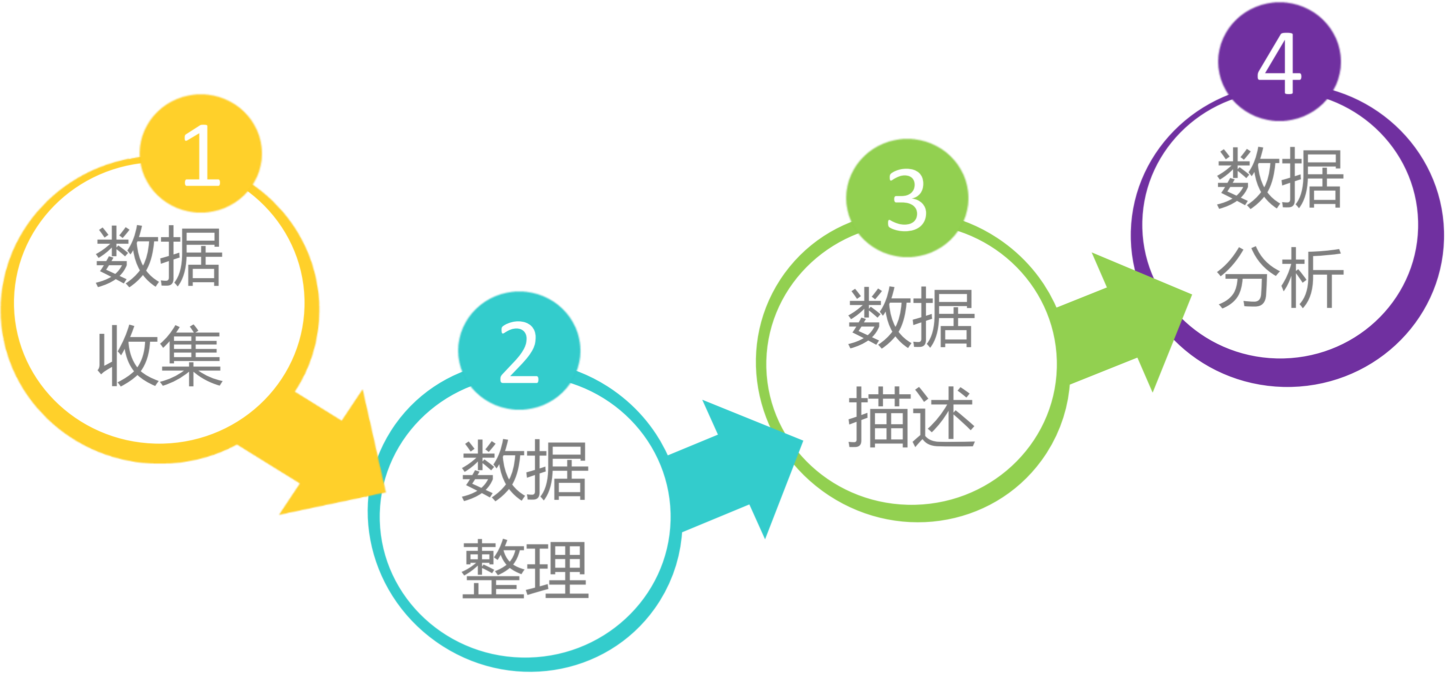
Basic data processing of Python

Python基本数据统计

Department of Computer Science and Technology
Department of University Basic Computer Teaching

简单数据处理过程



1 数据收集

2 数据整理

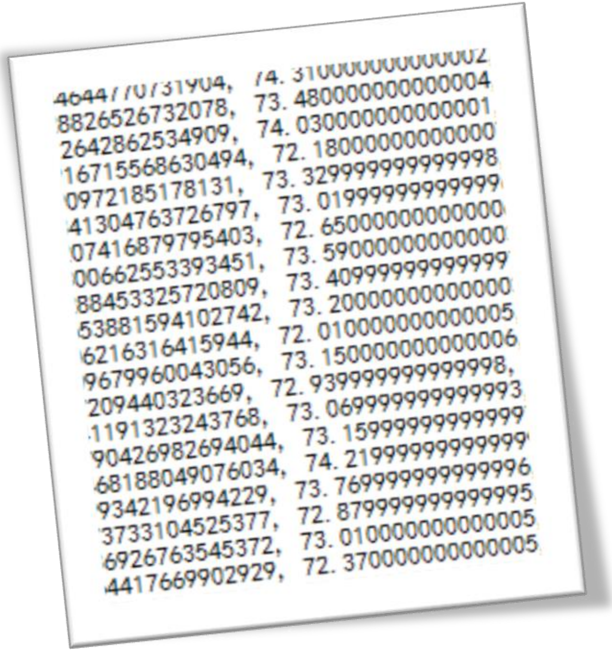
3 数据描述

4 数据分析

1

便捷数据获取

用Python获取数据



```
4644770731904,  74.31000000000002
8826526732078,  73.48000000000004
2642862534909,  74.03000000000001
16715568630494,  72.18000000000000
0972185178131,  73.32999999999998
41304763726797,  73.01999999999999
07416879795403,  72.65000000000000
00662553393451,  73.59000000000000
88453325720809,  73.40999999999999
53881594102742,  73.20000000000000
6216316415944,  72.01000000000005
9679960043056,  73.15000000000006
209440323669,  72.93999999999998,
1191323243768,  73.06999999999993
90426982694044,  73.15999999999999
68188049076034,  74.21999999999999
9342196994229,  73.76999999999996
3733104525377,  72.87999999999995
6926763545372,  73.01000000000005
4417669902929,  72.37000000000005
```

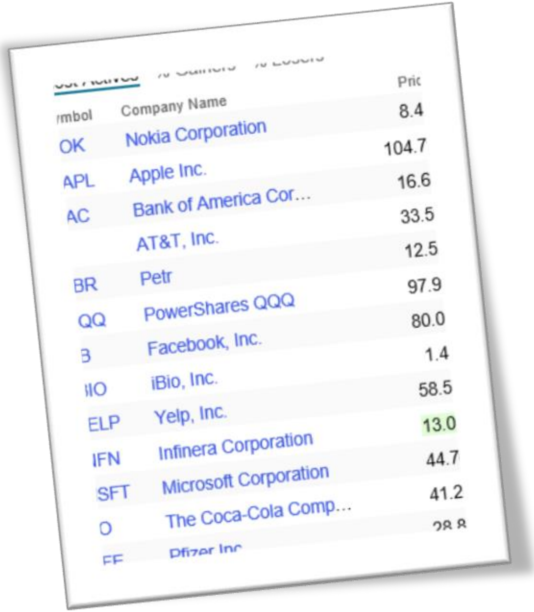
本地数据如何获取?

文件的打开，读写和关闭

- 文件打开
- 读文件

  写文件
- 文件关闭

用Python获取数据



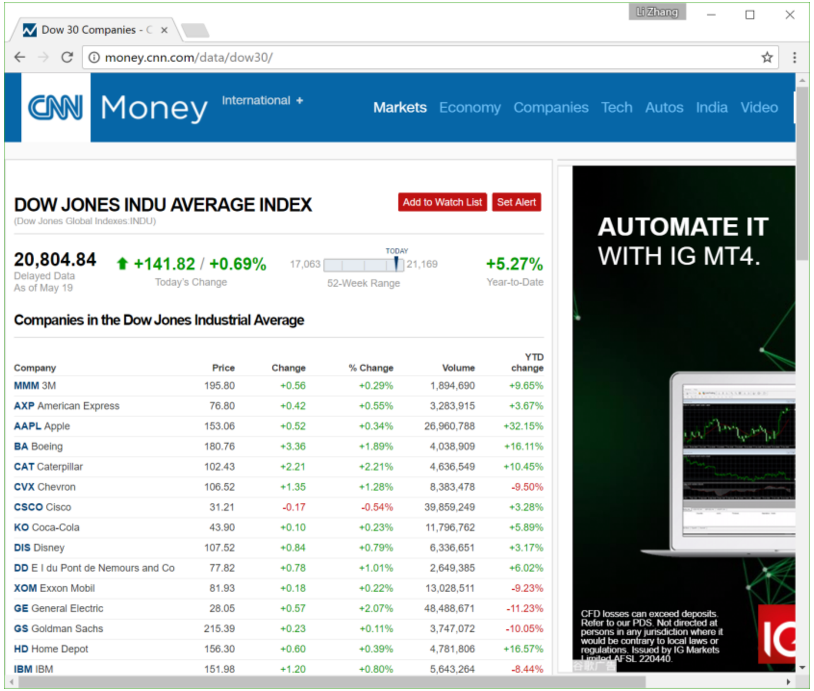
ymbol	Company Name	Pric
OK	Nokia Corporation	8.4
APL	Apple Inc.	104.7
AC	Bank of America Cor...	16.6
	AT&T, Inc.	33.5
BR	Petr	12.5
QQ	PowerShares QQQ	97.9
B	Facebook, Inc.	80.0
IO	iBio, Inc.	1.4
ELP	Yelp, Inc.	58.5
IFN	Infinera Corporation	13.0
SFT	Microsoft Corporation	44.7
O	The Coca-Cola Comp...	41.2
FE	Pfizer Inc	28.8

网络数据如何获取（爬取）？

抓取网页，解析网页内容

- 抓取
  - urllib内建模块
    - – urllib.request
  - Requests第三方库
  - Scrapy框架
- 解析
  - BeautifulSoup库
  - re模块

道指成分股数据



DOW JONES INDU AVERAGE INDEX
(Dow Jones Global Indexes:INDU)

