Pandas_tutorial

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1 Pandas Tutorial

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```
In [ ]: ####################
        ###### Part 1 ######
        ####################

In [1]: # import necessary packages
        import pandas as pd
        from datetime import datetime
        import pandas_datareader.data as web

In [2]: # specify start time and end time
        start_time = datetime(2016,1,1)
        end_time = datetime(2016,12,31)

In [3]: # load stock information from MorningStar database
        # this function could have multiple options: google (blocked), yahoo(removed)
        df = web.DataReader("AAPL", "morningstar", start_time, end_time)

In [4]: print(df.head())
        print(df.tail(10))

                     Close     High     Low    Open    Volume
Symbol Date
AAPL   2016-01-01  105.26  105.260  105.26  105.26         0
       2016-01-04  105.35  105.368  102.00  102.61  67649387
       2016-01-05  102.71  105.850  102.41  105.75  55790992
       2016-01-06  100.70  102.370   99.87  100.56  68457388
       2016-01-07   96.45  100.130   96.43   98.68  81094428
                     Close      High     Low    Open    Volume
Symbol Date
AAPL   2016-12-19  116.64  117.3800  115.75  115.80  27779423
```

```
2016-12-20  116.95  117.5000  116.68  116.74  21424965
2016-12-21  117.06  117.4000  116.78  116.80  23724084
2016-12-22  116.29  116.5100  115.64  116.35  26085854
2016-12-23  116.52  116.5200  115.59  115.59  14249484
2016-12-26  116.52  116.5200  116.52  116.52         0
2016-12-27  117.26  117.8000  116.49  116.52  18296855
2016-12-28  116.76  118.0166  116.20  117.52  20905892
2016-12-29  116.73  117.1095  116.40  116.45  15039519
2016-12-30  115.82  117.2000  115.43  116.65  30586265
```

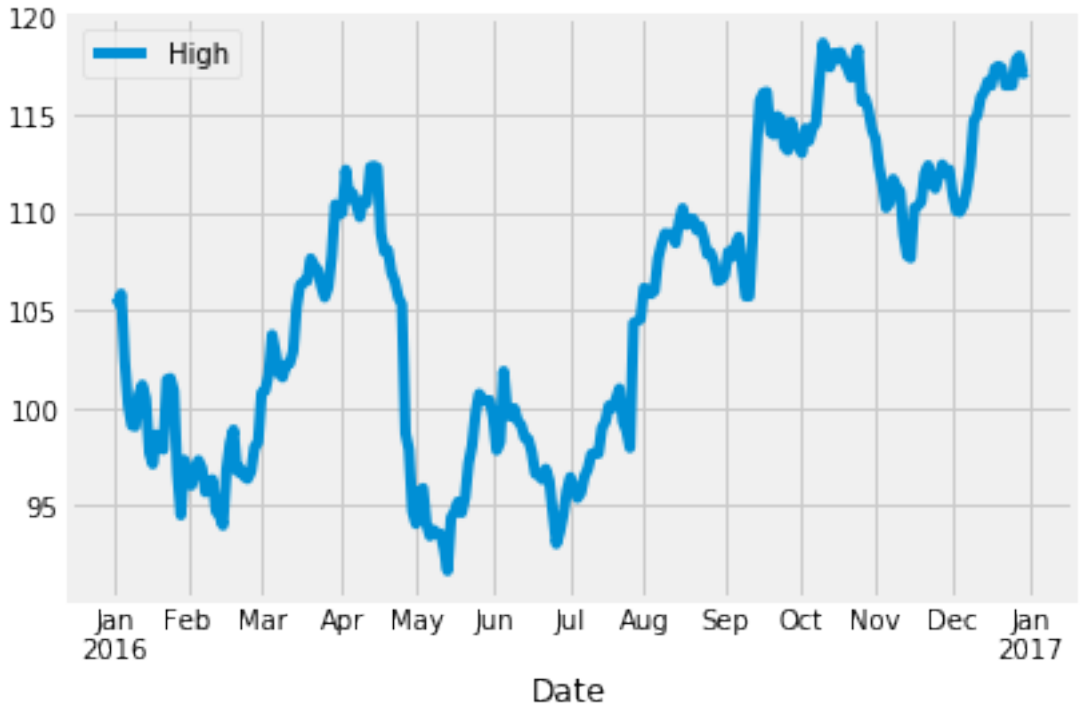
```
In [5]: # reset index and construct data-frame like a XLS spreadsheet
        df.reset_index(inplace=True)
        df.set_index("Date", inplace=True)
        df.drop("Symbol", axis=1, inplace=True)
```

```
In [11]: df.head()
```

```
Out[11]:              Close     High     Low    Open    Volume
         Date
         2016-01-01  105.26  105.260  105.26  105.26         0
         2016-01-04  105.35  105.368  102.00  102.61  67649387
         2016-01-05  102.71  105.850  102.41  105.75  55790992
         2016-01-06  100.70  102.370   99.87  100.56  68457388
         2016-01-07   96.45  100.130   96.43   98.68  81094428
```

```
In [7]: # plot it
        import matplotlib.pyplot as plt
        from matplotlib import style
        style.use("fivethirtyeight")
```

```
In [8]: df['High'].plot()
        plt.legend()
        plt.show()
```




```
In [12]: # how to save data?
         # option 1: save as binary pickle
         import pickle
         fout = open("aapl_stock.pickle", "wb")
         pickle.dump(df, fout)

