Python大数据分析

五、时间采样

```
星 Eile Edit View Navigate Code Refactor Run Iools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
     Exec.py
                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                   'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                  12
                                   datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                   datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('M').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-30
                        1.880000
        2019-12-31
                       1.816667
        2020-01-31
                       1.750000
        Freq: M, Name: height, dtype: float64
        Process finished with exit code 0
         I 6: TODO
                 ■ Terminal
                          Python Console
                                                                                                                                               C Event Log
                                                                                                                     16:44 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🦫 💆
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星 Eile Edit View Navigate Code Refactor Run Iools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
     Exec.py
                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                   'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
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                  12
                                   datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                   datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('M', kind='period').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11
                    1.880000
        2019-12
                    1.816667
        2020-01
                    1.750000
        Freq: M, Name: height, dtype: float64
        Process finished with exit code 0
         I 6: TODO
                 ■ Terminal
                          Python Console
                                                                                                                                              C Event Log
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🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                  Exec.py
                         Trom datetime import datetime
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                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
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                                   'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
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                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                  12
                                   datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                   datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].groupby(frame.index.to_period(freq='M')).mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11
                    1.880000
        2019-12
                    1.816667
        2020-01
                    1.750000
        Freq: M, Name: height, dtype: float64
        Process finished with exit code 0
         I 6: TODO
                 ■ Terminal
                          Python Console
                                                                                                                                              C Event Log
                                                                                                                     16:71 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🚡
```

```
🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
     Exec.py
                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                  'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                  12
                                   datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                   datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('H').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-29 00:00:00
                                  1.88
        2019-11-29 01:00:00
                                   NaN
        2019-11-29 02:00:00
                                   NaN
        2019-11-29 03:00:00
                                   NaN
        2019-11-29 04:00:00
                                   NaN
        2020-01-03 20:00:00
                                   NaN
         ≡ 6: TODO ► Terminal • Python Console
                                                                                                                     16:44 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🦫 💆
```

```
🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
mp2 \ Exec.py
                   Exec.py
                          trom datetime import datetime
    mp2 C:\Users\leeshu
   > venv library root
      Exec.py
                          data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
      macrodata.csv
                                    'name': ['黎明','赵怡春','张富平','白丽','牛玉德','姚华','李南'],
  > IIII External Libraries
    Scratches and Consol
                                    'gender': [True, False, True, False, True, False, True],
                                    'age': [16, 20, 18, 18, 17, 18, 16],
                    9
                                    'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                   10
                   11
                   12
                          dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                                    datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                   13
                                    datetime(2020, 1, 4)]
                   14
                          frame = pd.DataFrame(data, index=dates)
                   15
                          print(frame['height'].resample('H').ffill())
                   16
                   17
        Exec >
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
         2019-11-29 00:00:00
                                   1.88
         2019-11-29 01:00:00
                                   1.88
         2019-11-29 02:00:00
                                   1.88
         2019-11-29 03:00:00
                                   1.88
         2019-11-29 04:00:00
                                   1.88
         2020-01-03 20:00:00
                                   1.75
  ▶ 4: Run 	≡ 6: TODO 	国 Terminal 	♣ Python Console
PyCharm 2020.1 available: // Update... (20 minutes ago)
                                                                                                                        16:45 CRLF UTF-8 8 spaces* Python 3.7 (mp2) 🧣 💆
```

```
🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                                                                                                                                       Exec
mp2 Exec.py
  mp2 C:\Users\leeshu 5
   > le venv library root