20,804.84
Delayed Data
As of May 19

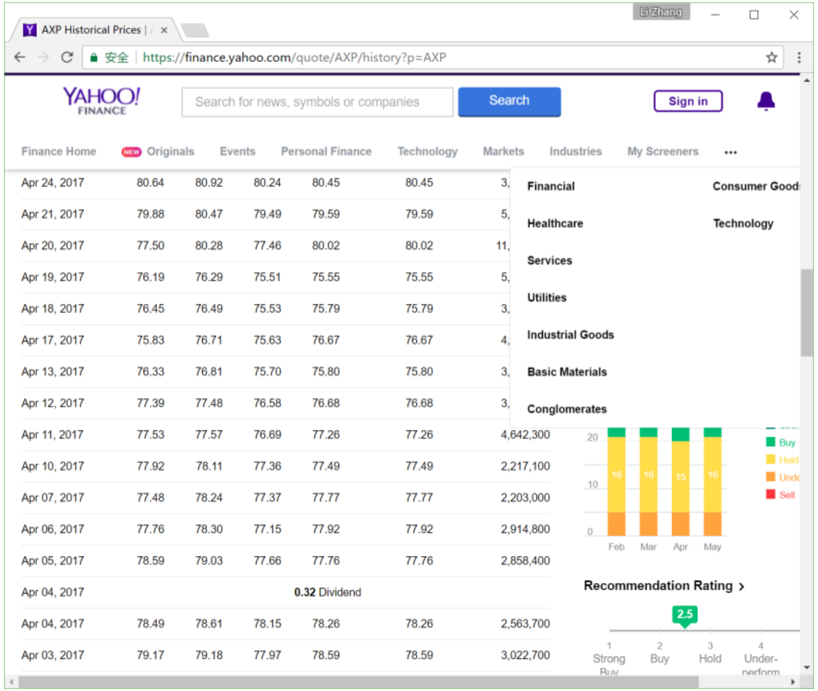
+141.82 / +0.69%
Today's Change

+5.27%
Year-to-Date

Companies in the Dow Jones Industrial Average

Company	Price	Change	% Change	Volume	YTD change
MMM 3M	195.80	+0.56	+0.29%	1,894,690	+9.65%
AXP American Express	76.80	+0.42	+0.55%	3,283,915	+3.67%
AAPL Apple	153.06	+0.52	+0.34%	26,960,788	+32.15%
BA Boeing	180.76	+3.36	+1.89%	4,038,909	+16.11%
CAT Caterpillar	102.43	+2.21	+2.21%	4,636,549	+10.45%
CVX Chevron	106.52	+1.35	+1.28%	8,383,478	-9.50%
CSCO Cisco	31.21	-0.17	-0.54%	39,859,249	+3.28%
KO Coca-Cola	43.90	+0.10	+0.23%	11,796,762	+5.89%
DIS Disney	107.52	+0.84	+0.79%	6,336,651	+3.17%
DD E I du Pont de Nemours and Co	77.82	+0.78	+1.01%	2,649,385	+6.02%
XOM Exxon Mobil	81.93	+0.18	+0.22%	13,028,511	-9.23%
GE General Electric	28.05	+0.57	+2.07%	48,488,671	-11.23%
GS Goldman Sachs	215.39	+0.23	+0.11%	3,747,072	-10.05%
HD Home Depot	156.30	+0.60	+0.39%	4,781,806	+16.57%
IBM IBM	151.98	+1.20	+0.80%	5,643,264	-8.44%

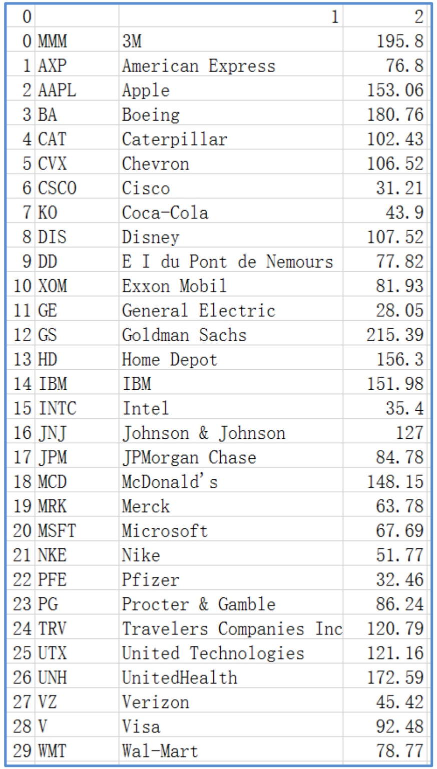
dji



Apr 24, 2017	80.64	80.92	80.24	80.45	80.45	3,
Apr 21, 2017	79.88	80.47	79.49	79.59	79.59	5,
Apr 20, 2017	77.50	80.28	77.46	80.02	80.02	11,
Apr 19, 2017	76.19	76.29	75.51	75.55	75.55	5,
Apr 18, 2017	76.45	76.49	75.53	75.79	75.79	3,
Apr 17, 2017	75.83	76.71	75.63	76.67	76.67	4,
Apr 13, 2017	76.33	76.81	75.70	75.80	75.80	3,
Apr 12, 2017	77.39	77.48	76.58	76.68	76.68	3,
Apr 11, 2017	77.53	77.57	76.69	77.26	77.26	4,642,300
Apr 10, 2017	77.92	78.11	77.36	77.49	77.49	2,217,100
Apr 07, 2017	77.48	78.24	77.37	77.77	77.77	2,203,000
Apr 06, 2017	77.76	78.30	77.15	77.92	77.92	2,914,800
Apr 05, 2017	78.59	79.03	77.66	77.76	77.76	2,858,400
Apr 04, 2017				0.32 Dividend		
Apr 04, 2017	78.49	78.61	78.15	78.26	78.26	2,563,700
Apr 03, 2017	79.17	79.18	77.97	78.59	78.59	3,022,700

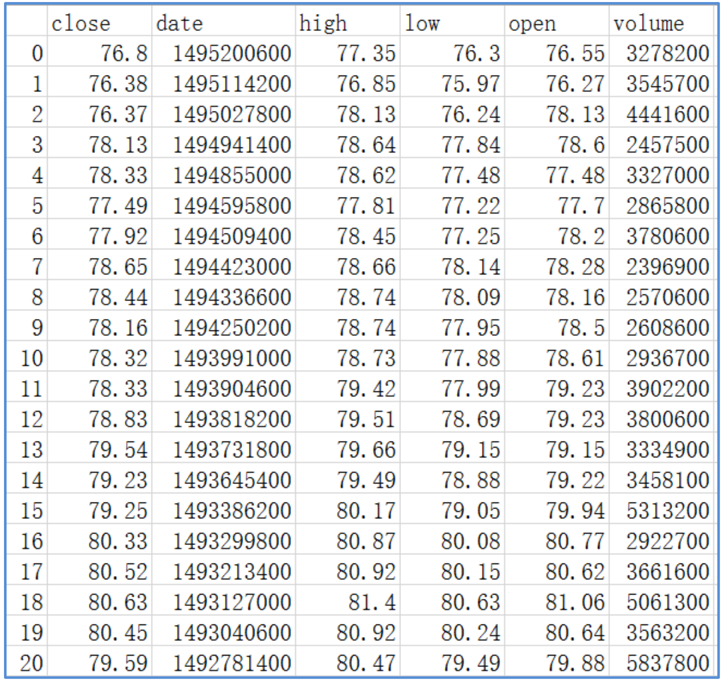
quotes

数据形式



0		1	2
0	MMM	3M	195.8
1	AXP	American Express	76.8
2	AAPL	Apple	153.06
3	BA	Boeing	180.76
4	CAT	Caterpillar	102.43
5	CVX	Chevron	106.52
6	CSCO	Cisco	31.21
7	KO	Coca-Cola	43.9
8	DIS	Disney	107.52
9	DD	E I du Pont de Nemours	77.82
10	XOM	Exxon Mobil	81.93
11	GE	General Electric	28.05
12	GS	Goldman Sachs	215.39
13	HD	Home Depot	156.3
14	IBM	IBM	151.98
15	INTC	Intel	35.4
16	JNJ	Johnson & Johnson	127
17	JPM	JPMorgan Chase	84.78
18	MCD	McDonald's	148.15
19	MRK	Merck	63.78
20	MSFT	Microsoft	67.69
21	NKE	Nike	51.77
22	PFE	Pfizer	32.46
23	PG	Procter & Gamble	86.24
24	TRV	Travelers Companies Inc	120.79
25	UTX	United Technologies	121.16
26	UNH	UnitedHealth	172.59
27	VZ	Verizon	45.42
28	V	Visa	92.48
29	WMT	Wal-Mart	78.77

djidf

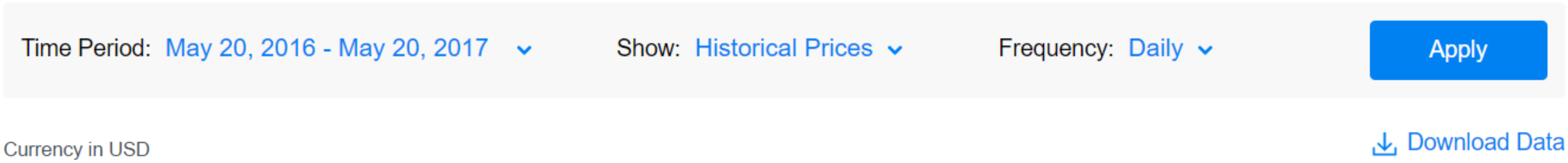


	close	date	high	low	open	volume
0	76.8	1495200600	77.35	76.3	76.55	3278200
1	76.38	1495114200	76.85	75.97	76.27	3545700
2	76.37	1495027800	78.13	76.24	78.13	4441600
3	78.13	1494941400	78.64	77.84	78.6	2457500
4	78.33	1494855000	78.62	77.48	77.48	3327000
5	77.49	1494595800	77.81	77.22	77.7	2865800
6	77.92	1494509400	78.45	77.25	78.2	3780600
7	78.65	1494423000	78.66	78.14	78.28	2396900
8	78.44	1494336600	78.74	78.09	78.16	2570600
9	78.16	1494250200	78.74	77.95	78.5	2608600
10	78.32	1493991000	78.73	77.88	78.61	2936700
11	78.33	1493904600	79.42	77.99	79.23	3902200
12	78.83	1493818200	79.51	78.69	79.23	3800600
13	79.54	1493731800	79.66	79.15	79.15	3334900
14	79.23	1493645400	79.49	78.88	79.22	3458100
15	79.25	1493386200	80.17	79.05	79.94	5313200
16	80.33	1493299800	80.87	80.08	80.77	2922700
17	80.52	1493213400	80.92	80.15	80.62	3661600
18	80.63	1493127000	81.4	80.63	81.06	5061300
19	80.45	1493040600	80.92	80.24	80.64	3563200
20	79.59	1492781400	80.47	79.49	79.88	5837800

