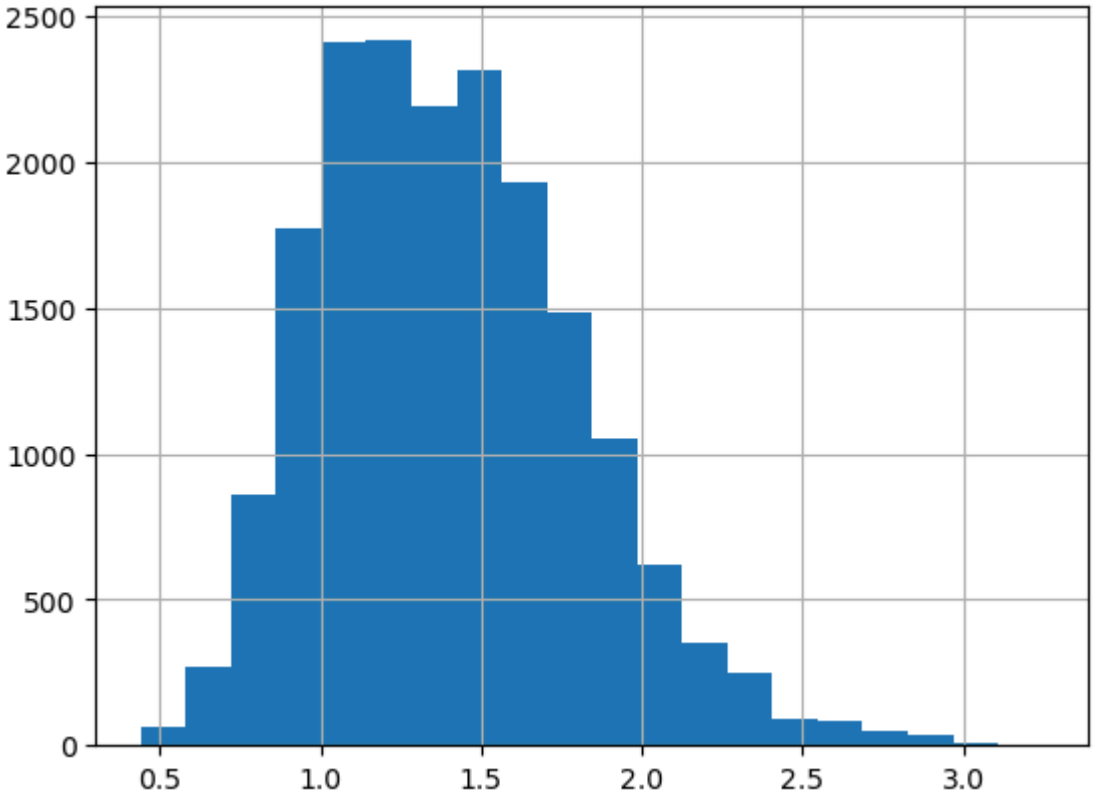
# Visualizing your data

## Histograms

use the function .hist()

