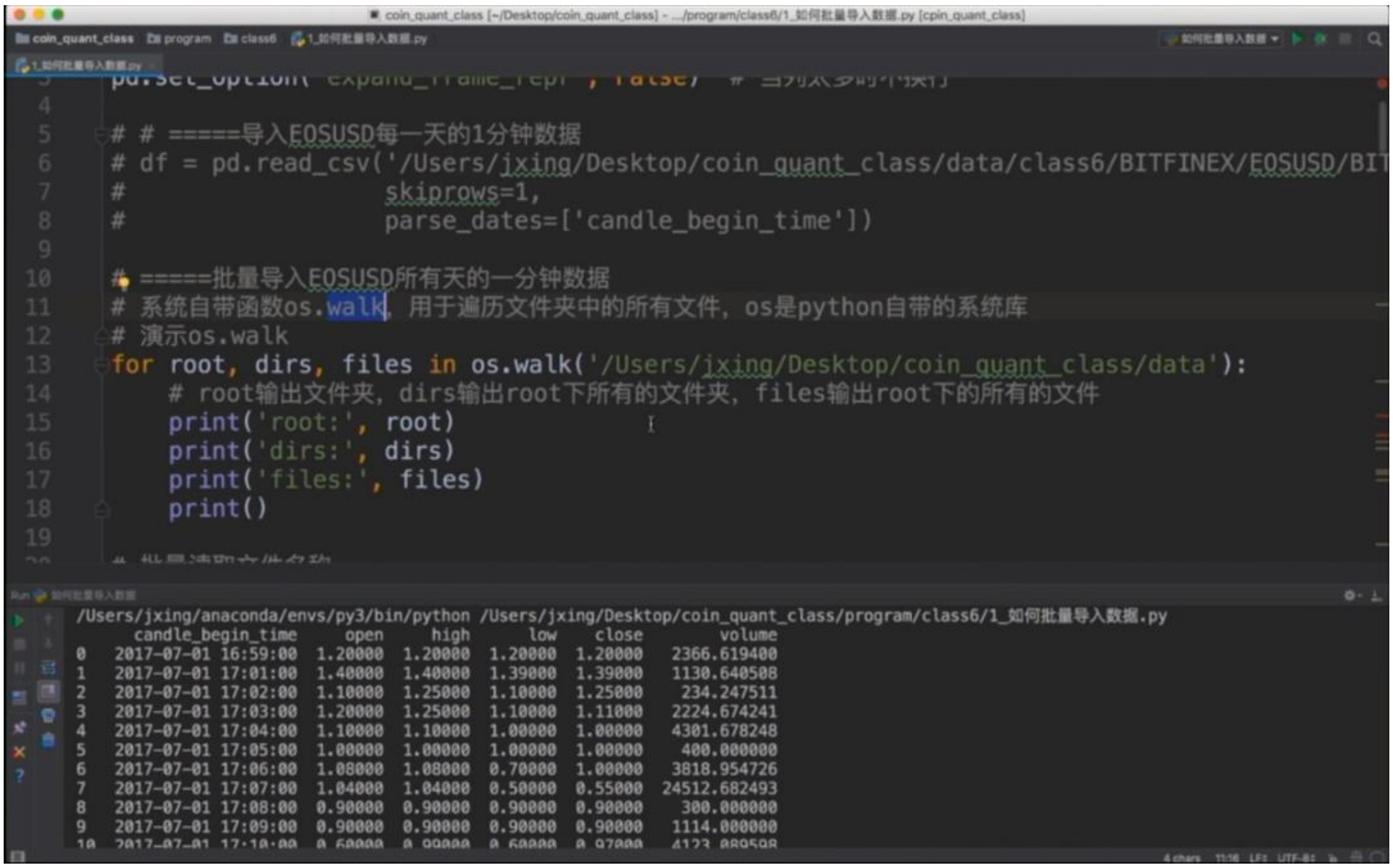
第 6 课：Pandas 高阶操作

目录

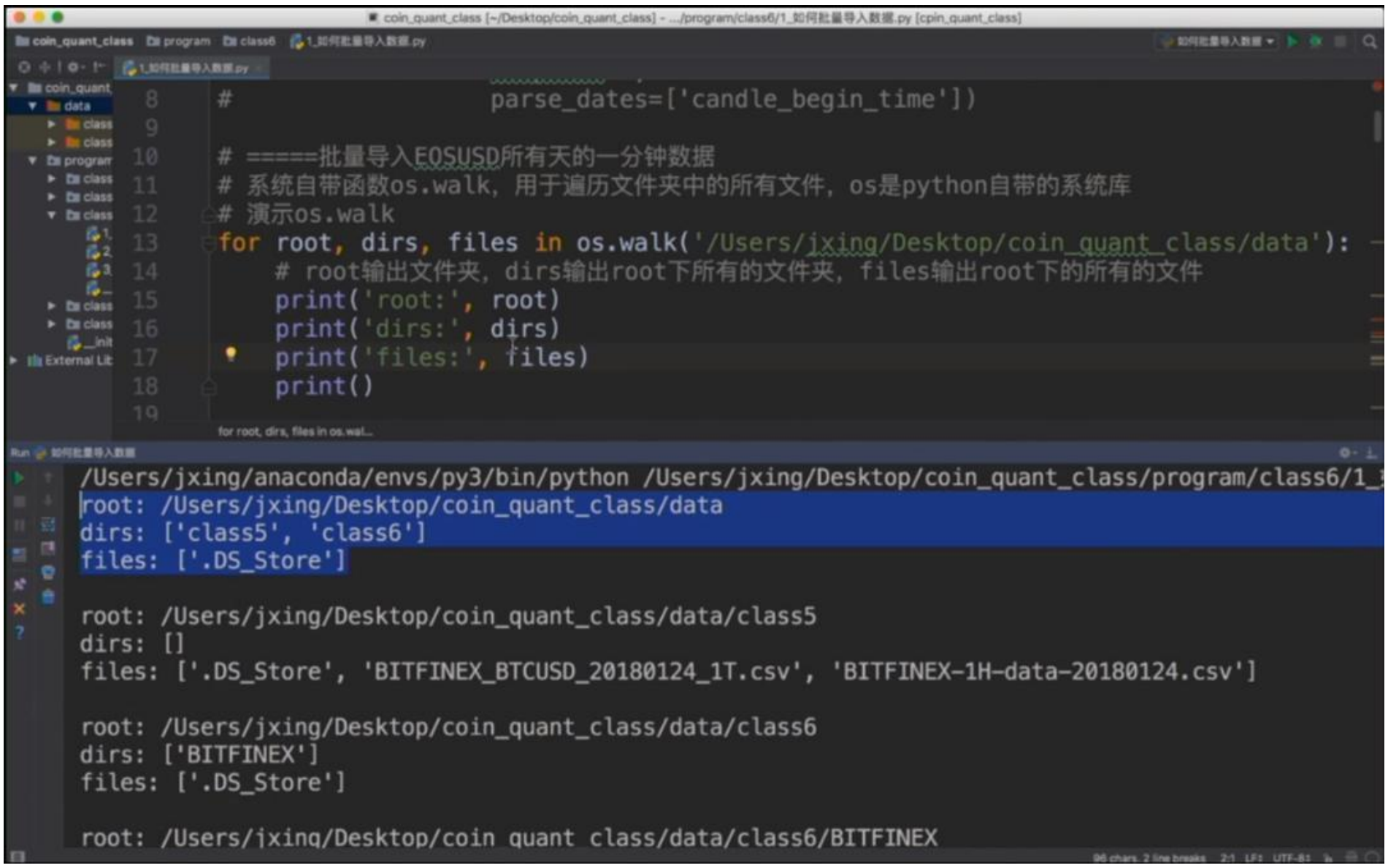
6.1 批量导入数据

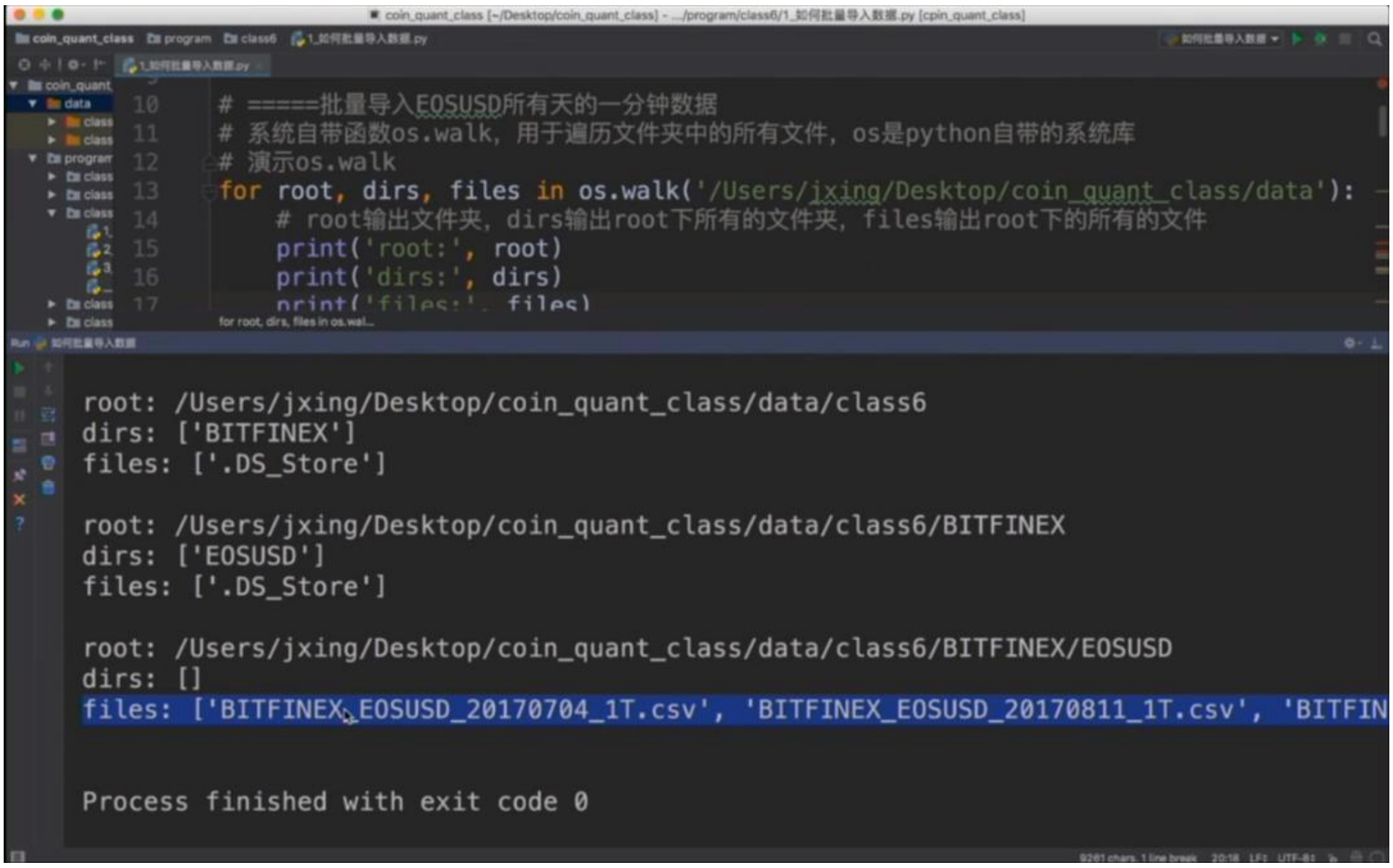
遍历文件

- import os
- pd.set_option('expand_frame_repr', False) # 当列太多时不换行
- 系统自带函数 os.walk，用于遍历文件夹中的所有文件，os 是 python 自带的系统库。