quotesdf

便捷网络数据获取

？是否能够简单方便并且快速的方式获得财经网站上公司股票的历史数据？

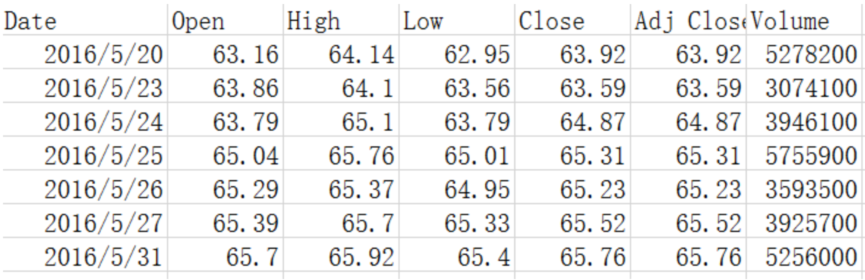


Time Period: May 20, 2016 - May 20, 2017

Show: Historical Prices

Frequency: Daily

Currency in USD

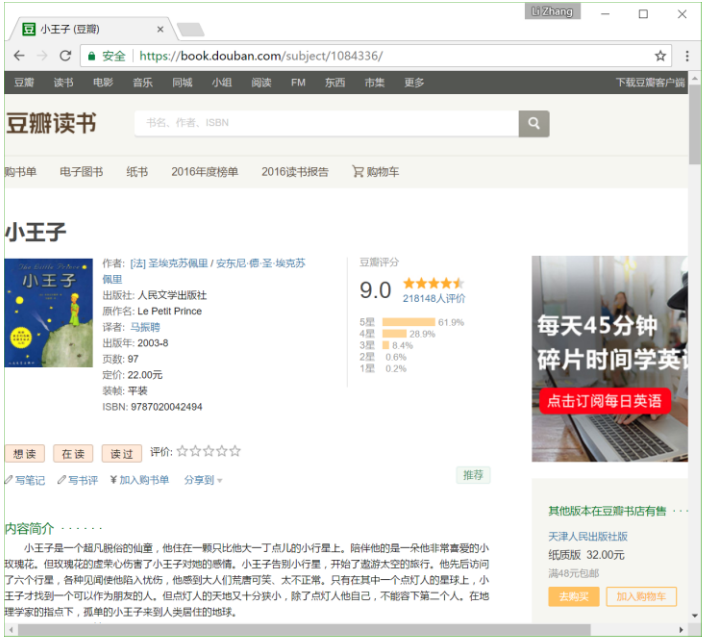


Date	Open	High	Low	Close	Adj Clos	Volume
2016/5/20	63.16	64.14	62.95	63.92	63.92	5278200
2016/5/23	63.86	64.1	63.56	63.59	63.59	3074100
2016/5/24	63.79	65.1	63.79	64.87	64.87	3946100
2016/5/25	65.04	65.76	65.01	65.31	65.31	5755900
2016/5/26	65.29	65.37	64.95	65.23	65.23	3593500
2016/5/27	65.39	65.7	65.33	65.52	65.52	3925700
2016/5/31	65.7	65.92	65.4	65.76	65.76	5256000

File

```
# Filename: quotes_fromcsv.py
import pandas as pd
quotesdf = pd.read_csv('axp.csv')
print(quotesdf)
```

便捷网络数据获取



小王子 (豆瓣) ×

Li Zhang

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小王子

作者: [法] 圣埃克苏佩里 / 安东尼·德·圣·埃克苏佩里
出版社: 人民文学出版社
原作名: Le Petit Prince
译者: 马振聘
出版年: 2003-8
页数: 97
定价: 22.00元
装帧: 平装
ISBN: 9787020042494

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4星	28.9%
3星	8.4%
2星	0.6%
1星	0.2%

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内容简介 · · · · · ·

小王子是一个超凡脱俗的仙童，他住在一颗只比他大一丁点儿的小行星上。陪伴他的是一朵他非常喜爱的小玫瑰花。但玫瑰花的虚荣心伤害了小王子对她的感情。小王子告别小行星，开始了遨游太空的旅行。他先后访问了六个行星，各种见闻使他陷入忧伤，他感到大人们荒唐可笑、太不正常。只有在其中一个点灯人的星球上，小王子才找到一个可以作为朋友的人。但点灯人的天地又十分狭小，除了点灯人他自己，不能容下第二个人。在地理学家的指点下，孤单的小王子来到人类居住的地球。

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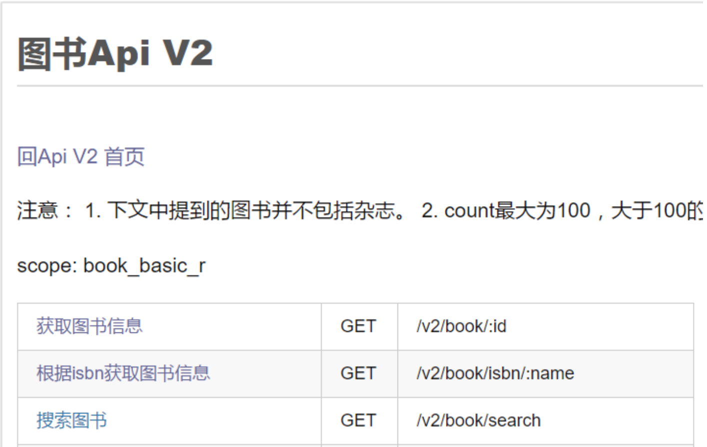


图书Api V2

回Api V2 首页

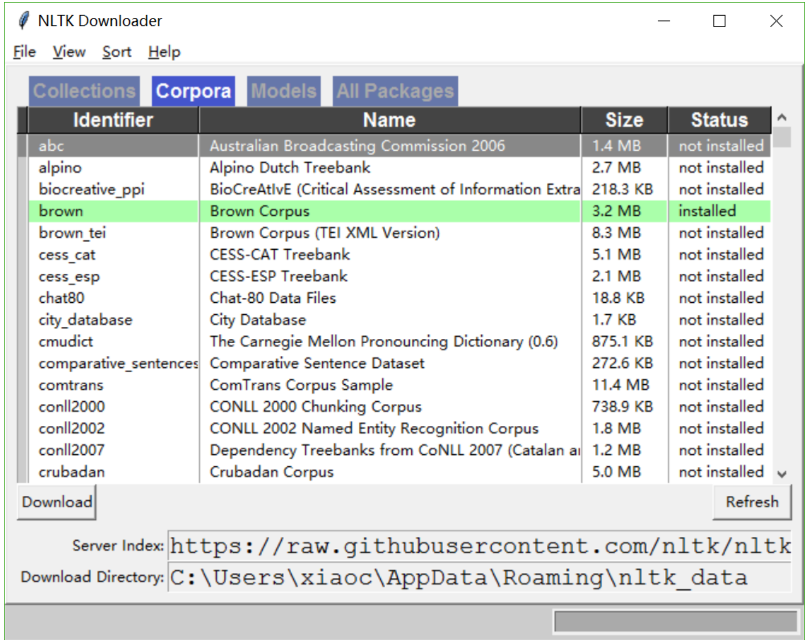
注意： 1. 下文中提到的图书并不包括杂志。 2. count最大为100，大于100的

scope: book_basic_r

获取图书信息	GET	/v2/book/:id
根据isbn获取图书信息	GET	/v2/book/isbn/:name
搜索图书	GET	/v2/book/search

```
>>> r = requests.get('https://api.douban.com/v2/book/1084336')
>>> r.text
'{"rating":{"max":10,"numRaters":218148,"average":"9.0","min":0
},"subtitle":"","author":["[法] 圣埃克苏佩里"],"pubdate":"2003-
8","tags":[{"count":52078,"name":"小王子","title":"小王子
"},{"count":43966,"name":"童话", ... , "price":"22.00元"}'
```