                          data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
      Exec.py
                                   'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
      macrodata.csv
                    7
  > IIII External Libraries
                                   'gender': [True, False, True, False, True, False, True],
    Scratches and Consol
                                   'age': [16, 20, 18, 18, 17, 18, 16],
                                   'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                   10
                  11
                  12
                          dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                                    datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                    datetime(2020, 1, 4)]
                  14
                          frame = pd.DataFrame(data, index=dates)
                  15
                          pd.set_option('display.max_rows', None)
                   16
                          print(frame['height'].resample('H').ffill(limit=2))
                   17
                   18
        Exec ×
         2019-12-04 22:00:00
                                    NaN
         2019-12-04 23:00:00
                                    NaN
         2019-12-05 00:00:00
                                   1.78
         2019-12-05 01:00:00
                                   1.78
         2019-12-05 02:00:00
                                   1.78
         2019-12-05 03:00:00
                                    NaN
         2019-12-05 04:00:00
                                    NaN
  ▶ 4: Run 	≡ 6: TODO 	国 Terminal 	♣ Python Console
PyCharm 2020.1 available: // Update... (35 minutes ago)
                                                                                                                      17:52 CRLF UTF-8 8 spaces* Python 3.7 (mp2) 🔓 👨
```

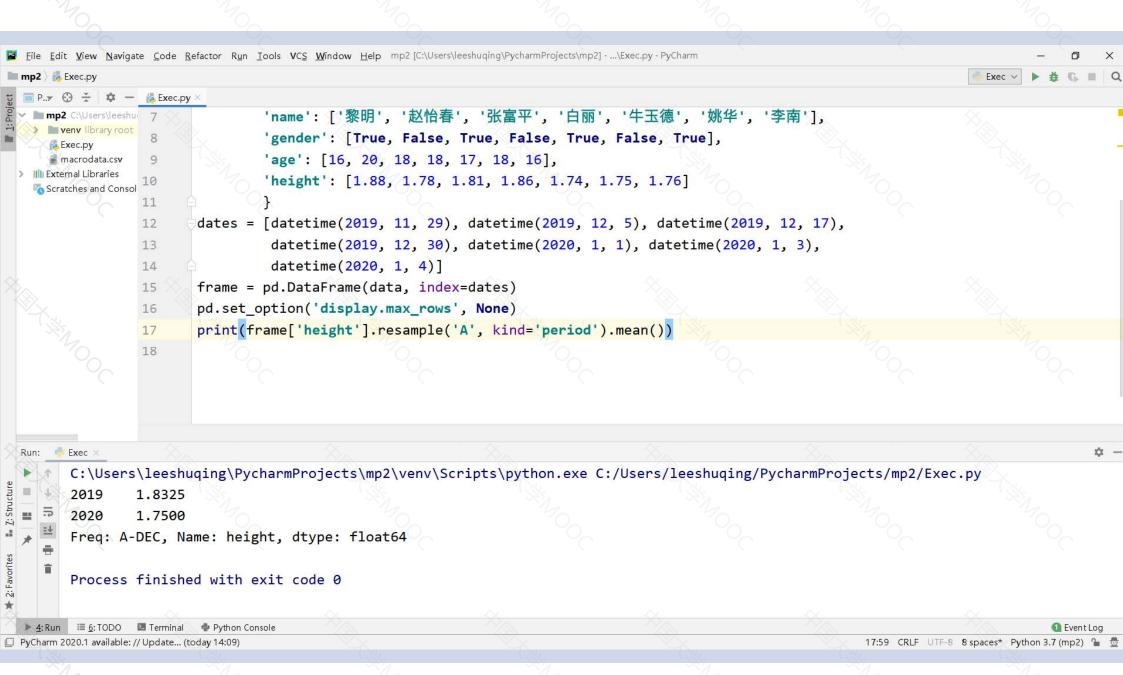
```
🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
     Exec.py
                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                  'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                  12
                                   datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                  13
                                   datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('H', closed='right').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-28 23:00:00
                                  1.88
        2019-11-29 00:00:00
                                   NaN
        2019-11-29 01:00:00
                                   NaN
        2019-11-29 02:00:00
                                   NaN
        2019-11-29 03:00:00
                                   NaN
        2020-01-03 19:00:00
                                   NaN
         ≡ 6: TODO ► Terminal • Python Console
                                                                                                                     16:60 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🦫 💆
```

```
🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
mp2 \ Exec.py
   P.y (3) ÷ = -
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > library root 5
     Exec.py
                        data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                  'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                  'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                  9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                 10
                 11
                         dates = [datetime(2019, 11, 29, 1, 2, 0), datetime(2019, 11, 29, 2, 0, 0),
                 12
                                  datetime(2019, 12, 17), datetime(2019, 12, 30), datetime(2020, 1, 1),
                 13
                                  datetime(2020, 1, 3), datetime(2020, 1, 4)]
                 14
                        frame = pd.DataFrame(data, index=dates)
                 15
                         print(frame)
                  16
                  17
        Exec >
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
                                   ID name gender age height
                                         黎明
        2019-11-29 01:02:00 000001
                                                 True
                                                        16
                                                               1.88
                                       赵怡春
        2019-11-29 02:00:00 000002
                                                False
                                                         20
                                                                1.78
                                       张富平
        2019-12-17 00:00:00
                              000003
                                                  True
                                                         18
                                                                1.81
        2019-12-30 00:00:00
                                         白丽
                                                False
                              000004
                                                        18
                                                               1.86
                                        牛玉德
                                                                1.74
        2020-01-01 00:00:00
                              000005
                                                  True
                                                         17
                                        姚华
        2020-01-03 00:00:00 000006
                                                False
                                                        18
                                                               1.75
  ▶ 4: Run ≡ 6: TODO ► Terminal • Python Console
                                                                                                                                           C Event Log
                                                                                                                  12:75 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🦫 💆
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🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
mp2 \ Exec.py
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
     Exec.py
                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
     macrodata.csv
                                  'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
  III External Libraries
   Scratches and Consol
                                   'gender': [True, False, True, False, True, False, True],
                                  'age': [16, 20, 18, 18, 17, 18, 16],
                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29, 1, 2, 0), datetime(2019, 11, 29, 2, 0, 0),
                  12
                                   datetime(2019, 12, 17), datetime(2019, 12, 30), datetime(2020, 1, 1),
                  13