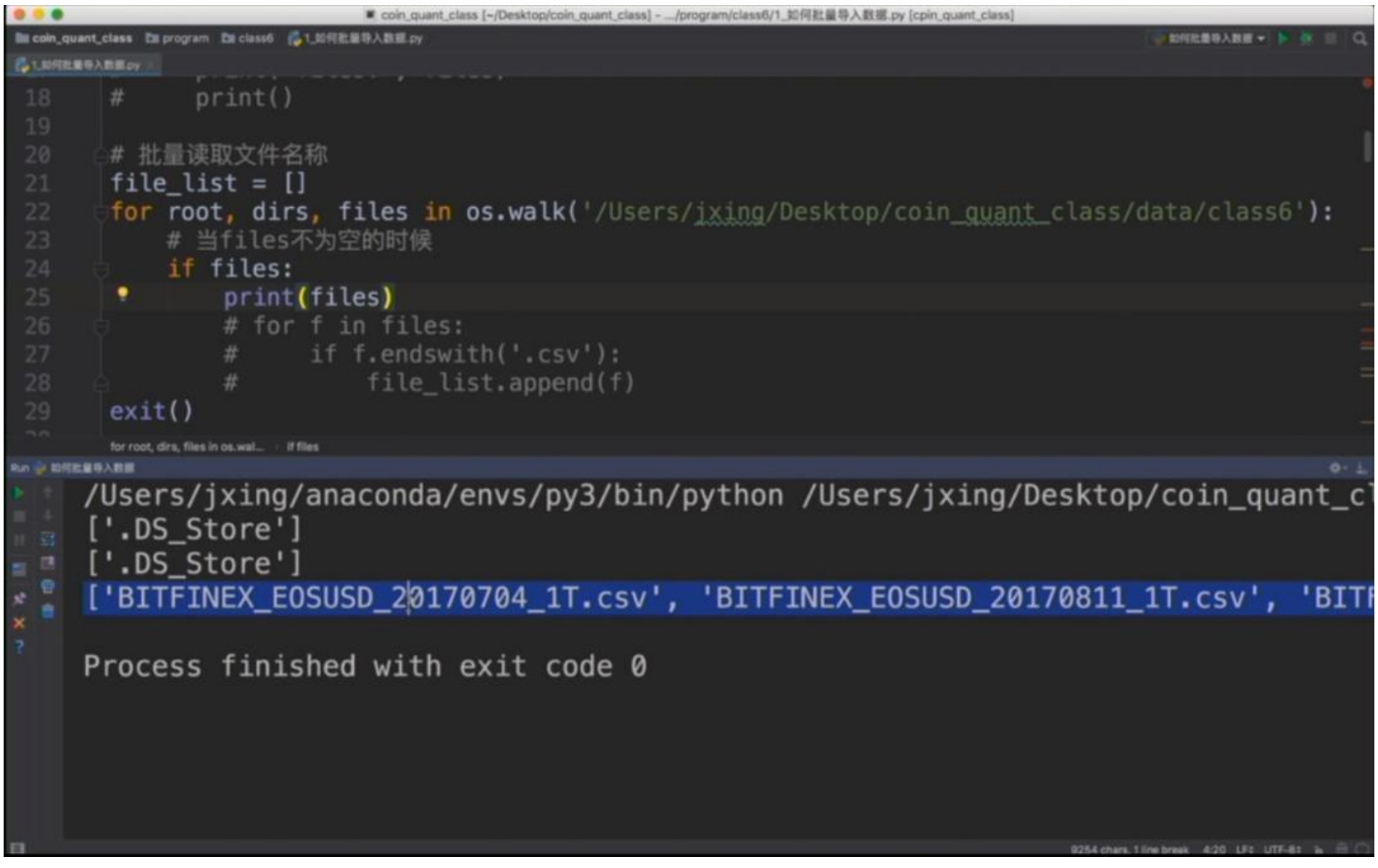
- for root, dirs, files in os.walk('/Users/jxing/Desktop/coin_quant_class/data'):
- root 输出文件夹，dirs 输出 root 下所有的文件夹，files 输出 root 下的所有的文件。
- print('root:', root)
- print('dirs:', dirs)
- print('files:', files)





批量读取文件名称

- file_list = []
- for root, dirs, files in os.walk('/Users/jxing/Desktop/coin_quant_class/data/class6'):
- 当 files 不为空的时候
- if files:
- print(files)



- for f in files:
- if f.endswith('.csv'):
- file_list.append(f)

```
#     print()

# 批量读取文件名称
file_list = []
for root, dirs, files in os.walk('/Users/jxing/Desktop/coin_quant_class/data/class6'):
    # 当files不为空的时候
    if files:
        for f in files:
            if f.endswith('.csv'):
                file_list.append(f)
exit()
```

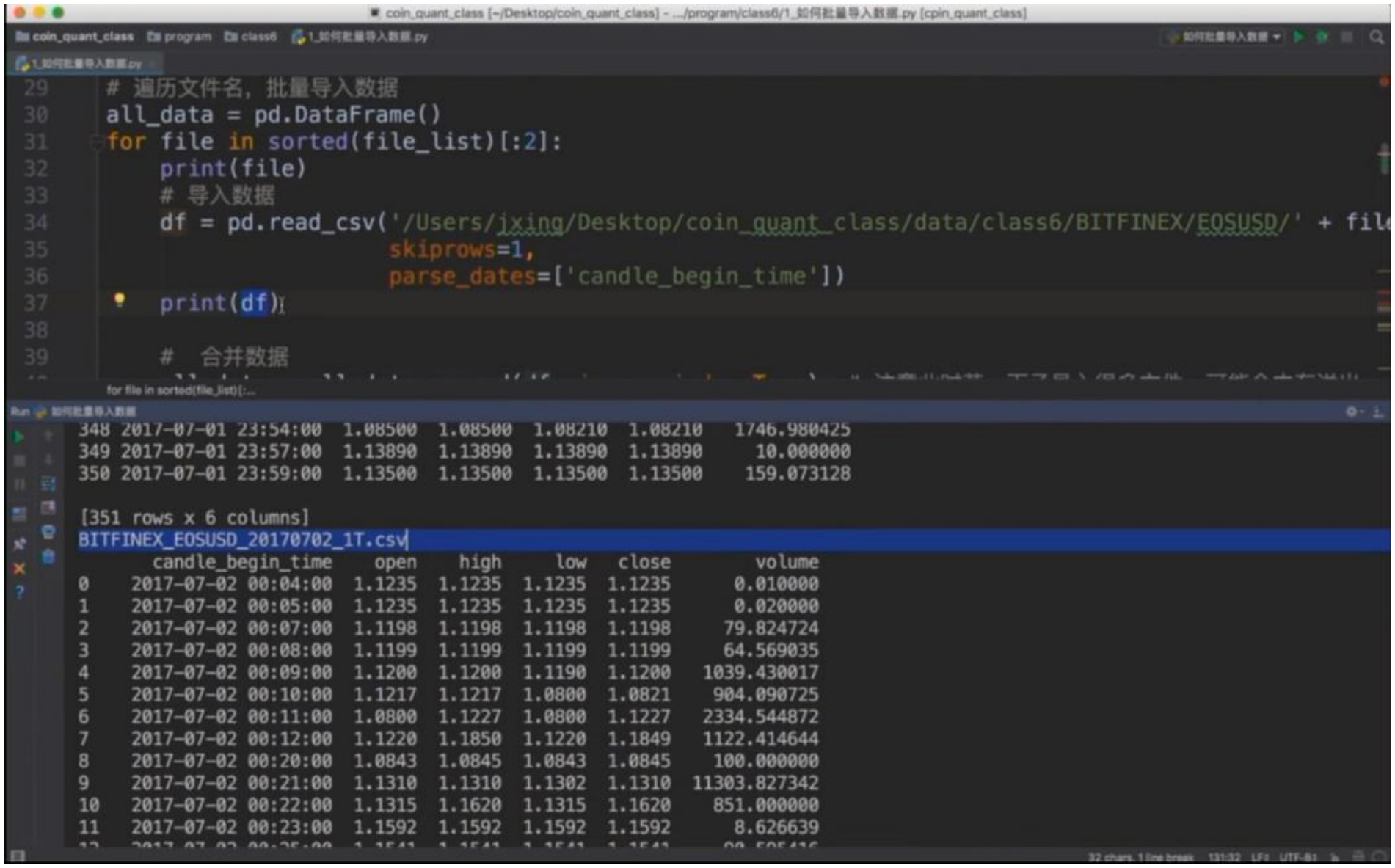
```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_cl
['.DS_Store']
['.DS_Store']
['BITFINEX_EOSUSD_20170704_1T.csv', 'BITFINEX_EOSUSD_20170811_1T.csv', 'BITF

Process finished with exit code 0
```

```
#     print()

# 批量读取文件名称
file_list = []
for root, dirs, files in os.walk('/Users/jxing/Desktop/coin_quant_class/data/class6'
    # 当files不为空的时候
    if files:
        for f in files:
            if f.endswith('.csv'):
                file_list.append(f)
print(file_list)
```

```
envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/class6
0704_1T.csv', 'BITFINEX_EOSUSD_20170811_1T.csv', 'BITFINEX_EOSUSD_20170

exit code 0
```