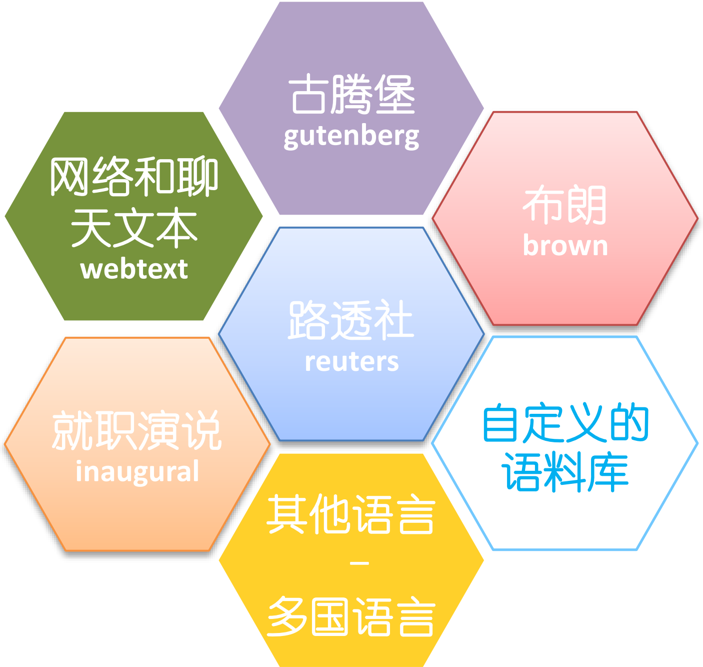
NLTK语料库



Identifier	Name	Size	Status
abc	Australian Broadcasting Commission 2006	1.4 MB	not installed
alpino	Alpino Dutch Treebank	2.7 MB	not installed
biocreative_ppi	BioCreAtIvE (Critical Assessment of Information Extra	218.3 KB	not installed
brown	Brown Corpus	3.2 MB	installed
brown_tei	Brown Corpus (TEI XML Version)	8.3 MB	not installed
cess_cat	CESS-CAT Treebank	5.1 MB	not installed
cess_esp	CESS-ESP Treebank	2.1 MB	not installed
chat80	Chat-80 Data Files	18.8 KB	not installed
city_database	City Database	1.7 KB	not installed
cmudict	The Carnegie Mellon Pronouncing Dictionary (0.6)	875.1 KB	not installed
comparative_sentences	Comparative Sentence Dataset	272.6 KB	not installed
comtrans	ComTrans Corpus Sample	11.4 MB	not installed
conll2000	CONLL 2000 Chunking Corpus	738.9 KB	not installed
conll2002	CONLL 2002 Named Entity Recognition Corpus	1.8 MB	not installed
conll2007	Dependency Treebanks from CoNLL 2007 (Catalan ar	1.2 MB	not installed
crubadan	Crubadan Corpus	5.0 MB	not installed

Server Index: https://raw.githubusercontent.com/nltk/nltk

Download Directory: C:\Users\xiaoc\AppData\Roaming\nltk_data



古腾堡 gutenberg

网络和聊天文本 webtext

布朗 brown

路透社 reuters

就职演说 inaugural

自定义的语料库

其他语言 – 多国语言

便捷网络数据

Source

```
>>> from nltk.corpus import gutenberg
```

→ brown

```
>>> import nltk
>>> print(gutenberg.fileids())
['austen-emma.txt', 'austen-persuasion.txt', 'austen-sense.txt', 'bible-kjv.txt', 'blake-
poems.txt', 'bryant-stories.txt', 'burgess-busterbrown.txt', 'carroll-alice.txt',
'chesterton-ball.txt', 'chesterton-brown.txt', 'chesterton-thursday.txt', 'edgeworth-
parents.txt', 'melville-moby_dick.txt', 'milton-paradise.txt', 'shakespeare-caesar.txt',
'shakespeare-hamlet.txt', 'shakespeare-macbeth.txt', 'whitman-leaves.txt']
>>> texts = gutenberg.words('shakespeare-hamlet.txt')
>>> print(texts)
['[', 'The', 'Tragedie', 'of', 'Hamlet', 'by', ...]
```

用Python玩转数据

2 数据准备

数据形式

30支道指成分股（dji）股票数据的逻辑结构

公司代码	公司名	最近一次成交价

美国运通公司（quotes）股票历史数据的逻辑结构

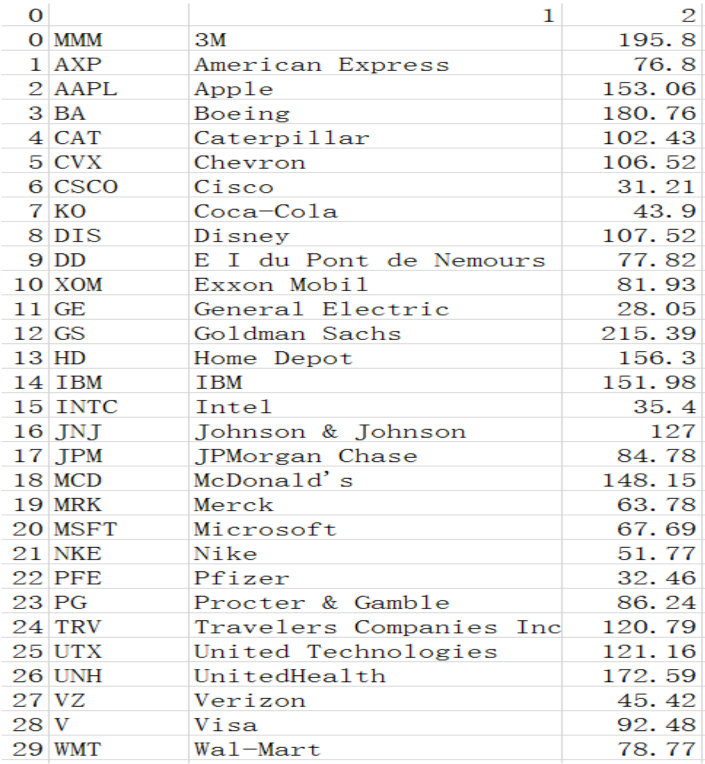
收盘价	日期	最高价	最低价	开盘价	成交量

数据整理

djidf加列索引（columns）

File

```
# Filename: stock.py
import requests
import re
import pandas as pd
def retrieve_dji_list():
        …
        return dji_list
dji_list = retrieve_dji_list()
djidf = pd.DataFrame(dji_list)
cols = ['code', 'name', 'lasttrade']
djidf.columns = cols
print(quotesdf)
```



	0	1	2
0	MMM	3M	195.8
1	AXP	American Express	76.8
2	AAPL	Apple	153.06
3	BA	Boeing	180.76
4	CAT	Caterpillar	102.43
5	CVX	Chevron	106.52
6	CSCO	Cisco	31.21
7	KO	Coca-Cola	43.9
8	DIS	Disney	107.52
9	DD	E I du Pont de Nemours	77.82
10	XOM	Exxon Mobil	81.93
11	GE	General Electric	28.05
12	GS	Goldman Sachs	215.39
13	HD	Home Depot	156.3
14	IBM	IBM	151.98
15	INTC	Intel	35.4
16	JNJ	Johnson & Johnson	127
17	JPM	JPMorgan Chase	84.78
18	MCD	McDonald’s	148.15
19	MRK	Merck	63.78
20	MSFT	Microsoft	67.69
21	NKE	Nike	51.77
22	PFE	Pfizer	32.46
23	PG	Procter & Gamble	86.24
24	TRV	Travelers Companies Inc	120.79
25	UTX	United Technologies	121.16
26	UNH	UnitedHealth	172.59
27	VZ	Verizon	45.42
28	V	Visa	92.48
29	WMT	Wal-Mart	78.77

数据整理

djidf数据：加完columns的形式

code	name	lasttrade
MMM		
AXP		
AAPL		
…		
WMT		

quotesdf数据：原始数据中已有columns

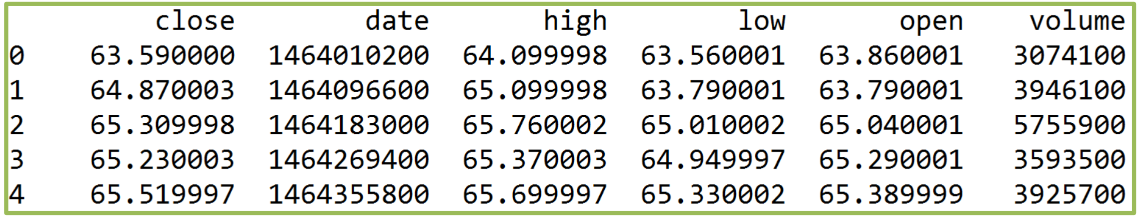
close	date	high	low	open	volume
	1464010200				
	1464096600				
	1464183000				
	…				
	1495200600				

数据整理

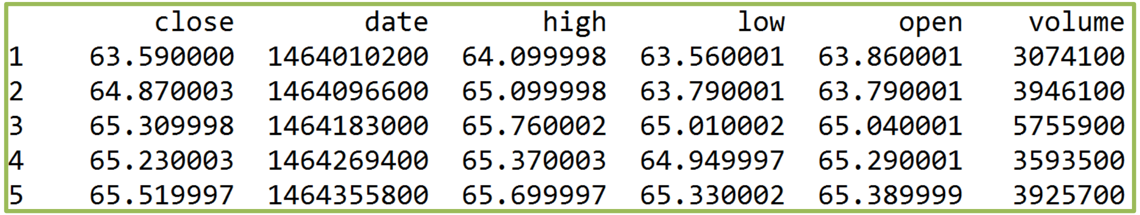
用1,2,...作为index（行索引）

```
quotesdf = pd.DataFrame(quotes)
```

```
quotesdf.index = range(1,len(quotes)+1)
```



```
       close        date       high        low       open   volume
0  63.590000  1464010200  64.099998  63.560001  63.860001  3074100
1  64.870003  1464096600  65.099998  63.790001  63.790001  3946100
2  65.309998  1464183000  65.760002  65.010002  65.040001  5755900
3  65.230003  1464269400  65.370003  64.949997  65.290001  3593500
4  65.519997  1464355800  65.699997  65.330002  65.389999  3925700
```

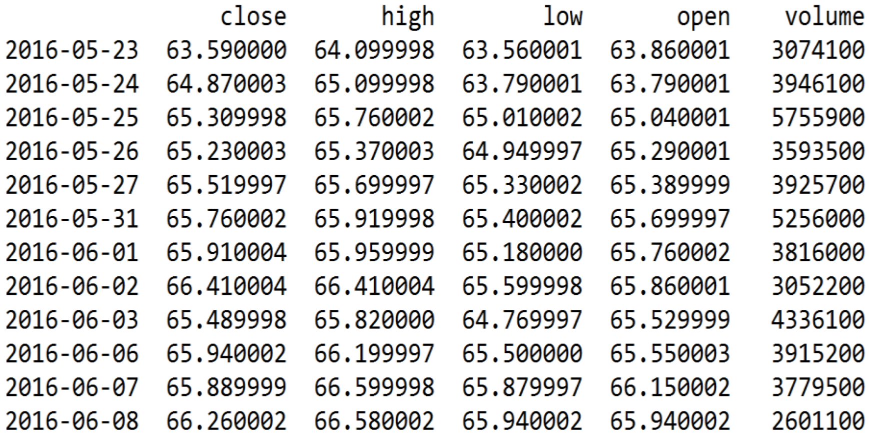


```
       close        date       high        low       open   volume
1  63.590000  1464010200  64.099998  63.560001  63.860001  3074100
2  64.870003  1464096600  65.099998  63.790001  63.790001  3946100
3  65.309998  1464183000  65.760002  65.010002  65.040001  5755900
4  65.230003  1464269400  65.370003  64.949997  65.290001  3593500
5  65.519997  1464355800  65.699997  65.330002  65.389999  3925700
```