                                   datetime(2020, 1, 3), datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('H').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-29 01:00:00
                                  1.88
        2019-11-29 02:00:00
                                  1.78
        2019-11-29 03:00:00
                                   NaN
        2019-11-29 04:00:00
                                   NaN
        2019-11-29 05:00:00
                                   NaN
        2020-01-03 20:00:00
                                   NaN
         ≡ 6: TODO ► Terminal • Python Console
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🖺 File Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
mp2 \ Exec.py
                  Exec.py
                         Trom datetime import datetime
   mp2 C:\Users\leeshu
   > le venv library root 5
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                         data = {'ID': ['000001', '000002', '000003', '000004', '000005', '000006', '000007'],
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   Scratches and Consol
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                  10
                  11
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                  12
                                   datetime(2019, 12, 17), datetime(2019, 12, 30), datetime(2020, 1, 1),
                  13
                                   datetime(2020, 1, 3), datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('H', closed='right').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-29 01:00:00
                                  1.83
        2019-11-29 02:00:00
                                   NaN
        2019-11-29 03:00:00
                                   NaN
        2019-11-29 04:00:00
                                   NaN
        2019-11-29 05:00:00
                                   NaN
        2020-01-03 19:00:00
                                   NaN
        ≡ 6: TODO ► Terminal • Python Console
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   Scratches and Consol
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                   9
                                  'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
                  10
                  11
                         dates = [datetime(2019, 11, 29, 1, 2, 0), datetime(2019, 11, 29, 2, 0, 0),
                  12
                                   datetime(2019, 12, 17), datetime(2019, 12, 30), datetime(2020, 1, 1),
                  13
                                   datetime(2020, 1, 3), datetime(2020, 1, 4)]
                  14
                         frame = pd.DataFrame(data, index=dates)
                  15
                         print(frame['height'].resample('H', label='right', closed='right').mean())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
        2019-11-29 02:00:00
                                  1.83
        2019-11-29 03:00:00
                                   NaN
        2019-11-29 04:00:00
                                   NaN
        2019-11-29 05:00:00
                                   NaN
        2019-11-29 06:00:00
                                   NaN
        2020-01-03 20:00:00
                                   NaN
        ≡ 6: TODO ■ Terminal → Python Console
                                                                                                                     16:75 CRLF UTF-8 4 spaces Python 3.7 (mp2) 🧣 💆
```



```
🖺 Eile Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
    P.. - - Exec.py
    mp2 C:\Users\leeshu q
                                    'age': [16, 20, 18, 18, 17, 18, 16],
    > wenv library root
                                    'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
      Exec.py
      macrodata.csv
                   11
  > IIII External Libraries
    Scratches and Consol 12
                           dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                                     datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                                     datetime(2020, 1, 4)]
                   14
                           frame = pd.DataFrame(data, index=dates)
                   15
                           pd.set_option('display.max_rows', None)
                   16
                   17
                          frame = frame['height'].resample('A', kind='period').mean()
                           print(frame.resample('Q-DEC').ffill())
                   18
                   19
         C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
         201901
                    1.8325
         201902
                    1.8325
         201903
                    1.8325
         2019Q4
                    1.8325
         202001
                    1.7500
         202002
                    1.7500
         202003
                    1.7500
                    1.7500
         202004
         Freq: Q-DEC, Name: height, dtype: float64
  ▶ 4: Run ≡ 6: TODO ► Terminal → Python Console
PyCharm 2020.1 available: // Update... (today 14:09)
                                                                                                                         18:39 CRLF UTF-8 8 spaces* Python 3.7 (mp2) 🦫 💆
```

```
📴 Eile Edit View Navigate Code Refactor Run Jools VCS Window Help mp2 [C:\Users\leeshuqing\PycharmProjects\mp2] - ...\Exec.py - PyCharm
    P..y 🕀 🛨 🌣 — 🐔 Exec.py
                                   'name': ['黎明', '赵怡春', '张富平', '白丽', '牛玉德', '姚华', '李南'],
   mp2 C:\Users\leeshu 7
   > library root
                                   'gender': [True, False, True, False, True, False, True],
      Exec.py
      macrodata.csv
                                   'age': [16, 20, 18, 18, 17, 18, 16],
  > IIII External Libraries
                                   'height': [1.88, 1.78, 1.81, 1.86, 1.74, 1.75, 1.76]
    Scratches and Consol
                   11
                          dates = [datetime(2019, 11, 29), datetime(2019, 12, 5), datetime(2019, 12, 17),
                  12
                  13
                                    datetime(2019, 12, 30), datetime(2020, 1, 1), datetime(2020, 1, 3),
                                    datetime(2020, 1, 4)]
                  14
                          frame = pd.DataFrame(data, index=dates)
                  15
                          print(frame['height'].resample('A', kind='period').ohlc())
                  16
                  17
        C:\Users\leeshuqing\PycharmProjects\mp2\venv\Scripts\python.exe C:/Users/leeshuqing/PycharmProjects/mp2/Exec.py
               open high
                             low close
         2019 1.88 1.88 1.78
                                    1.86
         2020 1.74 1.76 1.74
                                   1.76
         Process finished with exit code 0
         ≡ 6: TODO ► Terminal
                          Python Console
PyCharm 2020.1 available: // Update... (today 14:09)
                                                                                                                      16:59 CRLF UTF-8 8 spaces* Python 3.7 (mp2) 🧣 💆
```

一次不学多,下次再学