遍历文件名，批量导入数据

- all_data = pd.DataFrame()
- for file in sorted(file_list):
- print(file)
- 导入数据
- df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD/' + file,
- skiprows=1,
- parse_dates=['candle_begin_time'])



- 合并数据
- all_data = all_data.append(df, ignore_index=True) # 注意此时若一下子导入很多文件，可能会内存溢出

```
    # 导入数据
    df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD/' + file
                     skiprows=1,
                     parse_dates=['candle_begin_time'])
    print(df)

    #  合并数据
    all_data = all_data.append(df, ignore_index=True)  # 注意此时若一下子导入很多文件，可能会内存溢出
    print(all_data)
```

```
1232 2017-07-02 23:52:00  2.9000  2.9800  2.9000  2.9800    678.528575
1233 2017-07-02 23:53:00  2.9800  2.9800  2.8800  2.8955    685.627382
1234 2017-07-02 23:54:00  2.9761  2.9761  2.8955  2.9700     22.338780
1235 2017-07-02 23:55:00  2.8851  3.0000  2.8851  2.9600   4891.299121
1236 2017-07-02 23:56:00  2.9588  2.9588  2.8901  2.8901    332.749353
1237 2017-07-02 23:57:00  2.9980  2.9980  2.9103  2.9103    723.112999

[1238 rows x 6 columns]
       candle_begin_time     open     high      low    close        volume
0    2017-07-01 16:59:00  1.20000  1.20000  1.20000  1.20000   2366.619400
1    2017-07-01 17:01:00  1.40000  1.40000  1.39000  1.39000   1130.640508
2    2017-07-01 17:02:00  1.10000  1.25000  1.10000  1.25000    234.247511
3    2017-07-01 17:03:00  1.20000  1.25000  1.10000  1.11000   2224.674241
4    2017-07-01 17:04:00  1.10000  1.10000  1.00000  1.00000   4301.678248
5    2017-07-01 17:05:00  1.00000  1.00000  1.00000  1.00000    400.000000
6    2017-07-01 17:06:00  1.08000  1.08000  0.70000  1.00000   3818.954726
7    2017-07-01 17:07:00  1.04000  1.04000  0.50000  0.55000  24512.682493
8    2017-07-01 17:08:00  0.90000  0.90000  0.90000  0.90000    300.000000
9    2017-07-01 17:09:00  0.90000  0.90000  0.90000  0.90000   1114.000000
10   2017-07-01 17:10:00  0.60000  0.99000  0.60000  0.97000   4123.089598
11   2017-07-01 17:11:00  0.97000  0.97000  0.96500  0.96500   1034.836664
12   2017-07-01 17:12:00  0.96500  0.96500  0.95000  0.96500    346.770000
```

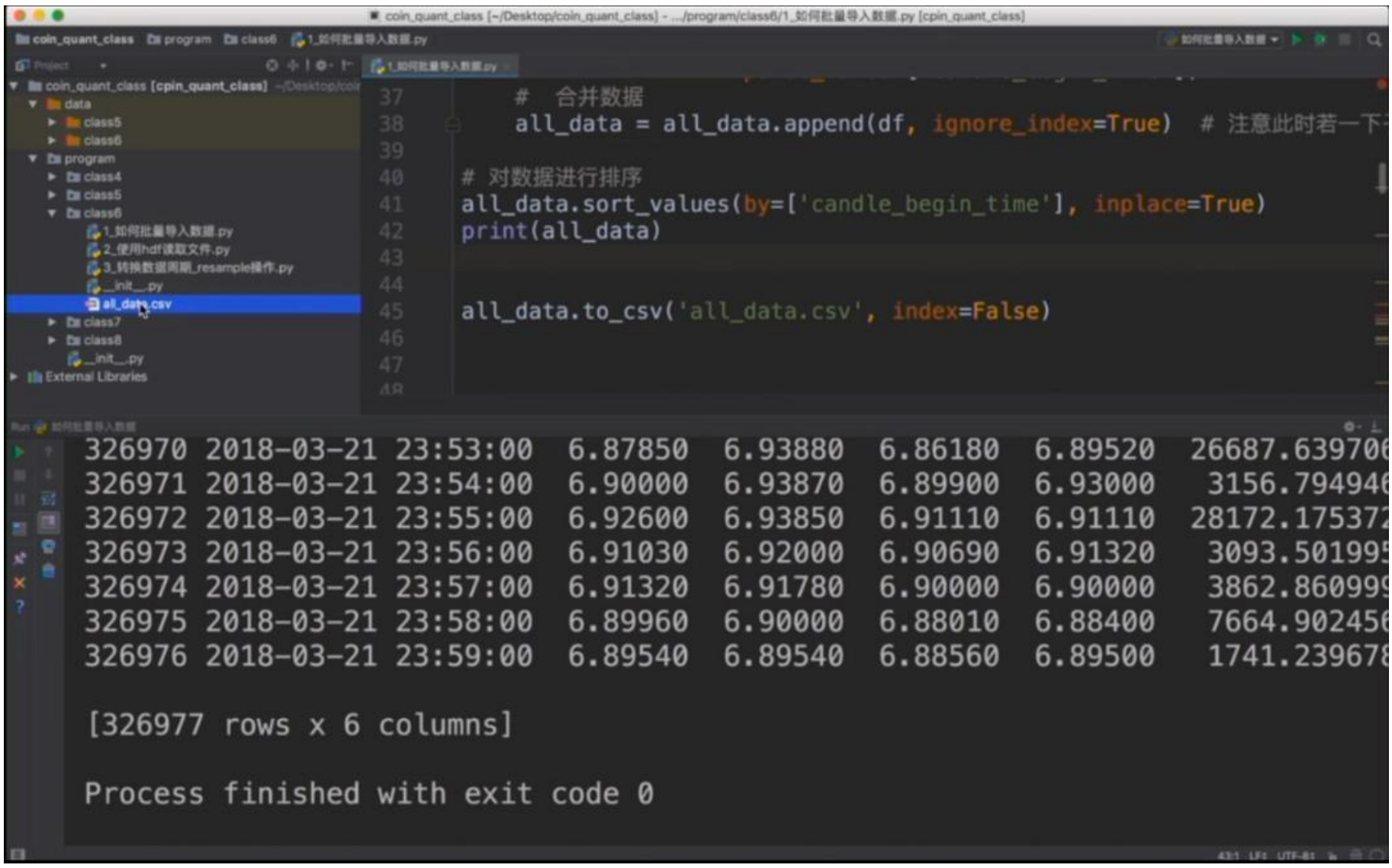
对数据进行排序

- all_data.sort_values(by=['candle_begin_time'], inplace=True)

```
all_data = pd.DataFrame()
for file in sorted(file_list):
    print(file)
    # 导入数据
    df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD/' + file
                     skiprows=1,
                     parse_dates=['candle_begin_time'])
    #  合并数据
    all_data = all_data.append(df, ignore_index=True)  # 注意此时若一下子导入很多文件，可能会内存溢出

# 对数据进行排序
all_data.sort_values(by=['candle_begin_time'], inplace=True)
print(all_data)
```

```
BITFINEX_EOSUSD_20180319_1T.csv
BITFINEX_EOSUSD_20180320_1T.csv
BITFINEX_EOSUSD_20180321_1T.csv
       candle_begin_time     open     high      low    close        volume
0    2017-07-01 16:59:00  1.20000  1.20000  1.20000  1.20000   2366.619400
1    2017-07-01 17:01:00  1.40000  1.40000  1.39000  1.39000   1130.640508
2    2017-07-01 17:02:00  1.10000  1.25000  1.10000  1.25000    234.247511
3    2017-07-01 17:03:00  1.20000  1.25000  1.10000  1.11000   2224.674241
4    2017-07-01 17:04:00  1.10000  1.10000  1.00000  1.00000   4301.678248
5    2017-07-01 17:05:00  1.00000  1.00000  1.00000  1.00000    400.000000
6    2017-07-01 17:06:00  1.08000  1.08000  0.70000  1.00000   3818.954726
7    2017-07-01 17:07:00  1.04000  1.04000  0.50000  0.55000  24512.682493
8    2017-07-01 17:08:00  0.90000  0.90000  0.90000  0.90000    300.000000
9    2017-07-01 17:09:00  0.90000  0.90000  0.90000  0.90000   1114.000000
10   2017-07-01 17:10:00  0.60000  0.99000  0.60000  0.97000   4123.089598
11   2017-07-01 17:11:00  0.97000  0.97000  0.96500  0.96500   1034.836664
```