数据整理

如果可以直接用date作为索引，quotes的时间能否转换成普通日期形式（如下图中的效果）？

1464010200



```
                close       high        low       open   volume
2016-05-23  63.590000  64.099998  63.560001  63.860001  3074100
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100
2016-05-25  65.309998  65.760002  65.010002  65.040001  5755900
2016-05-26  65.230003  65.370003  64.949997  65.290001  3593500
2016-05-27  65.519997  65.699997  65.330002  65.389999  3925700
2016-05-31  65.760002  65.919998  65.400002  65.699997  5256000
2016-06-01  65.910004  65.959999  65.180000  65.760002  3816000
2016-06-02  66.410004  66.410004  65.599998  65.860001  3052200
2016-06-03  65.489998  65.820000  64.769997  65.529999  4336100
2016-06-06  65.940002  66.199997  65.500000  65.550003  3915200
2016-06-07  65.889999  66.599998  65.879997  66.150002  3779500
2016-06-08  66.260002  66.580002  65.940002  65.940002  2601100
```

Source

```
>>> from datetime import date
>>> firstday = date.fromtimestamp(1464010200)
>>> lastday = date.fromtimestamp(1495200600)
>>> firstday
datetime.date(2016, 5, 23)
>>> lastday
datetime.date(2017, 5, 19)
```

时间序列

File

```
# Filename: quotes_history_v2.py
def retrieve_quotes_historical(stock_code):
        ...
    return  [item for item in quotes if not 'type' in item]
quotes = retrieve_quotes_historical('AXP')
list1 = []
for i in range(len(quotes)):
    x = date.fromtimestamp(quotes[i]['date'])
    y = date.strftime(x,'%Y-%m-%d')
    list1.append(y)
quotesdf_ori = pd.DataFrame(quotes, index = list1)
quotesdf_m = quotesdf_ori.drop(['unadjclose'], axis = 1)
quotesdf = quotesdf_m.drop(['date'], axis = 1)
print(quotesdf)
```

转换成常规时间

转换成固定格式

删除原unadjclose列

删除原date列

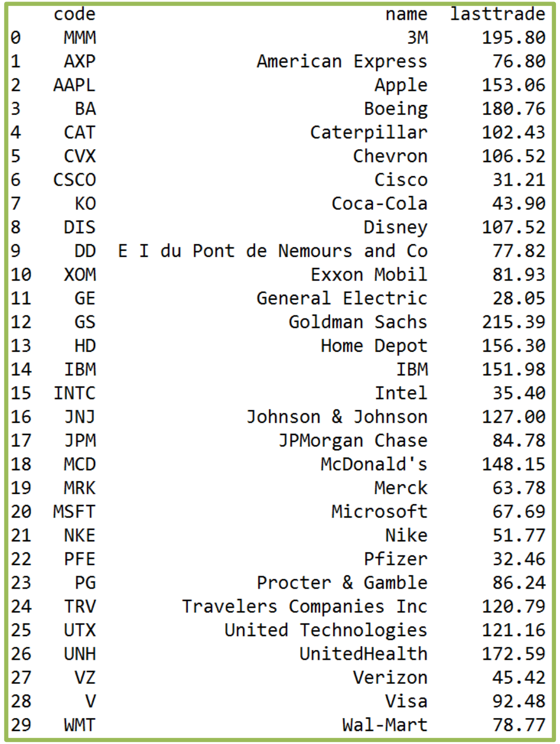
创建时间序列

Source

```
>>> import pandas as pd
>>> dates = pd.date_range('20170520', periods=7)
>>> dates
<class 'pandas.tseries.index.DatetimeIndex'>
[2017-05-20, ..., 2017-05-26]
Length: 7, Freq: D, Timezone: None
>>> import numpy as np
>>> datesdf = pd.DataFrame(np.random.randn(7,3), index=dates, columns = list('ABC'))
>>> datesdf
                   A         B         C
2017-05-20  1.302600 -1.214708  1.411628
2017-05-21 -0.512343  2.277474  0.403811
2017-05-22 -0.788498 -0.217161  0.173284
2017-05-23  1.042167 -0.453329 -2.107163
2017-05-24 -1.628075  1.663377  0.943582
2017-05-25 -0.091034  0.335884  2.455431
2017-05-26 -0.679055 -0.865973  0.246970
```

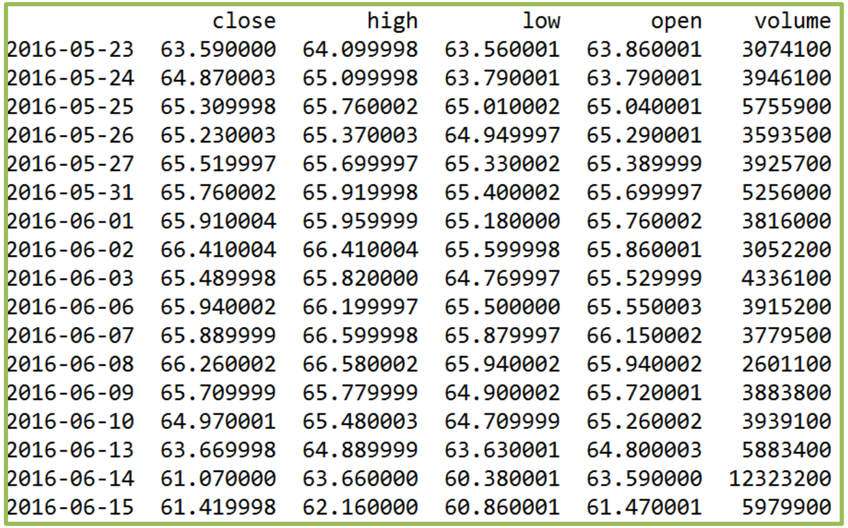
3 数据显示

数据显示



```
   code                          name  lasttrade
0   MMM                            3M     195.80
1   AXP              American Express      76.80
2  AAPL                         Apple     153.06
3    BA                        Boeing     180.76
4   CAT                   Caterpillar     102.43
5   CVX                       Chevron     106.52
6  CSCO                         Cisco      31.21
7    KO                     Coca-Cola      43.90
8   DIS                        Disney     107.52
9    DD  E I du Pont de Nemours and Co      77.82
10  XOM                   Exxon Mobil      81.93
11   GE              General Electric      28.05
12   GS                 Goldman Sachs     215.39
13   HD                    Home Depot     156.30
14  IBM                           IBM     151.98
15 INTC                         Intel      35.40
16  JNJ             Johnson & Johnson     127.00
17  JPM                JPMorgan Chase      84.78
18  MCD                    McDonald's     148.15
19  MRK                         Merck      63.78
20 MSFT                     Microsoft      67.69
21  NKE                          Nike      51.77
22  PFE                        Pfizer      32.46
23   PG              Procter & Gamble      86.24
24  TRV        Travelers Companies Inc     120.79
25  UTX        United Technologies     121.16
26  UNH                 UnitedHealth     172.59
27   VZ                       Verizon      45.42
28    V                          Visa      92.48
29  WMT                      Wal-Mart      78.77
```

djidf



```
               close       high        low       open    volume
2016-05-23  63.590000  64.099998  63.560001  63.860001   3074100
2016-05-24  64.870003  65.099998  63.790001  63.790001   3946100
2016-05-25  65.309998  65.760002  65.010002  65.040001   5755900
2016-05-26  65.230003  65.370003  64.949997  65.290001   3593500
2016-05-27  65.519997  65.699997  65.330002  65.389999   3925700
2016-05-31  65.760002  65.919998  65.400002  65.699997   5256000
2016-06-01  65.910004  65.959999  65.180000  65.760002   3816000
2016-06-02  66.410004  66.410004  65.599998  65.860001   3052200
2016-06-03  65.489998  65.820000  64.769997  65.529999   4336100
2016-06-06  65.940002  66.199997  65.500000  65.550003   3915200
2016-06-07  65.889999  66.599998  65.879997  66.150002   3779500
2016-06-08  66.260002  66.580002  65.940002  65.940002   2601100
2016-06-09  65.709999  65.779999  64.900002  65.720001   3883800
2016-06-10  64.970001  65.480003  64.709999  65.260002   3939100
2016-06-13  63.669998  64.889999  63.630001  64.800003   5883400
2016-06-14  61.070000  63.660000  60.380001  63.590000  12323200
2016-06-15  61.419998  62.160000  60.860001  61.470001   5979900
```

quotesdf

数据显示

显示方式：

- 显示行索引
- 显示列索引
- 显示数据的值
- 显示数据描述

Source

```
>>> list(djidf.index)
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
23, 24, 25, 26, 27, 28, 29]
>>> list(djidf.columns)
['code', 'name', 'lasttrade']
>>> dijdf.values
array([['MMM', '3M', 195.8],
       ...,
       ['WMT', 'Wal-Mart', 78.77]], dtype=object)
>>> djidf.describe
<bound method NDFrame.describe of   code      name  lasttrade
0                                  MM        3M     195.80
...,
29                                WMT  Wal-Mart      78.77>
```