In [13]: # option 2: use pandas io tools -> pd.to_csv()
         df.to_csv("aapl_stock.csv", sep="|")

In [14]: # how to read them back?
         fin = open("aapl_stock.pickle","rb")
         df_reload = pickle.load(fin)
         df_reload.head()
```

Out[14]:

Date	Close	High	Low	Open	Volume
2016-01-01	105.26	105.260	105.26	105.26	0
2016-01-04	105.35	105.368	102.00	102.61	67649387
2016-01-05	102.71	105.850	102.41	105.75	55790992
2016-01-06	100.70	102.370	99.87	100.56	68457388
2016-01-07	96.45	100.130	96.43	98.68	81094428

```
In [15]: df_reload2 = pd.read_csv("aapl_stock.csv",delimiter="|")
         df_reload2.head()
```

```
Out[15]:          Date   Close     High      Low     Open    Volume
         0  2016-01-01  105.26  105.260  105.26  105.26         0
         1  2016-01-04  105.35  105.368  102.00  102.61  67649387
         2  2016-01-05  102.71  105.850  102.41  105.75  55790992
         3  2016-01-06  100.70  102.370   99.87  100.56  68457388
         4  2016-01-07   96.45  100.130   96.43   98.68  81094428
```

```
In [ ]: ####################
        ###### Part 2 ######
        ####################
```

```
In [1]: import pandas as pd

        df1 = pd.DataFrame({'HPI':[80,85,88,85],
                            'Int_rate':[2, 3, 2, 2],
                            'US_GDP_Thousands':[50, 55, 65, 55]},
                           index = [2001, 2002, 2003, 2004])

        df2 = pd.DataFrame({'HPI':[80,85,88,85],
                            'Int_rate':[2, 3, 2, 2],
                            'US_GDP_Thousands':[50, 55, 65, 55]},
                           index = [2005, 2006, 2007, 2008])

        df3 = pd.DataFrame({'HPI':[80,85,88,85],
                            'Int_rate':[2, 3, 2, 2],
                            'Low_tier_HPI':[50, 52, 50, 53]},
                           index = [2001, 2002, 2003, 2004])
```

```
In [2]: # concatenate,  stata  append
        concat = pd.concat([df1,df2])
        print(concat)
```

```
      HPI  Int_rate  US_GDP_Thousands
2001   80         2                50
2002   85         3                55
2003   88         2                65
2004   85         2                55
2005   80         2                50
2006   85         3                55
2007   88         2                65
2008   85         2                55
```

```
In [3]: concat = pd.concat([df1,df2,df3])
        print(concat)
```

```
      HPI  Int_rate  Low_tier_HPI  US_GDP_Thousands
2001   80         2           NaN              50.0
2002   85         3           NaN              55.0
```

```
2003   88          2            NaN               65.0
2004   85          2            NaN               55.0
2005   80          2            NaN               50.0
2006   85          3            NaN               55.0
2007   88          2            NaN               65.0
2008   85          2            NaN               55.0
2001   80          2           50.0                NaN
2002   85          3           52.0                NaN
2003   88          2           50.0                NaN
2004   85          2           53.0                NaN
```

```
In [4]: df4 = df1.append(df3)
        print(df4)
```

```
      HPI  Int_rate  Low_tier_HPI  US_GDP_Thousands
2001   80          2           NaN              50.0
2002   85          3           NaN              55.0
2003   88          2           NaN              65.0
2004   85          2           NaN              55.0
2001   80          2          50.0               NaN
2002   85          3          52.0               NaN
2003   88          2          50.0               NaN
2004   85          2          53.0               NaN
```

```
In [5]: print(pd.merge(df1,df3, on='HPI'))
```

```
   HPI  Int_rate_x  US_GDP_Thousands  Int_rate_y  Low_tier_HPI
0   80           2                50           2            50
1   85           3                55           3            52
2   85           3                55           2            53
3   85           2                55           3            52
4   85           2                55           2            53
5   88           2                65           2            50
```

```
In [6]: print(pd.merge(df1,df2, on=['HPI','Int_rate']))
```

```
   HPI  Int_rate  US_GDP_Thousands_x  US_GDP_Thousands_y
0   80         2                  50                  50
1   85         3                  55                  55
2   88         2                  65                  65
3   85         2                  55                  55
```

```
In [8]: df1 = pd.DataFrame({
                           'Int_rate':[2, 3, 2, 2],
                           'US_GDP_Thousands':[50, 55, 65, 55],
```

```
                        'Year':[2001, 2002, 2003, 2004]
                        })

        df3 = pd.DataFrame({
                        'Unemployment':[7, 8, 9, 6],
                        'Low_tier_HPI':[50, 52, 50, 53],
                        'Year':[2001, 2003, 2004, 2005]})
```

In [ ]:
```
        '''
        Left - equal to left outer join SQL - use keys from left frame only
        Right - right outer join from SQL- use keys from right frame only.
        Outer - full outer join - use union of keys
        Inner - use only intersection of keys.
        '''
```

In [9]:
```
        merged = pd.merge(df1,df3, on='Year', how='left')
        merged.set_index('Year', inplace=True)
        print(merged)
```

```
      Int_rate  US_GDP_Thousands  Low_tier_HPI  Unemployment
Year
2001         2                50          50.0           7.0
2002         3                55           NaN           NaN
2003         2                65          52.0           8.0
2004         2                55          50.0           9.0
```