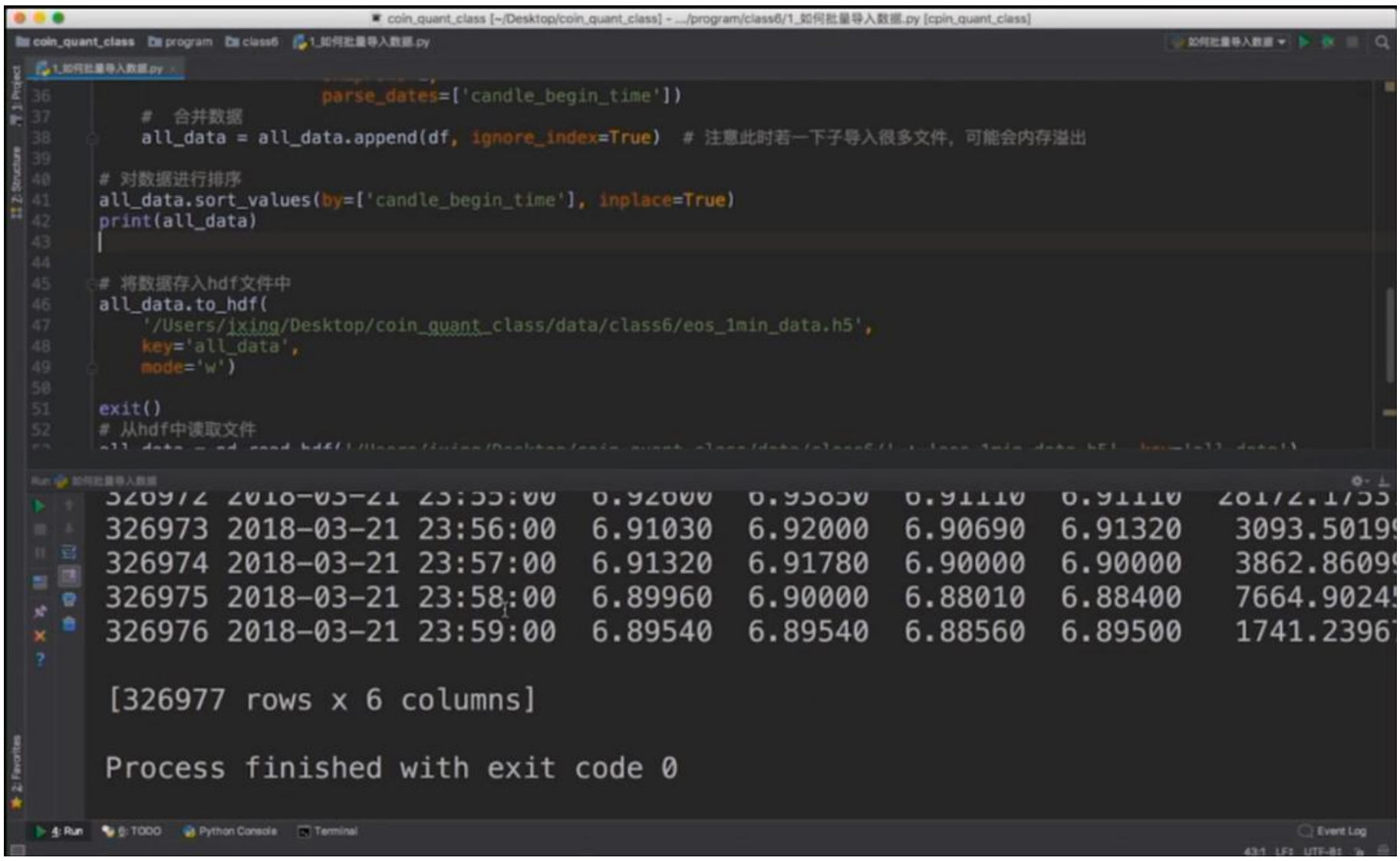
将数据存入 csv 文件中



6.2 HDF 存取数据

将数据存入 hdf 文件中

- all_data.to_hdf('.h5', key='all_data', mode='w')



从 hdf 中读取文件

- all_data = pd.read_hdf(.h5', key='all_data')

```
#
#
# # 将数据存入hdf文件中
# all_data.to_hdf(
#     '/Users/jxing/Desktop/coin_quant_class/data/class6/eos_1min_data.h5',
#     key='all_data',
#     mode='w')

# 从hdf中读取文件
all_data = pd.read_hdf('/Users/jxing/Desktop/coin_quant_class/data/class6/eos_1min_data.h5', key='all_da
print(all_data)
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/class6/1_如何批量
      candle_begin_time     open     high      low    close        volume
0   2017-07-01 16:59:00  1.20000  1.20000  1.20000  1.20000   2366.619400
1   2017-07-01 17:01:00  1.40000  1.40000  1.39000  1.39000   1130.640508
2   2017-07-01 17:02:00  1.10000  1.25000  1.10000  1.25000    234.247511
3   2017-07-01 17:03:00  1.20000  1.25000  1.10000  1.11000   2224.674241
4   2017-07-01 17:04:00  1.10000  1.10000  1.00000  1.00000   4301.678248
5   2017-07-01 17:05:00  1.00000  1.00000  1.00000  1.00000    400.000000
6   2017-07-01 17:06:00  1.08000  1.08000  0.70000  1.00000   3818.954726
7   2017-07-01 17:07:00  1.04000  1.04000  0.50000  0.55000  24512.682493
8   2017-07-01 17:08:00  0.90000  0.90000  0.90000  0.90000    300.000000
9   2017-07-01 17:09:00  0.90000  0.90000  0.90000  0.90000   1114.000000
10  2017-07-01 17:10:00  0.60000  0.99000  0.60000  0.97000   4123.089598
11  2017-07-01 17:11:00  0.97000  0.97000  0.96500  0.96500   1034.836664
12  2017-07-01 17:12:00  0.96500  0.96500  0.95000  0.96500    346.770000
13  2017-07-01 17:13:00  0.96500  1.00000  0.96500  1.00000   7119.489834
14  2017-07-01 17:14:00  1.00000  1.00000  1.00000  1.00000    205.000000
```

创建 hdf 文件

- h5_store = pd.HDFStore('eos_data.h5', mode='w')

```
for root, dirs, files in os.walk('/Users/jxing/Desktop/coin_quant_class/data/class6'):
    # 当files不为空的时候
    if files:
        for f in files:
            if f.endswith('.csv'):
                file_list.append(f)

# 创建hdf文件
h5_store = pd.HDFStore('eos_data.h5', mode='w')
exit()
# 批量导入并且存储数据
for file in sorted(file_list):
    date = file.split('_')[2]
    print(date)
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_qu
Closing remaining open files:eos_data.h5...done

Process finished with exit code 0
```

批量导入并且存储数据

- for file in sorted(file_list):
- date = file.split('_')[2]
- print(date)

```
hdf读取文件.py
            if f.endswith('.csv'):
                file_list.append(f)

# 创建hdf文件
# h5_store = pd.HDFStore('eos_data.h5', mode='w')

# 批量导入并且存储数据
for file in sorted(file_list):
    date = file.split('_')[2]
    print(date)
    exit()

    # 导入数据
for file in sorted(file_list)
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_qu
BITFINEX_EOSUSD_20170701_1T.csv

Process finished with exit code 0
```

导入数据

- df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD/' + file,
- skiprows=1,
- parse_dates=['candle_begin_time'])

```
    print(date)

    # 导入数据
    df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/cla
                     skiprows=1,
                     parse_dates=['candle_begin_time'])
    # 存储数据到hdf
    h5_store['eos_'+date] = df

# 关闭hdf文件
h5_store.close()
exit()
```

```
20180314
20180315
20180316
20180317
20180318
20180319
20180320
20180321

Process finished with exit code 0
```

存储数据到 hdf

- h5_store['eos_'+date] = df

```
                file_list.append(f)

# 创建hdf文件
h5_store = pd.HDFStore('eos_data.h5', mode='w')

# 批量导入并且存储数据
for file in sorted(file_list):
    date = file.split('_')[2]
    print(date)

    # 导入数据
    df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD/'
                     skiprows=1,
                     parse_dates=['candle_begin_time'])
    # 存储数据到hdf
    h5_store['eos_'+date] = df

# 关闭hdf文件
h5_store.close()
exit()
# =====读取hdf数据
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_qu
20170701
```

关闭 hdf 文件

- h5_store.close()

读取 hdf 数据

创建 hdf 文件

- h5_store = pd.HDFStore('eos_data.h5', mode='r')
- w：写入
- r：读取

```
hdf读取文件.py
#                    file_list.append(f)
#
# # 创建hdf文件
# h5_store = pd.HDFStore('eos_data.h5', mode='w')
#
# # 批量导入并且存储数据
# for file in sorted(file_list):
#     date = file.split('_')[2]
#     print(date)
#
#     # 导入数据
#     df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class6/BITFINEX/EOSUSD
#                      skiprows=1,
#                      parse_dates=['candle_begin_time'])
#     # 存储数据到hdf
#     h5_store['eos_'+date] = df
#
# # 关闭hdf文件
# h5_store.close()


# =====读取hdf数据
# 创建hdf文件
h5_store = pd.HDFStore('eos_data.h5', mode='r')

# h5_store中的key
```

h5_store 中的 key

- print(h5_store.keys())

```
# =====读取hdf数据
# 创建hdf文件
h5_store = pd.HDFStore('eos_data.h5', mode='r')

# h5_store中的key
print(h5_store.keys())

exit()
```

```
'eos_20170713', '/eos_20170714', '/eos_20170715', '/eos_20170716', '/eo
```

读取某个 key 指向的数据

- print(h5_store.get('eos_20170701'))

```
# 创建hdf文件
h5_store = pd.HDFStore('eos_data.h5', mode='r')

# h5_store中的key
# print(h5_store.keys())

# 读取某个key指向的数据
print(h5_store.get('eos_20170701'))
# print(h5_store['eos_20180301'])
# 关闭hdf文件
h5_store.close()
```