数据显示

数据的格式

Source

```
>>> djidf.lasttrade
1     199.54
2      77.44
3     153.87
...
30     78.31
Name: lasttrade, dtype: float64
```

```
dji_list = []
for item in dji_list_in_text:
    dji_list.append([item[0], item[1], float(item[2])])
```

数据显示

? 查看道指成分股中前5只和后5只的股票基本信息？

显示方式：

- 显示行
  - 专用方式
  - 切片
- 显示列

Source

```
>>> djidf.head(5)
   code                  name  lasttrade
0   MMM                    3M     195.80
1   AXP      American Express      76.80
2  AAPL                 Apple     153.06
3    BA                Boeing     180.76
4   CAT           Caterpillar     102.43
```

djidf[:5]

```
>>> djidf.tail(5)
   code                    name  lasttrade
25  UTX  United Technologies     121.16
26  UNH         UnitedHealth     172.59
27   VZ              Verizon      45.42
28    V                 Visa      92.48
29  WMT             Wal-Mart      78.77
```

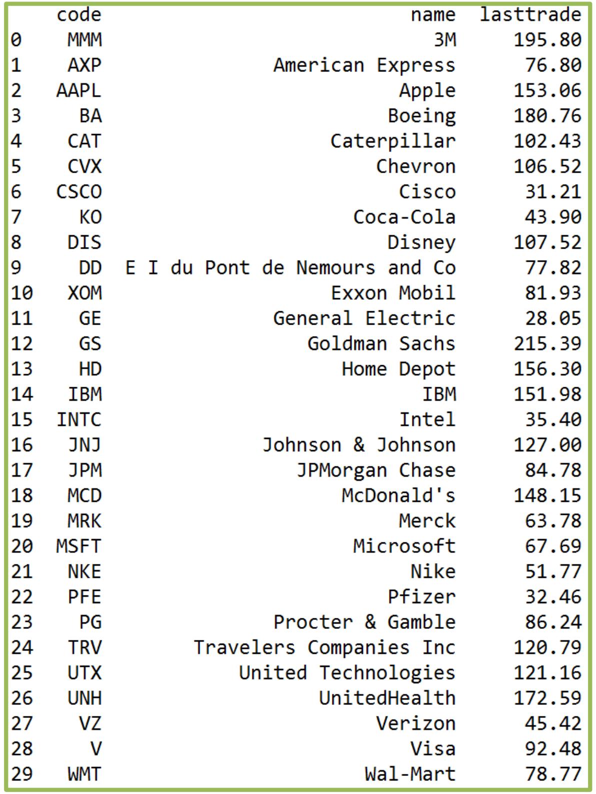
djidf[-5:]

用Python玩转数据

4

数据选择

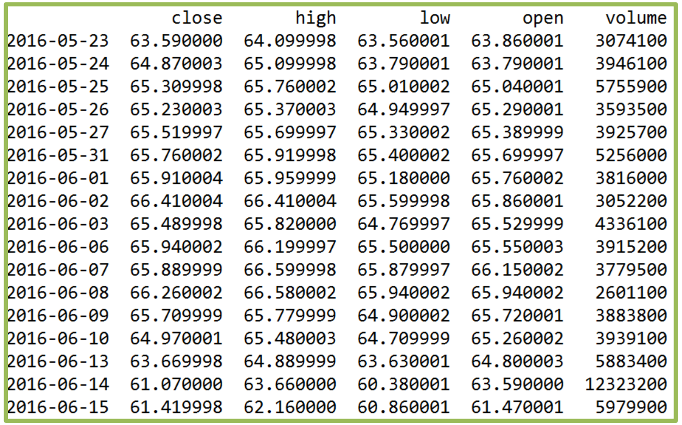
数据选择



```
   code                              name  lasttrade
0   MMM                                3M     195.80
1   AXP                  American Express      76.80
2  AAPL                             Apple     153.06
3    BA                            Boeing     180.76
4   CAT                       Caterpillar     102.43
5   CVX                           Chevron     106.52
6  CSCO                             Cisco      31.21
7    KO                         Coca-Cola      43.90
8   DIS                            Disney     107.52
9    DD  E I du Pont de Nemours and Co      77.82
10  XOM                       Exxon Mobil      81.93
11   GE                  General Electric      28.05
12   GS                     Goldman Sachs     215.39
13   HD                        Home Depot     156.30
14  IBM                               IBM     151.98
15 INTC                             Intel      35.40
16  JNJ                 Johnson & Johnson     127.00
17  JPM                    JPMorgan Chase      84.78
18  MCD                        McDonald's     148.15
19  MRK                             Merck      63.78
20 MSFT                         Microsoft      67.69
21  NKE                              Nike      51.77
22  PFE                            Pfizer      32.46
23   PG                  Procter & Gamble      86.24
24  TRV            Travelers Companies Inc     120.79
25  UTX               United Technologies     121.16
26  UNH                      UnitedHealth     172.59
27   VZ                           Verizon      45.42
28    V                              Visa      92.48
29  WMT                          Wal-Mart      78.77
```

选择方式：

- 选择行
- 选择列
- 选择区域
- 筛选（条件选择）



```
                close       high        low       open    volume
2016-05-23  63.590000  64.099998  63.560001  63.860001   3074100
2016-05-24  64.870003  65.099998  63.790001  63.790001   3946100
2016-05-25  65.309998  65.760002  65.010002  65.040001   5755900
2016-05-26  65.230003  65.370003  64.949997  65.290001   3593500
2016-05-27  65.519997  65.699997  65.330002  65.389999   3925700
2016-05-31  65.760002  65.919998  65.400002  65.699997   5256000
2016-06-01  65.910004  65.959999  65.180000  65.760002   3816000
2016-06-02  66.410004  66.410004  65.599998  65.860001   3052200
2016-06-03  65.489998  65.820000  64.769997  65.529999   4336100
2016-06-06  65.940002  66.199997  65.500000  65.550003   3915200
2016-06-07  65.889999  66.599998  65.879997  66.150002   3779500
2016-06-08  66.260002  66.580002  65.940002  65.940002   2601100
2016-06-09  65.709999  65.779999  64.900002  65.720001   3883800
2016-06-10  64.970001  65.480003  64.709999  65.260002   3939100
2016-06-13  63.669998  64.889999  63.630001  64.800003   5883400
2016-06-14  61.070000  63.660000  60.380001  63.590000  12323200
2016-06-15  61.419998  62.160000  60.860001  61.470001   5979900
```

数据选择

美国运通公司2017年5月1日至2017年5月5日间的股票交易信息？

选择方式：

- 选择行
  - 切片
  - 索引

Source

```
>>> quotesdf['2017-05-01':'2017-05-05']
                close       high        low       open   volume
2017-05-01  79.230003  79.489998  78.879997  79.220001  3458100
2017-05-02  79.540001  79.660004  79.150002  79.150002  3334900
2017-05-03  78.830002  79.510002  78.690002  79.230003  3800600
2017-05-04  78.330002  79.419998  77.989998  79.230003  3902200
2017-05-05  78.320000  78.730003  77.879997  78.610001  2936700
```

数据选择

道指成分股公司代码？

选择方式：

- 选择列
  - 列名

Source

```
>>> djidf['code']
0         MMM
1         AXP
2         AAPL
…
29       WMT
Name: code, dtype: object
>>> djidf.code
0          MMM
1          AXP
2          AAPL
…
29        WMT
Name: code, dtype: object
```

不支持

djidf['code', 'lasttrade']

djidf['code':'lasttrade']

数据选择

？道指成分股中行索引是1至5的股票信息以及所有股票的代码和最近一次交易价？

选择方式：

- 行、列
  - 标签label（loc）

Source

```
>>> djidf.loc[1:5,]
    code                              name   lasttrade
1    AXP              American Express       76.80
2   AAPL                          Apple     153.06
3      BA                         Boeing    180.76
4     CAT                    Caterpillar    102.43
5     CVX                        Chevron    106.52
>>> djidf.loc[:, ['code','lasttrade']]
       code   lasttrade
0    MMM        195.80
1       AXP       76.80
2      AAPL     153.06
...
29   WMT          78.77
```

数据选择

道指成分股中行索引是1至5的股票代码和最近一次交易价?行索引是1的股票的最近一次交易价？

选择方式：

- 行和列的区域
  - 标签label（loc）
- 单个值
  - at

Source

```
>>> djidf.loc[1:5, ['code','lasttrade']]
     code  lasttrade
1     AXP      76.80
2    AAPL     153.06
3      BA     180.76
4     CAT     102.43
5     CVX     106.52
>>> djidf.loc[1, 'lasttrade']
76.799999999999997
>>> djidf.at[1, 'lasttrade']
76.799999999999997
```

数据选择

选择方式：

- 行、列和区域
  - 用iloc（位置）
- 取某个值
  - iat

Source

```
>>> djidf.loc[1:5,['code','lasttrade']]
   code  lasttrade
1   AXP      76.80
2  AAPL     153.06
3    BA     180.76
4   CAT     102.43
5   CVX     106.52
```

Source

```
>>> djidf.loc[1,'lasttrade']
76.799999999999997
>>> djidf.at[1,'lasttrade']
76.799999999999997
```

Source

```
>>> djidf.iloc[1:6,[0,2]]
   code  lasttrade
1   AXP      76.80
2  AAPL     153.06
3    BA     180.76
4   CAT     102.43
5   CVX     106.52
```

如果直接写成[1:6, 0:2]则表示列索引即第0和第1列

Source

```
>>> djidf.iloc[1,2]
76.799999999999997
>>> djidf.iat[1,2]
76.799999999999997
```