# Visualizing Your Data

In [57]:
```
avocado["AveragePrice"].hist(bins=20)
plt.show()
```

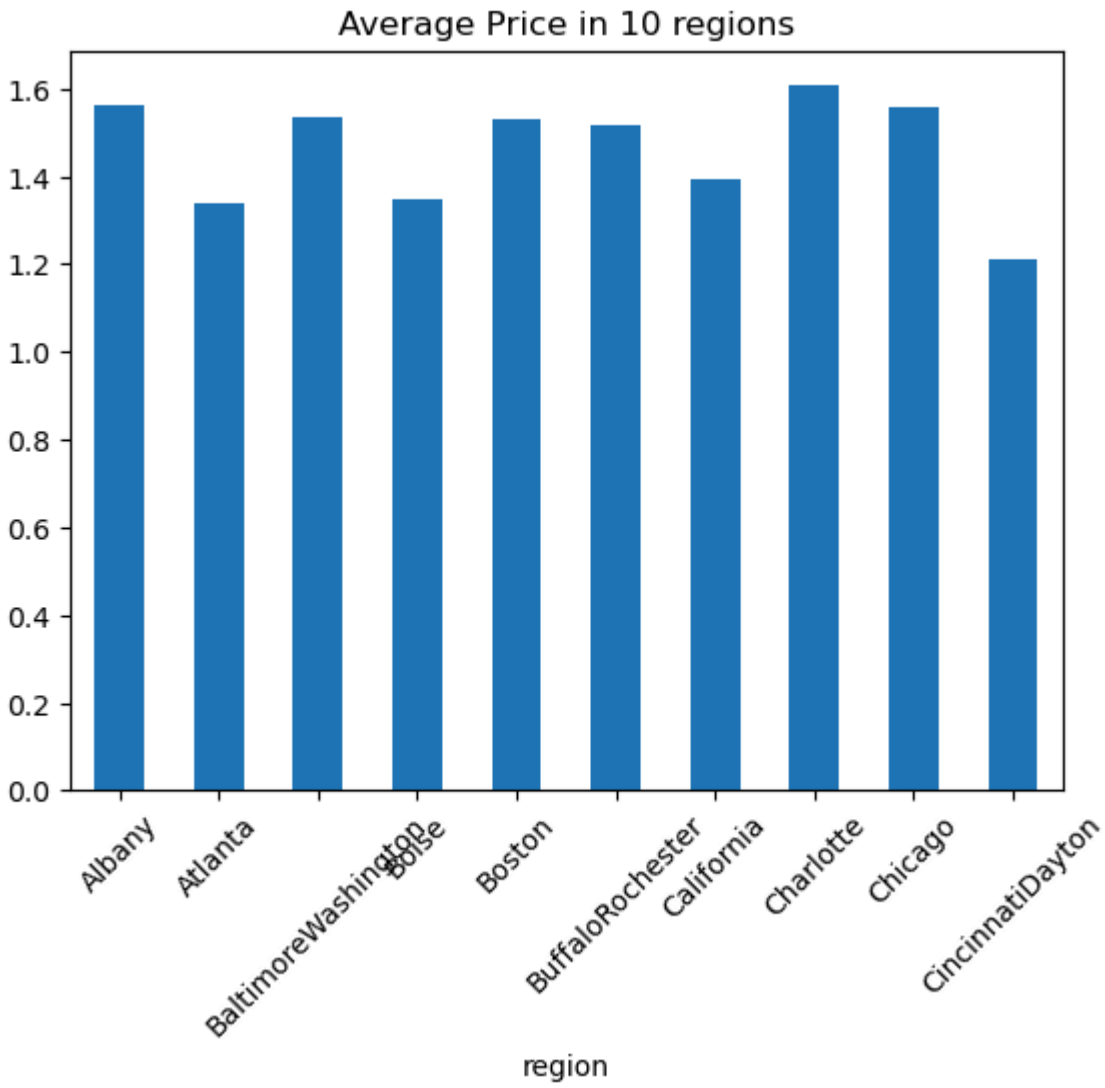



## Bar plots

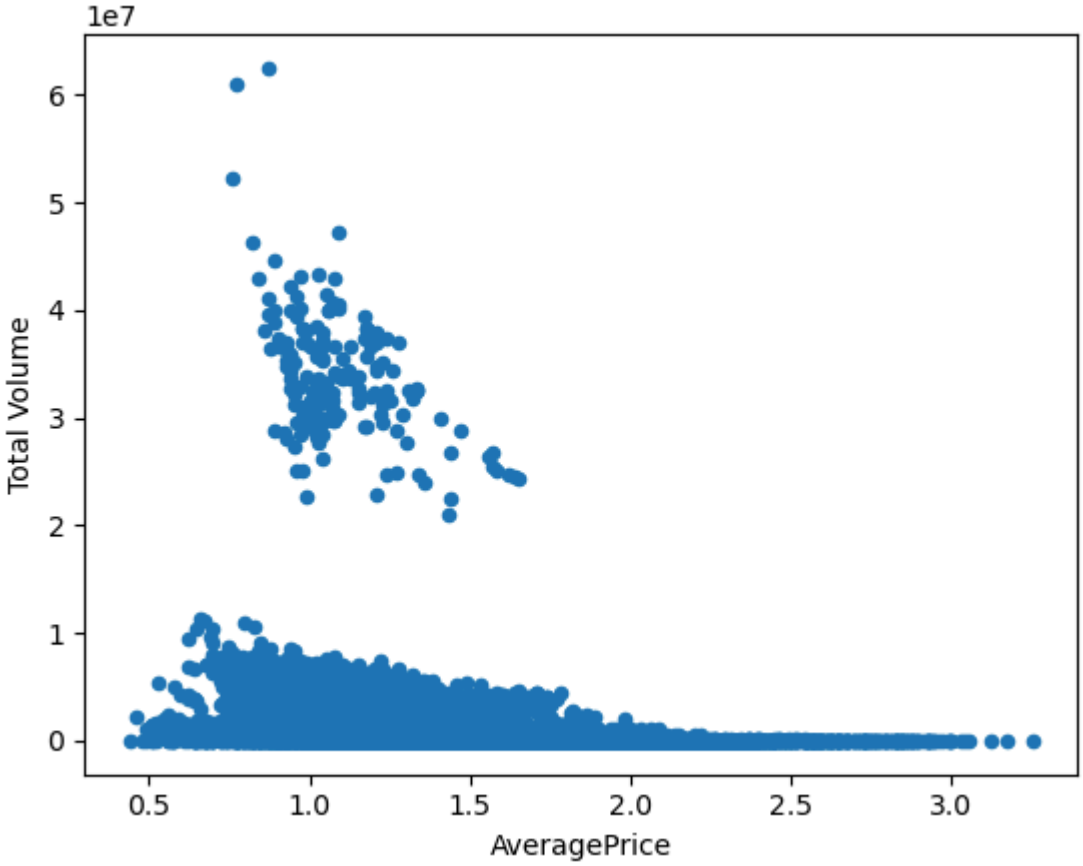
In [58]:
```
regionFilter = avocado.groupby("region")["AveragePrice"].mean().head(10)
regionFilter
```

Out[58]:
```
region
Albany                1.561036
Atlanta               1.337959
BaltimoreWashington   1.534231
Boise                 1.348136
Boston                1.530888
BuffaloRochester      1.516834
California            1.395325
Charlotte             1.606036
Chicago               1.556775
CincinnatiDayton      1.209201
Name: AveragePrice, dtype: float64
```

In [61]:
```
regionFilter.plot(kind = "bar", rot=45, title="Average Price in 10 regions")
plt.show()
```




In [62]:
```
avocado.plot(x="AveragePrice", y="Total Volume", kind="scatter")
plt.show()
```




# Arithmetic with Series & DataFrames

You can use arithmetic operators directly on series but sometimes you need more control while performing these operations, here is where these explicit arithmetic functions come into the picture

Add/Subtract function (just replece add with sub)

```
Syntax: Series.add(other, level=None, fill_value=None, axis=0)

Parameters:
other: other series or list type to be added into caller series
fill_value: Value to be replaced by NaN in series/list before
adding
level: integer value of level in case of multi index

Return type: Caller series with added values
```

Multiplication function

```
Syntax: Series.mul(other, level=None, fill_value=None, axis=0)

Parameters:
other: other series or list type to be added into caller series
fill_value: Value to be replaced by NaN in series/list before
adding
level: integer value of level in case of multi index
```

```
    Return type: Caller series with added values
```

Division function

```
    Syntax: Series.div(other, level=None, fill_value=None, axis=0)

    Parameters:
    other: other series or list type to be divided by the caller
    series
    fill_value: Value to be replaced by NaN in series/list before
    division
    level: integer value of level in case of multi index

    Return type: Caller series with divided values
```