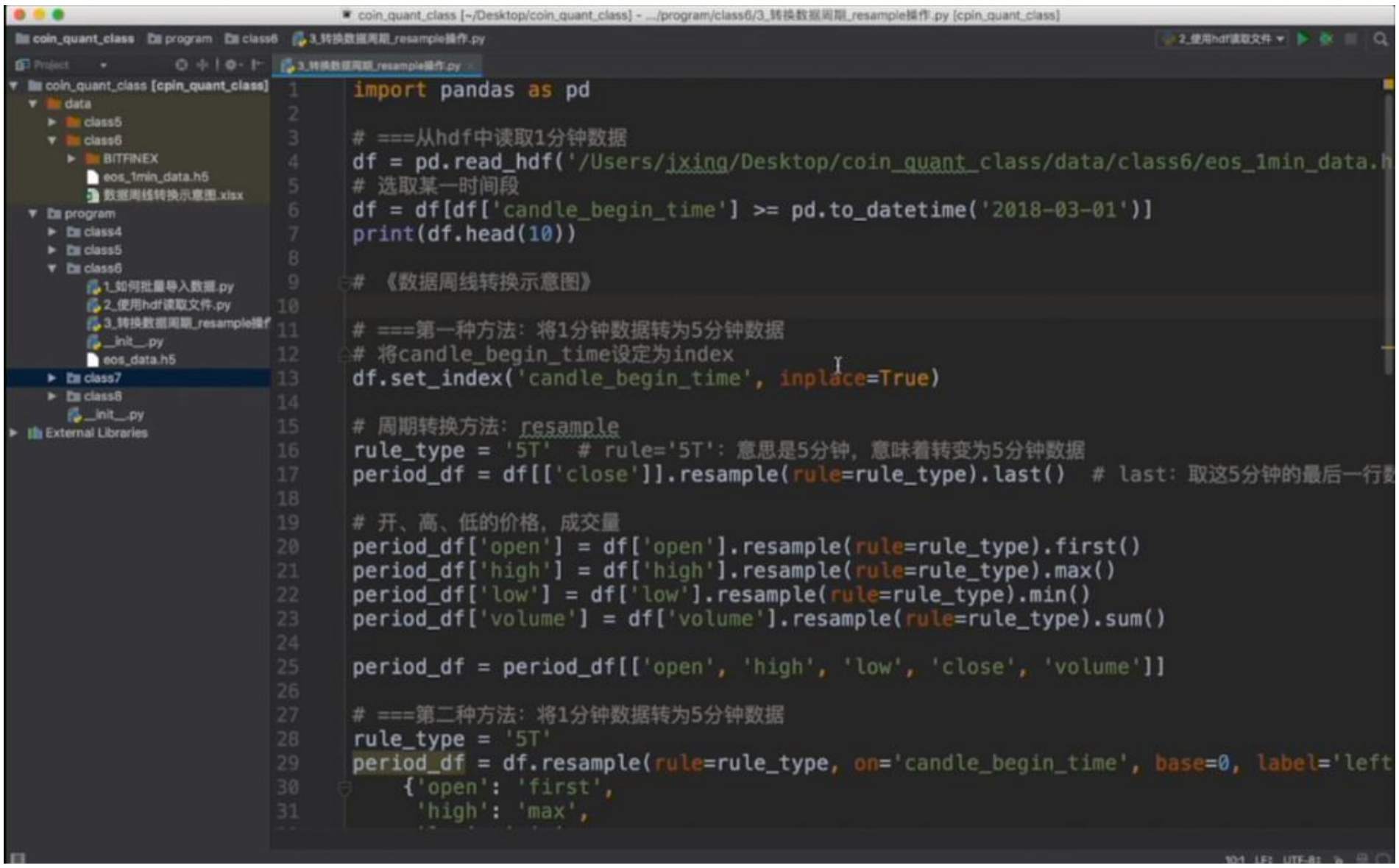
```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/class6/2_使用hdf读取文件.py
['/eos_20170701', '/eos_20170702', '/eos_20170703', '/eos_20170704', '/eos_20170705', '/eos_20170706', '/eos_20170
      candle_begin_time     open     high      low    close        volume
0   2017-07-01 16:59:00  1.20000  1.20000  1.20000  1.20000   2366.619400
1   2017-07-01 17:01:00  1.40000  1.40000  1.39000  1.39000   1130.640508
2   2017-07-01 17:02:00  1.10000  1.25000  1.10000  1.25000    234.247511
3   2017-07-01 17:03:00  1.20000  1.25000  1.10000  1.11000   2224.674241
4   2017-07-01 17:04:00  1.10000  1.10000  1.00000  1.00000   4301.678248
```

- print(h5_store['eos_20180301'])

关闭 hdf 文件

- h5_store.close()

6.3 转变 K 线数据周期



从 hdf 中读取 1 分钟数据

- df = pd.read_hdf('/Users/jxing/Desktop/coin_quant_class/data/class6/eos_1min_data.h5', key='all_data')

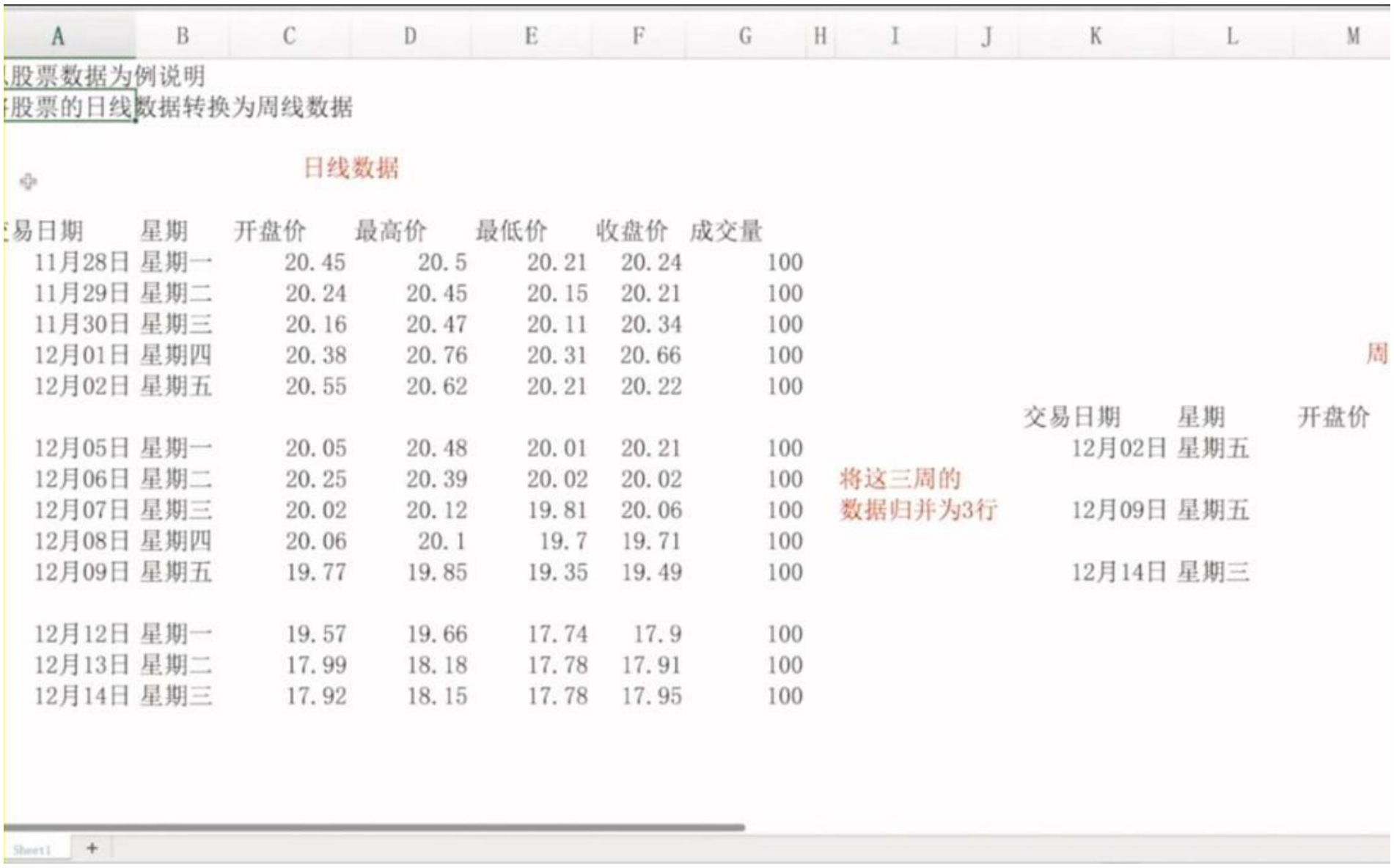
选取某一时间段

- df = df[df['candle_begin_time'] >= pd.to_datetime('2017-03-01')]
- print(df.head(10))

```python
import pandas as pd

# ===从hdf中读取1分钟数据
df = pd.read_hdf('/Users/jxing/Desktop/coin_quant_class/data/class6/eos_1m
# 选取某一时间段
df = df[df['candle_begin_time'] >= pd.to_datetime('2018-03-01')]
print(df.head(10))
exit()
# 《数据周线转换示意图》
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/progra
         candle_begin_time    open    high     low   close       volume
300327 2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818  1960.577170
300328 2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825   971.645839
300329 2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711   645.795930
300330 2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623   722.762733
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.063461
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.110082
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.845200
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.376247
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.068778
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.719523

Process finished with exit code 0
```

《数据周线转换示意图》



第一种方法：将 1 分钟数据转为 5 分钟数据

将 candle_begin_time 设定为 index

- df.set_index('candle_begin_time', inplace=True)

```
print(df.head(10))
# 《数据周线转换示意图》

# ===第一种方法：将1分钟数据转为5分钟数据
# 将candle_begin_time设定为index
df.set_index('candle_begin_time', inplace=True)
print(df)
exit()

# 周期转换方法：resample
rule_type = '5T'  # rule='5T'：意思是5分钟，意味着转变为5分钟数据
period_df = df[['close']].resample(rule=rule_type).last()  # last：取这5分钟

# 开、高、低的价格，成交量
period_df['open'] = df['open'].resample(rule=rule_type).first()
```

```
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.719523
                     open    high     low   close        volume
candle_begin_time
2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818   1960.577170
2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825    971.645839
2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711    645.795930
2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623    722.762733
2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337   7360.063461
2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150   4827.110082
2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181     25.845200
2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310   2678.376247
```

周期转换方法：resample

- rule_type = '5T' # rule='5T'：意思是 5 分钟，意味着转变为 5 分钟数据
- period_df = df[['close']].resample(rule=rule_type).last() # last：取这 5 分钟的最后一行数据

```
# 周期转换方法：resample
rule_type = '5T'  # rule='5T'：意思是5分钟，意味着转变为5分钟数据
period_df = df[['close']].resample(rule=rule_type).last()  # last：取这5分钟的最后一行数据
print(period_df)
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/clas
         candle_begin_time    open    high     low   close       volume
300327 2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818  1960.577170
300328 2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825   971.645839
300329 2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711   645.795930
300330 2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623   722.762733
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.063461
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.110082
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.845200
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.376247
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.068778
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.719523
                     close
candle_begin_time
2018-03-01 00:00:00  8.1623
2018-03-01 00:05:00  8.1330
```

开、高、低的价格，成交量

- period_df['open'] = df['open'].resample(rule=rule_type).first()
- period_df['high'] = df['high'].resample(rule=rule_type).max()
- period_df['low'] = df['low'].resample(rule=rule_type).min()
- period_df['volume'] = df['volume'].resample(rule=rule_type).sum()
- period_df = period_df[['open', 'high', 'low', 'close', 'volume']]

```
# ===第一种方法：将1分钟数据转为5分钟数据
# 将candle_begin_time设定为index
df.set_index('candle_begin_time', inplace=True)

# 周期转换方法：resample
rule_type = '5T'  # rule='5T'：意思是5分钟，意味着转变为5分钟数据
period_df = df[['close']].resample(rule=rule_type).last()  # last：取这5分钟的最后一行数据

# 开、高、低的价格，成交量
period_df['open'] = df['open'].resample(rule=rule_type).first()
period_df['high'] = df['high'].resample(rule=rule_type).max()
period_df['low'] = df['low'].resample(rule=rule_type).min()
period_df['volume'] = df['volume'].resample(rule=rule_type).sum()

period_df = period_df[['open', 'high', 'low', 'close', 'volume']]
print(period_df)
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/clas
         candle_begin_time    open    high     low   close       volume
300327 2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818  1960.577170
300328 2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825   971.645839
300329 2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711   645.795930
300330 2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623   722.762733
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.063461
```