数据选择

美国运通公司本年度3月份的股票信息？进一步寻找美国运通公司本年度一季度收盘价大于等于80的记录？

选择方式：

- 条件筛选

Source

```
>>> quotesdf[(quotesdf.index >= '2017-03-01') & (quotesdf.index <= '2017-03-31')]
                close       high        low       open   volume
2017-03-01  81.919998  82.000000  81.019997  81.050003  4746400
2017-03-02  80.099998  81.660004  80.059998  81.660004  4409800
…
2017-03-31  79.110001  79.430000  78.800003  78.930000  5228400
>>> quotesdf[(quotesdf.index >= '2017-01-01') & (quotesdf.index <= '2017-03-31') & (quotesdf.close >= 80)]
                 open      close       high        low   volume
2017-02-23  80.050003  80.449997  79.769997  79.870003  3339500
2017-02-27  80.169998  80.309998  79.589996  79.750000  2619400
2017-02-28  80.059998  80.489998  79.769997  80.120003  4415300
2017-03-01  81.919998  82.000000  81.019997  81.050003  4746400
2017-03-02  80.099998  81.660004  80.059998  81.660004  4409800
```

用Python玩转数据

5 简单统计与处理

简单统计与筛选

？求道指成分股中30只股票最近一次成交价的平均值？股票最近一次成交价大于等于180的公司名？

Source

```
>>> djidf.lasttrade.mean()
101.26500000000001
>>> djidf[djidf.lasttrade >= 180].name
0                3M
3            Boeing
12    Goldman Sachs
Name: name, dtype: object
```

简单统计与筛选

？统计美国运通公司近一年股票涨和跌分别的天数？

Source

```
>>> len(quotesdf[quotesdf.close > quotesdf.open])
123
>>> len(quotesdf)-123
128
```

？统计美国运通公司近一年相邻两天收盘价的涨跌情况？

Source

```
>>> status = np.sign(np.diff(quotesdf.close))
>>> status
array([ 1.,  1., -1., ..., -1.,  1.,  1.])
>>> status[np.where( status == 1.)].size
132
>>> status[np.where( status == -1.)].size
118
```

排序

按最近一次成交价对30只道指成分股股票进行排序。根据排序结果列出前三甲公司名。

Source

```
>>> tempdf = djidf.sort_values(by = 'lasttrade', ascending = False)
      code                name  lasttrade
12      GS       Goldman Sachs     215.39
0     MMM                  3M     195.80
3       BA              Boeing     180.76
26     UNH        UnitedHealth     172.59
…
>>> tempdf[:3].name
12    Goldman Sachs
0                3M
3            Boeing
Name: name, dtype: object
```

计数统计

统计本年度1月份的股票开盘天数？

Source

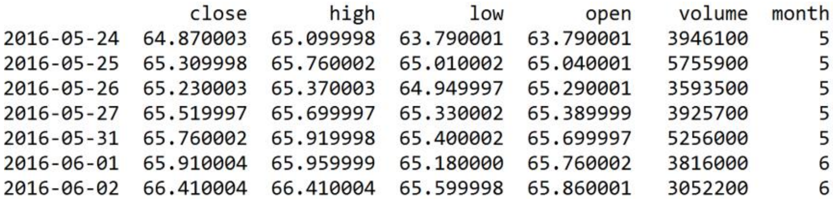
```
>>> t = quotesdf[(quotesdf.index >= '2017-01-01')  &  (quotesdf.index < '2017-02-01')]
>>> len(t)
20
```

计数统计

统计近一年每个月的股票开盘天数？

File

```
# Filename: quotes_month.py
import time
…
listtemp = []
for i in range(len(quotesdf)):
    temp = time.strptime(quotesdf.index[i],"%Y-%m-%d")
    listtemp.append(temp.tm_mon)
tempdf = quotesdf.copy()
tempdf['month'] = listtemp
print(tempdf['month'].value_counts())
```



```
                close       high        low       open   volume  month
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100      5
2016-05-25  65.309998  65.760002  65.010002  65.040001  5755900      5
2016-05-26  65.230003  65.370003  64.949997  65.290001  3593500      5
2016-05-27  65.519997  65.699997  65.330002  65.389999  3925700      5
2016-05-31  65.760002  65.919998  65.400002  65.699997  5256000      5
2016-06-01  65.910004  65.959999  65.180000  65.760002  3816000      6
2016-06-02  66.410004  66.410004  65.599998  65.860001  3052200      6
```

Output:

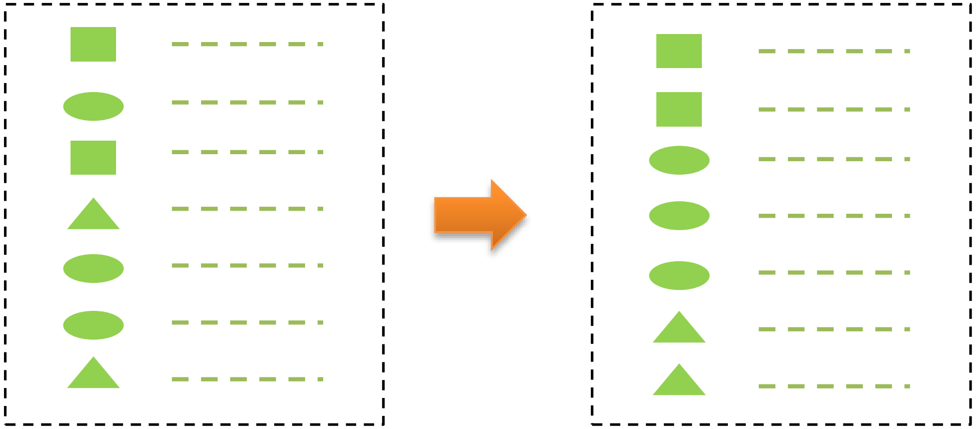
```
8     23
3     23
6     22
12    21
11    21
10    21
9     21
5     21
7     20
1     20
4     19
2     19
Name: month,
dtype: int64
```

用Python玩转数据

6

GROUPING

分组



Grouping的顺序

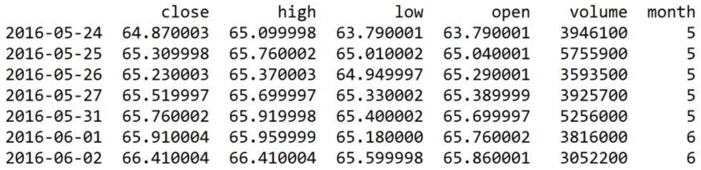
① Splitting

② Applying

③ Combining

分组

统计近一年每个月的股票开盘天数？



```
                close       high        low       open   volume  month
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100      5
2016-05-25  65.309998  65.760002  65.010002  65.040001  5755900      5
2016-05-26  65.230003  65.370003  64.949997  65.290001  3593500      5
2016-05-27  65.519997  65.699997  65.330002  65.389999  3925700      5
2016-05-31  65.760002  65.919998  65.400002  65.699997  5256000      5
2016-06-01  65.910004  65.959999  65.180000  65.760002  3816000      6
2016-06-02  66.410004  66.410004  65.599998  65.860001  3052200      6
```

Source

```
>>> x = tempdf.groupby('month').count()
         close   high   low  open  volume
month
1           20     20    20    20      20
2           19     19    19    19      19
3           23     23    23    23      23
…
11          21     21    21    21      21
12          21     21    21    21      21
>>> x.close
```

Output:

```
month
1     20
2     19
3     23
4     19
5     21
6     22
7     20
8     23
9     21
10    21
11    21
12    21
Name: month, dtype: int64
```

分组

统计近一年每个月的总成交量？

Source

```
>>> tempdf.groupby('month').sum().volume
month
1      103887100
2        65816600
3        98700800
4        77893800
…
10   116243400
11     99527200
12     75948200
Name: volume, dtype: float64
```

mean()

min()

max()

…

分组

如果更高效统计近一年每个月的总成交量？

Source

```
tempdf.groupby('month').sum().volume
```

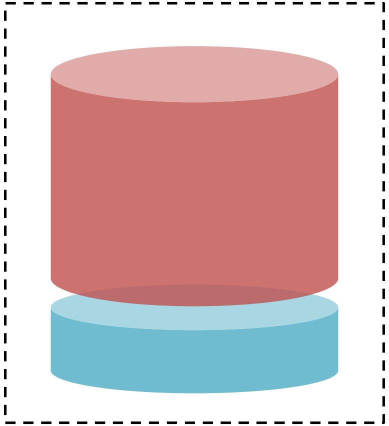
```
>>> tempdf.groupby('month').volume.sum()
month
1     103887100
2      65816600
3      98700800
4      77893800
…
12     75948200
Name: volume, dtype: float64
```

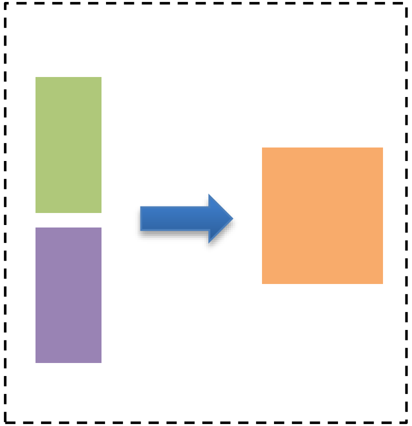
用Python玩转数据

7

MERGE

合并





Merge的形式

- Append
  - 加行到DataFrame
- Concat
  - 连接pandas对象
- Join
  - SQL类型的连接

Append

把美国运通公司本年度1月1日至1月5日间的股票交易信息合并到近一年中前两天的股票信息中？

Source

```
>>> p = quotesdf[:2]
>>> p
                 open      close       high        low   volume
2016-05-23  63.590000  64.099998  63.560001  63.860001  3074100
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100
>>> q = quotesdf['2017-01-01':'2017-01-05']
>>> q
                 open      close        high       low   volume
2017-01-03  75.349998  75.750000  74.739998  74.889999  5853900
2017-01-04  76.260002  76.550003  75.059998  75.260002  4635800
2017-01-05  75.320000  76.180000  74.820000  76.000000  3383000
>>> p.append(q)
                 open      close       high        low   volume
2016-05-23  63.590000  64.099998  63.560001  63.860001  3074100
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100
2017-01-03  75.349998  75.750000  74.739998  74.889999  5853900
2017-01-04  76.260002  76.550003  75.059998  75.260002  4635800
2017-01-05  75.320000  76.180000  74.820000  76.000000  3383000
```