In [63]:
```
# subtract AveragePrice with AveragePrice :P
# Dah its 0
avocado["AveragePrice"].sub(avocado["AveragePrice"])
```

Out[63]:
```
0        0.0
1        0.0
2        0.0
3        0.0
4        0.0
        ...
18244    0.0
18245    0.0
18246    0.0
18247    0.0
18248    0.0
Name: AveragePrice, Length: 18249, dtype: float64
```

# Merge DataFrames

Syntax:

> DataFrame.merge(self, right, how='inner', on=None, left_on=None, right_on=None, left_index=False, right_index=False, sort=False, suffixes=('_x', '_y'), copy=True, indicator=False, validate=None) → 'DataFrame'[source]¶

Merge DataFrame or named Series objects with a database-style join.

The join is done on columns or indexes. If joining columns on columns, the DataFrame indexes will be ignored. Otherwise if joining indexes on indexes or indexes on a column or columns, the index will be passed on.

Parameters right: DataFrame or named Series Object to merge with.

how{‘left’, ‘right’, ‘outer’, ‘inner’}, default ‘inner’

on: label or list Column or index level names to join on. These must be found in both DataFrames. If on is None and not merging on indexes then this defaults to the intersection of the columns in both DataFrames.

left_on: label or list, or array-like Column or index level names to join on in the left DataFrame. Can also be an array or list of arrays of the length of the left DataFrame. These arrays are treated as if they are columns.

right_on: label or list, or array-like Column or index level names to join on in the right DataFrame. Can also be an array or list of arrays of the length of the right DataFrame. These arrays are treated as if they are columns.

left_index: bool, default False Use the index from the left DataFrame as the join key(s). If it is a MultiIndex, the number of keys in the other DataFrame (either the index or a number of columns) must match the number of levels.

right_index: bool, default False Use the index from the right DataFrame as the join key. Same caveats as left_index.

sort: bool, default False Sort the join keys lexicographically in the result DataFrame. If False, the order of the join keys depends on the join type (how keyword).

suffixes: tuple of (str, str), default (‘_x’, ‘_y’) Suffix to apply to overlapping column names in the left and right side, respectively. To raise an exception on overlapping columns use (False, False).

# Join

> DataFrame.merge(self, right, how='inner', on=None, left_on=None, right_on=None, left_index=False, right_index=False, sort=False, suffixes=('_x', '_y'), copy=True, indicator=False, validate=None) → 'DataFrame'[source]¶

Merge DataFrame or named Series objects with a database-style join.

The join is done on columns or indexes. If joining columns on columns, the DataFrame indexes will be ignored. Otherwise if joining indexes on indexes or indexes on a column or columns, the index will be passed on.

Parameters rightDataFrame or named Series Object to merge with.

how{‘left’, ‘right’, ‘outer’, ‘inner’}, default ‘inner’ on: label or list Column or index level names to join on. These must be found in both DataFrames. If on is None and not merging on indexes then this defaults to the intersection of the columns in both DataFrames.

left_on: label or list, or array-like Column or index level names to join on in the left DataFrame. Can also be an array or list of arrays of the length of the left DataFrame. These arrays are treated as if they are columns.

right_on: label or list, or array-like Column or index level names to join on in the right DataFrame. Can also be an array or list of arrays of the length of the right DataFrame. These arrays are treated as if they are columns.

left_index: bool, default False Use the index from the left DataFrame as the join key(s). If it is a MultiIndex, the number of keys in the other DataFrame (either the index or a number of columns) must match the number of levels.

right_index: bool, default False Use the index from the right DataFrame as the join key. Same caveats as left_index.

sort: bool, default False Sort the join keys lexicographically in the result DataFrame. If False, the order of the join keys depends on the join type (how keyword).

suffixes: tuple of (str, str), default ('_x', '_y') Suffix to apply to overlapping column names in the left and right side, respectively. To raise an exception on overlapping columns use (False, False).