第二种方法：将 **1** 分钟数据转为 **5** 分钟数据

- rule_type = '5T'
- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', closed='left').agg
- ({'open': 'first','high': 'max','low': 'min','close': 'last','volume': 'sum',})

```python
# period_df['open'] = df['open'].resample(rule=rule_type).first()
# period_df['high'] = df['high'].resample(rule=rule_type).max()
# period_df['low'] = df['low'].resample(rule=rule_type).min()
# period_df['volume'] = df['volume'].resample(rule=rule_type).sum()
#
# period_df = period_df[['open', 'high', 'low', 'close', 'volume']]


# ===第二种方法：将1分钟数据转为5分钟数据
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', close
    {'open': 'first',
     'high': 'max',
     'low': 'min',
     'close': 'last',
     'volume': 'sum',
     })
period_df = period_df[['open', 'high', 'low', 'close', 'volume']]
# base参数：帮助确定转换周期开始的时间
# label='left', closed='left'，建议统一设置成'left'

# ===去除不必要的数据
# 去除一天都没有交易的周
period_df.dropna(subset=['open'], inplace=True)
# 去除成交量为0的交易周期
period_df = period_df[period_df['volume'] > 0]
```

- period_df = period_df[['open', 'high', 'low', 'close', 'volume']]
- base 参数：帮助确定转换周期开始的时间
- label='left', closed='left'，建议统一设置成'left'

```python
# ===第二种方法：将1分钟数据转为5分钟数据
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', close
    {'open': 'first',
     'high': 'max',
     'low': 'min',
     'close': 'last',
     'volume': 'sum',
     })
period_df = period_df[['open', 'high', 'low', 'close', 'volume']]
print(period_df)
exit()
# base参数：帮助确定转换周期开始的时间
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quar
         candle_begin_time    open    high     low   close       volume
300327 2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818  1960.577170
300328 2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825   971.645839
300329 2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711   645.795930
300330 2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623   722.762733
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.063461
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.110082
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.845200
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.376247
```

- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=1, label='left', closed='left')

- base=1，使 1 分钟转换成 5 分钟的起点分钟时间推后 1 位，即 base=0 时，5 分钟的起点为第 0 分钟开始（0-4 分钟），base=1 则为第 1 分钟开始（1-5 分钟），以此类推。

```
# period_df = period_df[['open', 'high', 'low', 'close', 'volume']]


# ===第二种方法：将1分钟数据转为5分钟数据
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=1, label='left', clos
    {'open': 'first',

300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.06346
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.11008
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.84520
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.37624
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.06877
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.71952
                       open    high     low   close         volume
candle_begin_time
2018-02-28 23:56:00  8.1754  8.1827  8.1677  8.1818    1960.577170
2018-03-01 00:01:00  8.1816  8.1959  8.1337  8.1337    9700.267963
2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1419    9127.119831
2018-03-01 00:11:00  8.1420  8.1569  8.1286  8.1419    5103.353294
2018-03-01 00:16:00  8.1419  8.1646  8.1410  8.1600    3891.474900
2018-03-01 00:21:00  8.1600  8.2150  8.1600  8.2011    9826.695940
```

- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=2, label='left', closed='left')
- base=2，则为第 1 分钟开始（2-6 分钟），因为有一些策略放弃前几分钟的数据，采用另类的及时方式来提高策略的有效性，可以采用参数穷举得到收益率差异。

```
# period_df = period_df[['open', 'high', 'low', 'close', 'volume']]


# ===第二种方法：将1分钟数据转为5分钟数据
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=2, label='left', clos
    {'open': 'first',

300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.06346
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.11008
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.84520
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.37624
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.06877
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.71952
                       open    high     low   close         volume
candle_begin_time
2018-02-28 23:57:00  8.1754  8.1910  8.1642  8.1825    2932.223009
2018-03-01 00:02:00  8.1824  8.1959  8.1150  8.1150   13555.732207
2018-03-01 00:07:00  8.1259  8.1557  8.1178  8.1460    5333.876140
2018-03-01 00:12:00  8.1460  8.1569  8.1286  8.1419    4092.982102
2018-03-01 00:17:00  8.1420  8.1666  8.1410  8.1666    5873.980900
2018-03-01 00:22:00  8.1748  8.2189  8.1748  8.1993   15618.326580
2018-03-01 00:27:00  8.1995  8.2122  8.1830  8.1830    9827.234074
```

label='left'

- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', closed='left')

```
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', clos
    {'open': 'first',
     'high': 'max',
     'low': 'min',
     'close': 'last',
     'volume': 'sum',
     })
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.06346
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.11008
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.84520
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.37624
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.06877
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.71952
                      open    high     low   close         volume
candle_begin_time
2018-03-01 00:00:00  8.1754  8.1959  8.1622  8.1623    4300.781673
2018-03-01 00:05:00  8.1623  8.1623  8.1150  8.1330   15352.463768
2018-03-01 00:10:00  8.1259  8.1569  8.1199  8.1392    4328.911697
2018-03-01 00:15:00  8.1392  8.1646  8.1286  8.1600    3996.532020
2018-03-01 00:20:00  8.1598  8.2081  8.1598  8.2070   10367.382166
2018-03-01 00:25:00  8.2100  8.2189  8.1852  8.2109   16541.544195
```

label='right'

- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='right', closed='left')

```
rule_type = '5T'
period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='right', cl
    {'open': 'first',
     'high': 'max',
     'low': 'min',
     'close': 'last',
     'volume': 'sum',
     })
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.37624
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.06877
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.71952
                      open    high     low   close         volume
candle_begin_time
2018-03-01 00:05:00  8.1754  8.1959  8.1622  8.1623    4300.781673
2018-03-01 00:10:00  8.1623  8.1623  8.1150  8.1330   15352.463768
2018-03-01 00:15:00  8.1259  8.1569  8.1199  8.1392    4328.911697
2018-03-01 00:20:00  8.1392  8.1646  8.1286  8.1600    3996.532020
2018-03-01 00:25:00  8.1598  8.2081  8.1598  8.2070   10367.382166
2018-03-01 00:30:00  8.2100  8.2189  8.1852  8.2109   16541.544195
2018-03-01 00:35:00  8.2108  8.2119  8.1830  8.1992   10953.504903
2018-03-01 00:40:00  8.1992  8.2687  8.1992  8.2470   19109.269358
```

closed='right'

- period_df = df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', closed='right')

```
= '5T'
= df.resample(rule=rule_type, on='candle_begin_time', base=0, label='left', closed='right'
': 'first',

/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_qua
          candle_begin_time    open    high     low   close        volume
300327 2018-03-01 00:00:00  8.1754  8.1827  8.1677  8.1818  1960.577170
300328 2018-03-01 00:01:00  8.1816  8.1910  8.1642  8.1825   971.645839
300329 2018-03-01 00:02:00  8.1824  8.1959  8.1673  8.1711   645.795930
300330 2018-03-01 00:04:00  8.1769  8.1799  8.1622  8.1623   722.762733
300331 2018-03-01 00:05:00  8.1623  8.1623  8.1337  8.1337  7360.063461
300332 2018-03-01 00:06:00  8.1337  8.1454  8.1150  8.1150  4827.110082
300333 2018-03-01 00:07:00  8.1259  8.1339  8.1181  8.1181    25.845200
300334 2018-03-01 00:08:00  8.1279  8.1417  8.1178  8.1310  2678.376247
300335 2018-03-01 00:09:00  8.1310  8.1330  8.1191  8.1330   461.068778
300336 2018-03-01 00:10:00  8.1259  8.1419  8.1199  8.1419  1134.719521
                       open    high     low   close        volume
candle_begin_time
2018-02-28 23:55:00  8.1754  8.1827  8.1677  8.1818    1960.577170
2018-03-01 00:00:00  8.1816  8.1959  8.1337  8.1337    9700.267963
2018-03-01 00:05:00  8.1337  8.1454  8.1150  8.1419    9127.119831
2018-03-01 00:10:00  8.1420  8.1569  8.1286  8.1419    5103.353294
```

去除不必要的数据，去除一天都没有交易的周

- period_df.dropna(subset=['open'], inplace=True)

去除成交量为 **0** 的交易周期

- period_df = period_df[period_df['volume'] > 0]

```
# ===去除不必要的数据
# 去除一天都没有交易的周
period_df.dropna(subset=['open'], inplace=True)
# 去除成交量为0的交易周期
period_df = period_df[period_df['volume'] > 0]

# ===rule的取值
"""
    B       business day frequency
    C       custom business day frequency (experimental)
    D       calendar day frequency
    W       weekly frequency
    M       month end frequency
    SM      semi-month end frequency (15th and end of month)
    BM      business month end frequency
    CBM     custom business month end frequency
```

rule 的取值

- S：secondly frequency，秒
- T：minutely frequency，分钟
- H：hourly frequency，小时
- D：calendar day frequency，日
- W：weekly frequency，周
- M：month end frequency，月
- Q：quarter end frequency，季
- A：year end frequency，年