Concat

将美国运通公司近一年股票数据中的前5个和后5个合并。

Source

```
>>> pieces = [tempdf[:5], tempdf[len(tempdf)-5:]]
>>> pd.concat(pieces)
                 open      close       high        low   volume month
2016-05-23  63.590000  64.099998  63.560001  63.860001  3074100     5
2016-05-24  64.870003  65.099998  63.790001  63.790001  3946100     5
2016-05-25  65.309998  65.760002  65.010002  65.040001  5755900     5
2016-05-26  65.230003  65.370003  64.949997  65.290001  3593500     5
2016-05-27  65.519997  65.699997  65.330002  65.389999  3925700     5
2017-05-15  78.330002  78.620003  77.480003  77.480003  3327000     5
2017-05-16  78.129997  78.639999  77.839996  78.599998  2457500     5
2017-05-17  76.370003  78.129997  76.239998  78.129997  4441600     5
2017-05-18  76.379997  76.849998  75.970001  76.269997  3545700     5
2017-05-19  76.800003  77.349998  76.300003  76.550003  3278200     5
```

Concat

两个不同逻辑结构的对象能否连接？

objs	axis
join	join_axes
keys	levels
names	verify_integrity
ignore_index	

Source

```
>>> piece1 = quotesdf[:3]
>>> piece2 = tempdf[:3]
>>> pd.concat([piece1,piece2], ignore_index = True)
       close       high        low month       open   volume
0  63.590000  64.099998  63.560001   NaN  63.860001  3074100
1  64.870003  65.099998  63.790001   NaN  63.790001  3946100
2  65.309998  65.760002  65.010002   NaN  65.040001  5755900
3  63.590000  64.099998  63.560001   5.0  63.860001  3074100
4  64.870003  65.099998  63.790001   5.0  63.790001  3946100
5  65.309998  65.760002  65.010002   5.0  65.040001  5755900
```

Join

code	name
AXP	
KO	

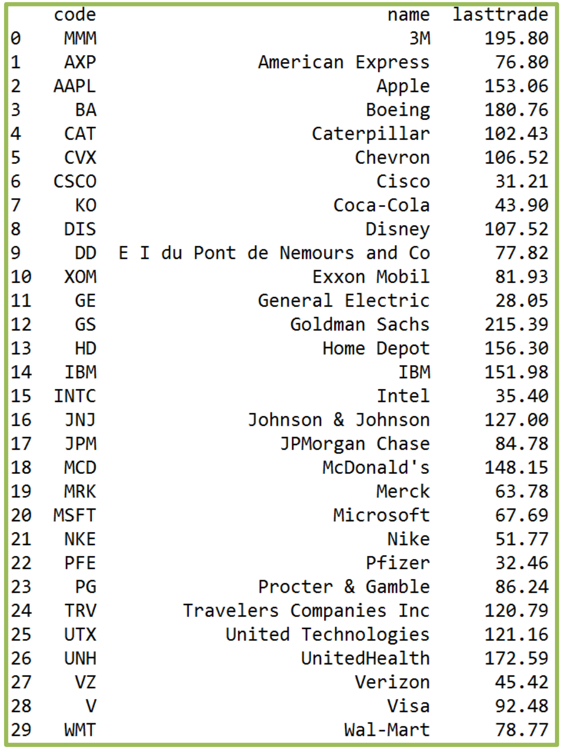
volume	code	month
	AXP	
	AXP	
	KO	
	KO	

code	name	volume	month
AXP			
AXP			
KO			
KO			

Join

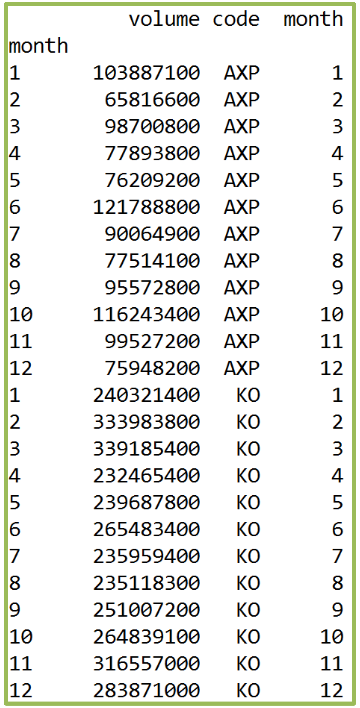
将美国运通公司和可口可乐公司近一年中每个月的交易总量表（包含公司代码）与30只道琼斯成分股股票信息合并。

code|name|volume|month



```
    code                          name  lasttrade
0    MMM                            3M     195.80
1    AXP              American Express      76.80
2   AAPL                         Apple     153.06
3     BA                        Boeing     180.76
4    CAT                   Caterpillar     102.43
5    CVX                       Chevron     106.52
6   CSCO                         Cisco      31.21
7     KO                     Coca-Cola      43.90
8    DIS                        Disney     107.52
9     DD  E I du Pont de Nemours and Co      77.82
10   XOM                   Exxon Mobil      81.93
11    GE              General Electric      28.05
12    GS                 Goldman Sachs     215.39
13    HD                    Home Depot     156.30
14   IBM                           IBM     151.98
15  INTC                         Intel      35.40
16   JNJ             Johnson & Johnson     127.00
17   JPM                JPMorgan Chase      84.78
18   MCD                    McDonald's     148.15
19   MRK                         Merck      63.78
20  MSFT                     Microsoft      67.69
21   NKE                          Nike      51.77
22   PFE                        Pfizer      32.46
23    PG              Procter & Gamble      86.24
24   TRV       Travelers Companies Inc     120.79
25   UTX         United Technologies     121.16
26   UNH                  UnitedHealth     172.59
27    VZ                       Verizon      45.42
28     V                          Visa      92.48
29   WMT                      Wal-Mart      78.77
```

djidf



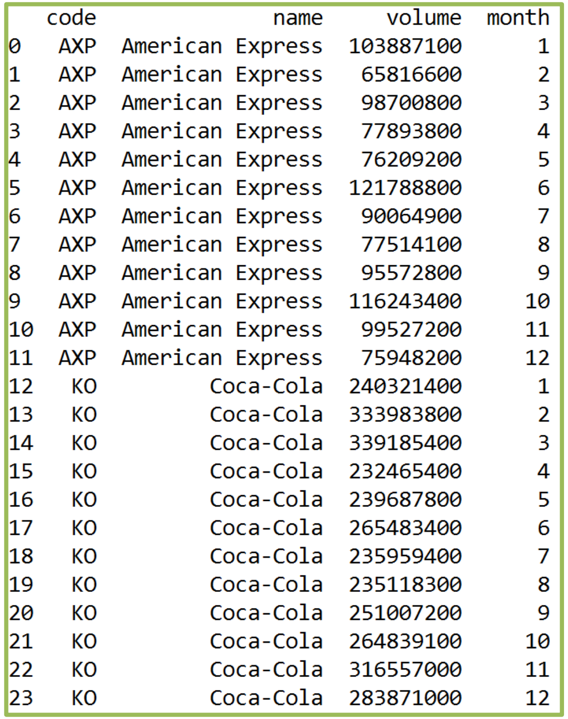
```
          volume  code   month
month
1      103887100   AXP       1
2       65816600   AXP       2
3       98700800   AXP       3
4       77893800   AXP       4
5       76209200   AXP       5
6      121788800   AXP       6
7       90064900   AXP       7
8       77514100   AXP       8
9       95572800   AXP       9
10     116243400   AXP      10
11      99527200   AXP      11
12      75948200   AXP      12
1      240321400    KO       1
2      333983800    KO       2
3      339185400    KO       3
4      232465400    KO       4
5      239687800    KO       5
6      265483400    KO       6
7      235959400    KO       7
8      235118300    KO       8
9      251007200    KO       9
10     264839100    KO      10
11     316557000    KO      11
12     283871000    KO      12
```

AKdf

Join

Source

```
>>> pd.merge(djidf.drop(['lasttrade'], axis = 1), AKdf, on = 'code')
     code              name       volume     month
0     AXP  American Express    103887100         1
1     AXP  American Express     65816600         2
2     AXP  American Express     98700800         3
3     AXP  American Express     77893800         4
4     AXP  American Express     76209200         5
…
19    KO           Coca-Cola   235118300         8
20    KO           Coca-Cola   251007200         9
21    KO           Coca-Cola   264839100        10
22    KO           Coca-Cola   316557000        11
23    KO           Coca-Cola   283871000        12
```



```
   code              name     volume  month
0   AXP  American Express  103887100      1
1   AXP  American Express   65816600      2
2   AXP  American Express   98700800      3
3   AXP  American Express   77893800      4
4   AXP  American Express   76209200      5
5   AXP  American Express  121788800      6
6   AXP  American Express   90064900      7
7   AXP  American Express   77514100      8
8   AXP  American Express   95572800      9
9   AXP  American Express  116243400     10
10  AXP  American Express   99527200     11
11  AXP  American Express   75948200     12
12   KO         Coca-Cola  240321400      1
13   KO         Coca-Cola  333983800      2
14   KO         Coca-Cola  339185400      3
15   KO         Coca-Cola  232465400      4
16   KO         Coca-Cola  239687800      5
17   KO         Coca-Cola  265483400      6
18   KO         Coca-Cola  235959400      7
19   KO         Coca-Cola  235118300      8
20   KO         Coca-Cola  251007200      9
21   KO         Coca-Cola  264839100     10
22   KO         Coca-Cola  316557000     11
23   KO         Coca-Cola  283871000     12
```

merge函数的参数

left	right	how
on	left_on	right_on
left_index	right_index	sort
suffixes	copy	