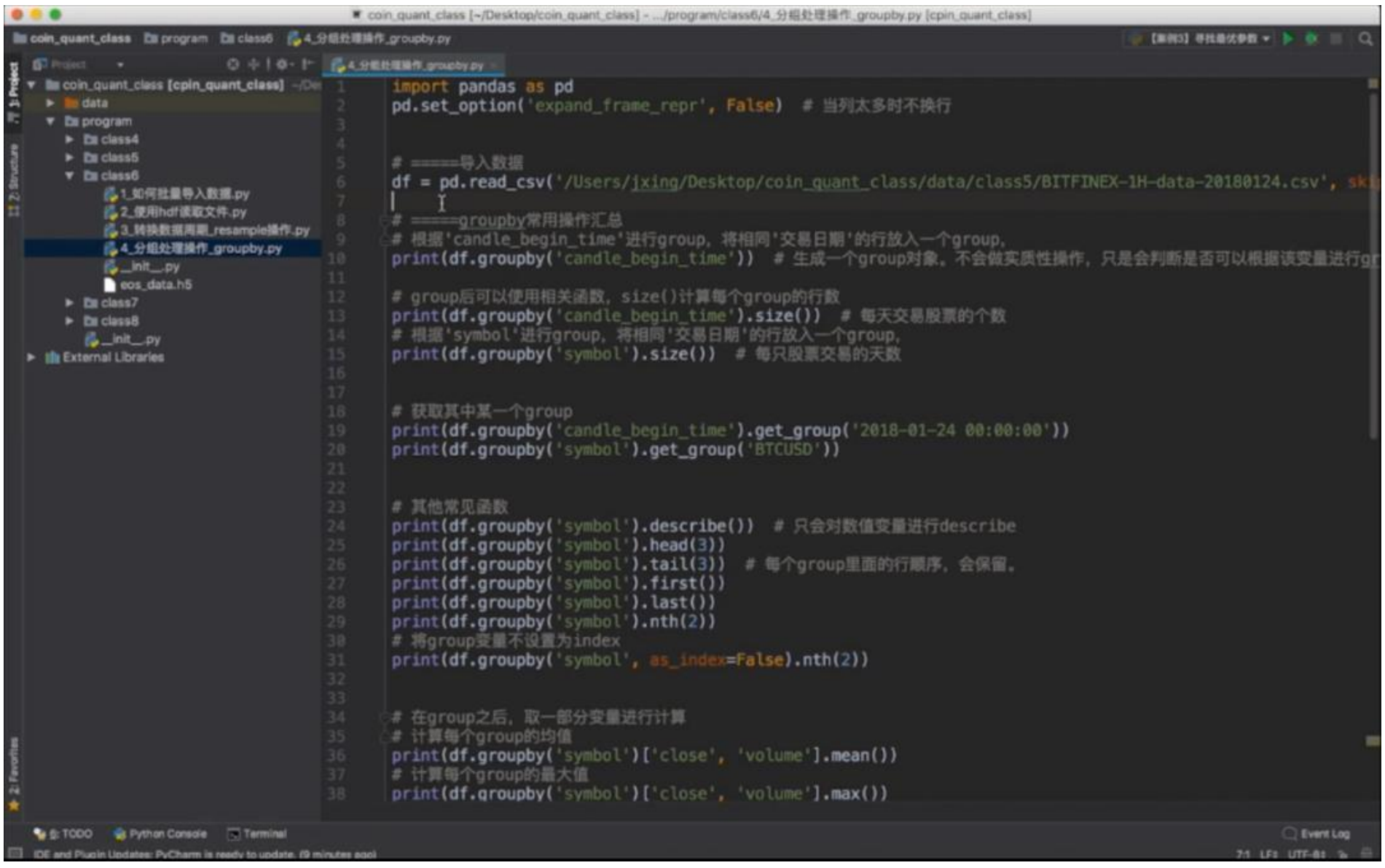
```
# ===rule的取值
"""
    B       business day frequency
    C       custom business day frequency (experimental)
    D       calendar day frequency
    W       weekly frequency
    M       month end frequency
    SM      semi-month end frequency (15th and end of month)
    BM      business month end frequency
    CBM     custom business month end frequency
    MS      month start frequency
    SMS     semi-month start frequency (1st and 15th)
    BMS     business month start frequency
    CBMS    custom business month start frequency
    Q       quarter end frequency
    BQ      business quarter endfrequency
    QS      quarter start frequency
    BQS     business quarter start frequency
```

```
    BQS     business quarter start frequency
    A       year end frequency
    BA      business year end frequency
    AS      year start frequency
    BAS     business year start frequency
    BH      business hour frequency
    H       hourly frequency
    T       minutely frequency
    S       secondly frequency
    L       milliseconds
    U       microseconds
    N       nanoseconds
"""
```

6.4 groupby 分组

导入数据

- df = pd.read_csv('/Users/jxing/Desktop/coin_quant_class/data/class5/BITFINEX-1H-data-20180124.csv', skiprows=1)



根据'candle_begin_time'进行 group，将相同'交易日期'的行放入一个 group，

- print(df.groupby('candle_begin_time')) # 生成一个 group 对象。不会做实质性操作，只是会判断是否可以根据该变量进行 groupby。

group 后可以使用相关函数，size()计算每个 group 的行数

- print(df.groupby('candle_begin_time').size()) # 每小时交易的币的个数

```
# 根据'candle_begin_time'进行group，将相同'交易日期'的行放入一个group，
# print(df.groupby('candle_begin_time'))  # 生成一个group对象。不会做实质性操作，只是会

# group后可以使用相关函数，size()计算每个group的行数
print(df.groupby('candle_begin_time').size())  # 每小时交易的币的个数
exit()
# 根据'symbol'进行group，将相同'symbol'的行放入一个group，
print(df.groupby('symbol').size())  # 每个币交易的小时数
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
candle_begin_time
2018-01-24 00:00:00     82
2018-01-24 01:00:00     79
2018-01-24 02:00:00     84
2018-01-24 03:00:00     82
2018-01-24 04:00:00     80
2018-01-24 05:00:00     80
2018-01-24 06:00:00     84
2018-01-24 07:00:00     84
2018-01-24 08:00:00     82
2018-01-24 09:00:00     84
```

根据'symbol'进行 group，将相同'symbol'的行放入一个 group

- print(df.groupby('symbol').size()) # 每个币交易的小时数

```
# print(df.groupby('candle_begin_time'))  # 生成一个group对象。不会做实质性操作，只是会

# group后可以使用相关函数，size()计算每个group的行数
# print(df.groupby('candle_begin_time').size())  # 每小时交易的币的个数
# 根据'symbol'进行group，将相同'symbol'的行放入一个group，
print(df.groupby('symbol').size())  # 每个币交易的小时数
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/
symbol
AIDBTC      8
AIDETH      8
AIDUSD      8
AVTBTC     23
AVTETH     22
AVTUSD     24
BATBTC     24
BATETH     21
BATUSD     24
```

获取其中某一个 group

- print(df.groupby('candle_begin_time').get_group('2018-01-24 00:00:00'))

```
# 获取其中某一个group
print(df.groupby('candle_begin_time').get_group('2018-01-24 00:00:00'))
exit()
print(df.groupby('symbol').get_group('BTCUSD'))
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/class6/
        candle_begin_time  symbol          open          high           low         close
24    2018-01-24 00:00:00  AVTBTC      0.000329      0.000338      0.000328      0.000338  9.11
47    2018-01-24 00:00:00  AVTETH      0.003633      0.003725      0.003633      0.003725  4.30
69    2018-01-24 00:00:00  AVTUSD      3.550000      3.591100      3.550000      3.590900  3.45
93    2018-01-24 00:00:00  BATBTC      0.000052      0.000058      0.000052      0.000052  6.18
117   2018-01-24 00:00:00  BATETH      0.000592      0.000640      0.000589      0.000589  2.32
138   2018-01-24 00:00:00  BATUSD      0.563070      0.630340      0.538360      0.538360  1.33
162   2018-01-24 00:00:00  BCHBTC      0.149160      0.149180      0.147880      0.148020  5.57
186   2018-01-24 00:00:00  BCHETH      1.637900      1.638300      1.627400      1.637200  8.10
210   2018-01-24 00:00:00  BCHUSD   1613.100000   1624.900000   1567.000000   1568.000000  1.84
234   2018-01-24 00:00:00  BTCEUR   8794.544912   8853.835804   8547.700000   8614.000000  1.39
258   2018-01-24 00:00:00  BTCUSD  10812.000000  10906.000000  10522.000000  10580.000000  2.61
282   2018-01-24 00:00:00  BTGBTC      0.017058      0.017360      0.017031      0.017319  4.73
306   2018-01-24 00:00:00  BTGUSD    184.900000    186.340000    182.170000    183.600000  3.26
330   2018-01-24 00:00:00  DATBTC      0.000016      0.000016      0.000016      0.000016  1.06
```

- print(df.groupby('symbol').get_group('BTCUSD'))

```
# 获取其中某一个group
# print(df.groupby('candle_begin_time').get_group('2018-01-24 00:00:00'))
print(df.groupby('symbol').get_group('BTCUSD'))
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_class/program/class6/
        candle_begin_time  symbol          open          high           low    close       volum
258  2018-01-24 00:00:00  BTCUSD  10812.000000  10906.000000  10522.000000  10580.0  2616.12474
259  2018-01-24 01:00:00  BTCUSD  10581.000000  10829.000000  10522.000000  10589.0  2562.00700
260  2018-01-24 02:00:00  BTCUSD  10588.000000  10768.000000  10518.333218  10739.0  2043.93154
261  2018-01-24 03:00:00  BTCUSD  10739.000000  10861.000000  10615.000000  10810.0  1137.68719
262  2018-01-24 04:00:00  BTCUSD  10809.000000  10813.000000  10430.000000  10631.0  2251.17544
263  2018-01-24 05:00:00  BTCUSD  10630.000000  10749.000000  10542.000000  10626.0   685.34088
264  2018-01-24 06:00:00  BTCUSD  10626.000000  11052.000000  10598.000000  10921.0  1652.14212
265  2018-01-24 07:00:00  BTCUSD  10921.000000  11090.000000  10842.000000  10936.0  1638.26467
266  2018-01-24 08:00:00  BTCUSD  10936.164237  11013.000000  10813.000000  10835.0   945.52062
267  2018-01-24 09:00:00  BTCUSD  10835.000000  11087.000000  10761.000000  11051.0  1244.67316
268  2018-01-24 10:00:00  BTCUSD  11055.000000  11162.000000  10919.000000  10991.0  2015.22184
269  2018-01-24 11:00:00  BTCUSD  10990.000000  11194.000000  10888.000000  11045.0  2001.24610
270  2018-01-24 12:00:00  BTCUSD  11045.000000  11461.000000  10970.000000  11286.0  3391.24426
271  2018-01-24 13:00:00  BTCUSD  11286.098637  11385.000000  11183.000000  11330.0  1981.17237
```

其他常见函数

- print(df.groupby('symbol').describe()) # 只会对数值变量进行 describe
- print(df.groupby('symbol').head(3))
- print(df.groupby('symbol').tail(3)) # 每个 group 里面的行顺序，会保留。
- print(df.groupby('symbol').first())

- print(df.groupby('symbol').last())
- print(df.groupby('symbol').nth(2))

```
# 其他常见函数
print(df.groupby('symbol').describe())  # 只会对数值变量进行describe
print(df.groupby('symbol').head(3))
print(df.groupby('symbol').tail(3))  # 每个group里面的行顺序，会保留。
print(df.groupby('symbol').first())
print(df.groupby('symbol').last())
print(df.groupby('symbol').nth(2))
# 将group变量不设置为index
print(df.groupby('symbol', as_index=False).nth(2))
```

将 group 变量设置为 index

- print(df.groupby('symbol').nth(2))

```
# 其他常见函数
# print(df.groupby('symbol').describe())  # 只会对数值变量进行describe
# print(df.groupby('symbol').head(3))
# print(df.groupby('symbol').tail(3))  # 每个group里面的行顺序，会保留。
# print(df.groupby('symbol').first())
# print(df.groupby('symbol').last())
print(df.groupby('symbol').nth(2))
exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
          candle_begin_time         close          high           low
symbol
AIDBTC  2018-01-24 18:00:00      0.000072      0.000075      0.000050
AIDETH  2018-01-24 18:00:00      0.000610      0.000674      0.000560
AIDUSD  2018-01-24 18:00:00      0.715000      0.717000      0.480000
AVTBTC  2018-01-24 02:00:00      0.000341      0.000341      0.000338
AVTETH  2018-01-24 02:00:00      0.003721      0.003729      0.003714
AVTUSD  2018-01-24 02:00:00      3.732100      3.743100      3.583000
BATBTC  2018-01-24 02:00:00      0.000051      0.000060      0.000051
BATETH  2018-01-24 03:00:00      0.000558      0.000558      0.000558
BATUSD  2018-01-24 02:00:00      0.540000      0.562590      0.540000
```

将 group 变量【不】设置为 index

- print(df.groupby('symbol', as_index=False).nth(2))

```python
# print(df.groupby('symbol').head(3))
# print(df.groupby('symbol').tail(3))  # 每个group里面的行顺序，会保留。
# print(df.groupby('symbol').first())
# print(df.groupby('symbol').last())
# print(df.groupby('symbol').nth(2))
# 将group变量不设置为index
print(df.groupby('symbol', as_index=False).nth(2))

exit()
```

```
Run 4_分组处理操作_groupby
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
         candle_begin_time  symbol          open          high            lo
2      2018-01-24 18:00:00  AIDBTC      0.000063      0.000075       0.00005
10     2018-01-24 18:00:00  AIDETH      0.000625      0.000674       0.00056
18     2018-01-24 18:00:00  AIDUSD      0.618000      0.717000       0.48000
26     2018-01-24 02:00:00  AVTBTC      0.000338      0.000341       0.00033
49     2018-01-24 02:00:00  AVTETH      0.003714      0.003729       0.00371
71     2018-01-24 02:00:00  AVTUSD      3.732200      3.743100       3.58300
95     2018-01-24 02:00:00  BATBTC      0.000052      0.000060       0.00005
119    2018-01-24 03:00:00  BATETH      0.000558      0.000558       0.00055
140    2018-01-24 02:00:00  BATUSD      0.551360      0.562590       0.54000
164    2018-01-24 02:00:00  BCHBTC      0.147310      0.148260       0.14666
188    2018-01-24 02:00:00  BCHETH      1.626700      1.626700       1.62130
```

在 group 之后，取一部分变量进行计算

计算每个 group 的均值

- print(df.groupby('symbol')['close', 'volume'].mean())

计算每个 group 的最大值

- print(df.groupby('symbol')['close', 'volume'].max())

```
# 在group之后，取一部分变量进行计算
# 计算每个group的均值
print(df.groupby('symbol')['close', 'volume'].mean())
exit()
# 计算每个group的最大值
print(df.groupby('symbol')['close', 'volume'].max())
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
                close        volume
symbol
AIDBTC       0.000075  4.045211e+04
AIDETH       0.000681  8.552060e+04
AIDUSD       0.711174  1.412989e+05
AVTBTC       0.000341  2.540781e+03
AVTETH       0.003721  8.899753e+02
AVTUSD       3.751133  4.340907e+03
BATBTC       0.000050  2.427838e+04
BATETH       0.000540  1.039421e+04
BATUSD       0.544707  3.526614e+04
BCHBTC       0.146840  4.273124e+02
```

计算每个 group 的加总

- print(df.groupby('symbol')['volume'].sum())

```
# 计算每个group的加总
print(df.groupby('symbol')['volume'].sum())
exit()
# 计算该数据在每个group中的排名
print(df.groupby('candle_begin_time')['volume'].rank())
print(df.groupby('candle_begin_time')['volume'].rank(pct=True))
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
symbol
AIDBTC    3.236169e+05
AIDETH    6.841648e+05
AIDUSD    1.130391e+06
AVTBTC    5.843797e+04
AVTETH    1.957946e+04
AVTUSD    1.041818e+05
BATBTC    5.826811e+05
BATETH    2.182783e+05
BATUSD    8.463872e+05
```

计算该数据在每个 group 中的排名

- print(df.groupby('candle_begin_time')['volume'].rank())
- print(df.groupby('candle_begin_time')['volume'].rank(pct=True))

```python
# 计算每个group的加总
print(df.groupby('symbol')['volume'].sum())

# 计算该数据在每个group中的排名
print(df.groupby('candle_begin_time')['volume'].rank())
exit()
print(df.groupby('candle_begin_time')['volume'].rank(pct=True))
```

```
ZRXETH    6.832194e+04
ZRXUSD    7.616381e+05
Name: volume, Length: 105, dtype: float64
0        63.0
1        80.0
2        88.0
3        82.0
4        68.0
5        27.0
6        78.0
7        68.0
8        74.0
9        88.0
```

也可以同时用多个变量来进行 **group**，将这些变量的值都相同的行

- df['candle_begin_time'] = pd.to_datetime(df['candle_begin_time'])
- df.loc[df['candle_begin_time'].dt.hour < 12, '时间'] = '上午'

```python
# 也可以同时用多个变量来进行group，将这些变量的值都相同的行
df['candle_begin_time'] = pd.to_datetime(df['candle_begin_time'])
df.loc[df['candle_begin_time'].dt.hour < 12, '时间'] = '上午'
print(df)
exit()
```

```
0  0.820000  0.771900  0.810000   50448.196440  NaN
0  0.000338  0.000328  0.000338     911.117580   上午
5  0.000348  0.000333  0.000335    2471.297744   上午
3  0.000341  0.000338  0.000341     245.576300   上午
3  0.000350  0.000348  0.000350      89.402137   上午
4  0.000350  0.000340  0.000350     539.020877   上午
0  0.000364  0.000344  0.000364    4227.805539   上午
...       ...       ...       ...            ...   ...
4  0.001624  0.001588  0.001588    2285.800000  NaN
2  0.001582  0.001576  0.001576     250.233022  NaN
9  0.001569  0.001569  0.001569    2397.000000  NaN
5  0.001610  0.001595  0.001610    1896.120939  NaN
2  0.001620  0.001600  0.001600    3629.822898  NaN
```

- df['时间'].fillna(value='下午', inplace=True)
- print(df.groupby(['symbol', '时间']).size())

```python
# 也可以同时用多个变量来进行group，将这些变量的值都相同的行
df['candle_begin_time'] = pd.to_datetime(df['candle_begin_time'])
df.loc[df['candle_begin_time'].dt.hour < 12, '时间'] = '上午'
df['时间'].fillna(value='下午', inplace=True)
print(df.groupby(['symbol', '时间']).size())

exit()
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Des
symbol  时间
AIDBTC  下午     8
AIDETH  下午     8
AIDUSD  下午     8
AVTBTC  上午    11
        下午    12
AVTETH  上午    12
        下午    10
AVTUSD  上午    12
```

我们之前讲过的 **resample**、**fillna**、**apply** 等常见操作，在 **group** 里面都可以进行。

这些操作需要大家有一定的积累，若直接在 **group** 上进行这些操作不熟练，可以使用已下的方式。

遍历 **group**，对每个 **group** 进行单独操作，然后将这些 **group** 合并起来。

- 语法：for key, group in df.groupby('列名'):

```python
for i, j in df.groupby('symbol'):
    print(i)
    print(j)
    print()

    # 以下可以对各个group进行任意操作。
```

```
/Users/jxing/anaconda/envs/py3/bin/python /Users/jxing/Desktop/coin_quant_
AIDBTC
     candle_begin_time  symbol      open      high       low     close
0  2018-01-24 16:00:00  AIDBTC  0.000197  0.000197  0.000030  0.000135   2
1  2018-01-24 17:00:00  AIDBTC  0.000079  0.000100  0.000047  0.000056   5
2  2018-01-24 18:00:00  AIDBTC  0.000063  0.000075  0.000050  0.000072  10
3  2018-01-24 19:00:00  AIDBTC  0.000072  0.000073  0.000061  0.000070   6
4  2018-01-24 20:00:00  AIDBTC  0.000070  0.000077  0.000061  0.000061   2
5  2018-01-24 21:00:00  AIDBTC  0.000061  0.000068  0.000060  0.000068
6  2018-01-24 22:00:00  AIDBTC  0.000063  0.000073  0.000055  0.000073   3
7  2018-01-24 23:00:00  AIDBTC  0.000073  0.000073  0.000065  0.000069   1

AIDETH
     candle_begin_time  symbol      open      high       low     close
```

- for symbol, group in df.groupby('symbol'):
- print(symbol)
- print(group)

以下可以对各个 **group** 进行任意操作。

- group.fillna()
- group.apply()

```
# 语法: for key, group in df.groupby('列名'):

for symbol, group in df.groupby('symbol'):
    print(symbol)
    print(group)

    # 以下可以对各个group进行任意操作。
    # group.fillna()
    # group.apply()

    # 操作完之后，将这些group再append起来

for symbol, group in df.groupby...
7  2018-01-24 23:00:00  AIDBTC  0.000073  0.000073  0.000065  0.000069  1

AIDETH
      candle_begin_time  symbol      open      high       low     close
8   2018-01-24 16:00:00  AIDETH  0.000546  0.000900  0.000510  0.000727
9   2018-01-24 17:00:00  AIDETH  0.000720  0.000720  0.000515  0.000602
10  2018-01-24 18:00:00  AIDETH  0.000625  0.000674  0.000560  0.000610  2
11  2018-01-24 19:00:00  AIDETH  0.000675  0.000728  0.000675  0.000710
12  2018-01-24 20:00:00  AIDETH  0.000700  0.000845  0.000511  0.000511  2
```

操作完之后，将这些 **group** 再 **append** 起来

在一开始不熟练的时候，可以多用遍历每个 **group** 的方式。

END

-