Representing time with datetimes

INTERMEDIATE PYTHON FOR FINANCE

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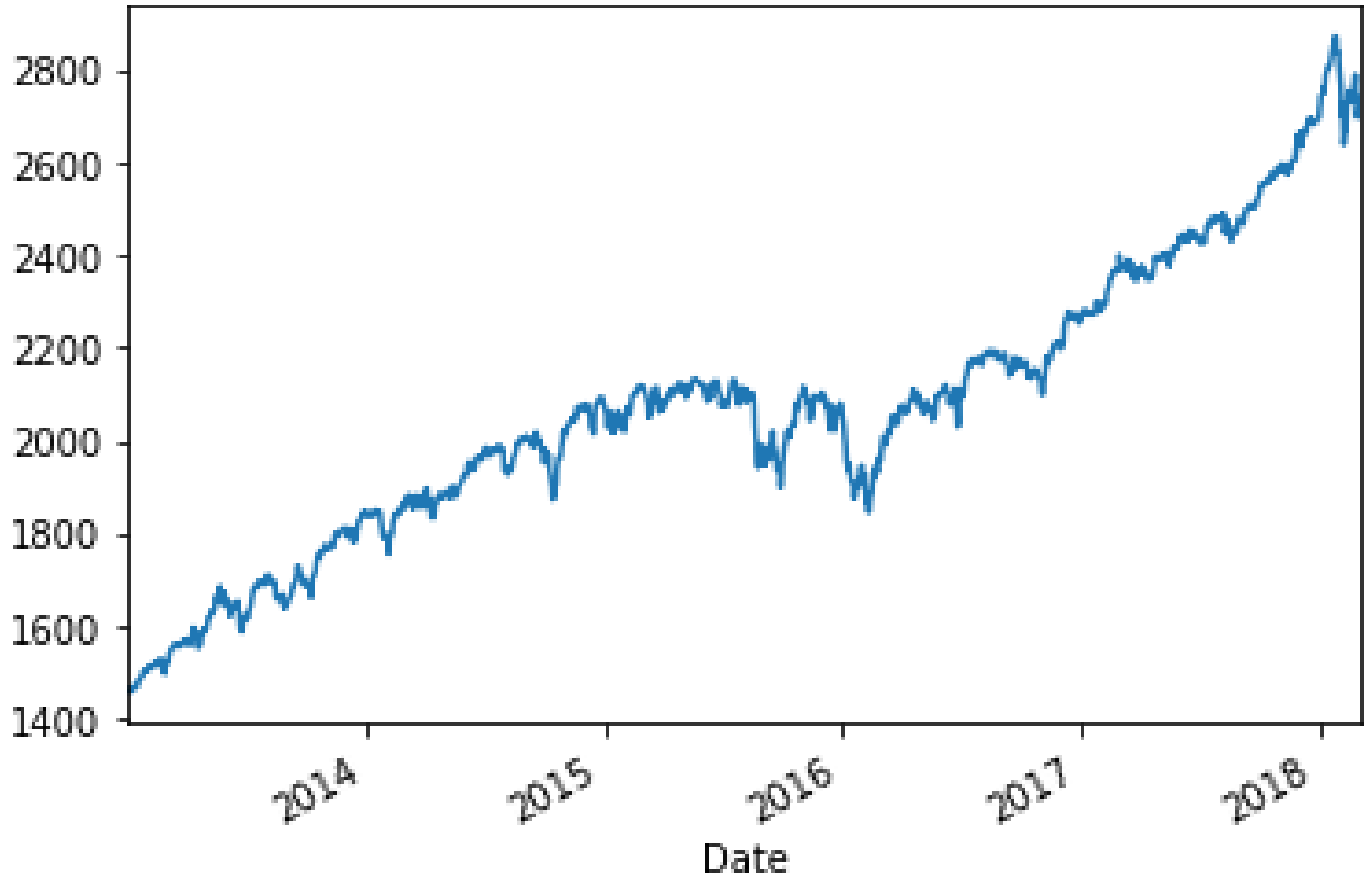
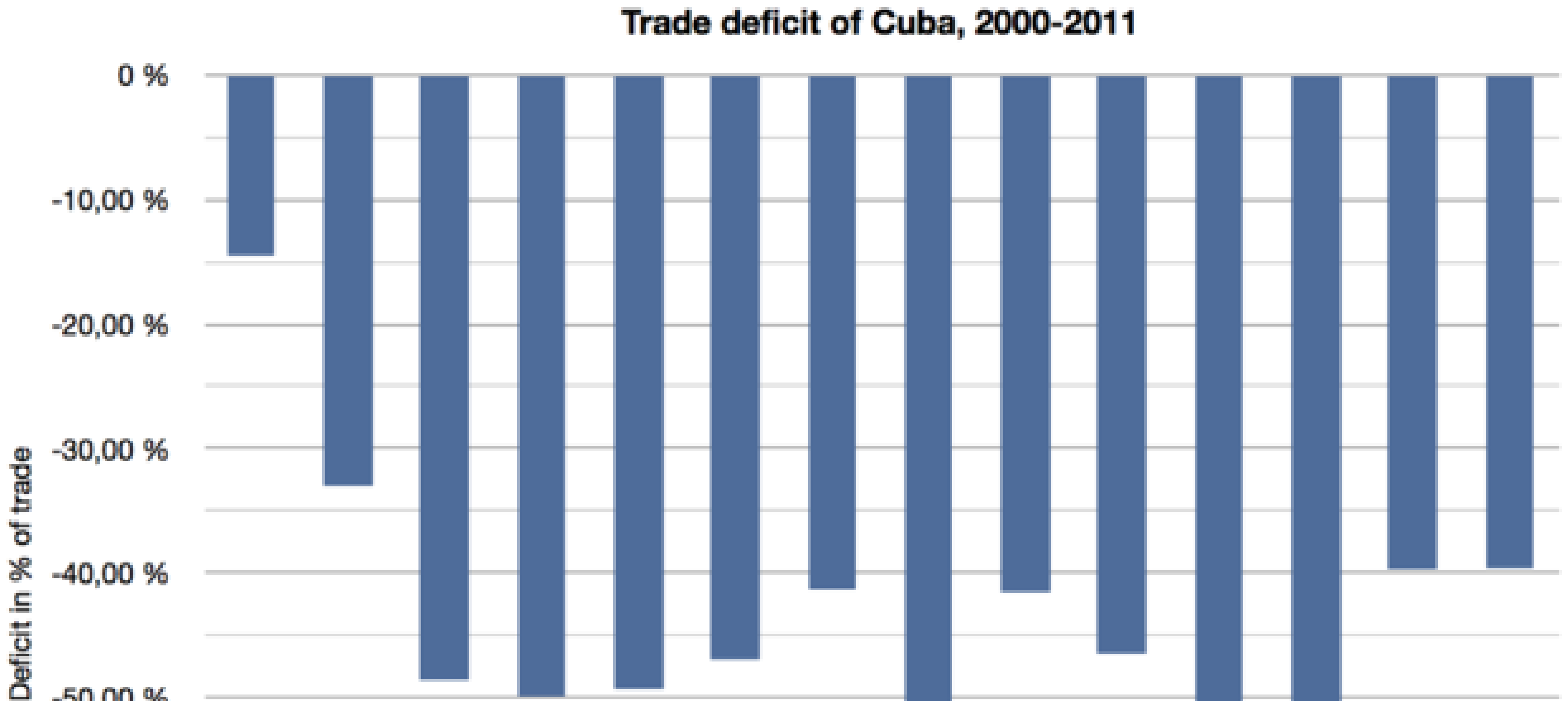
Datetimes


2800
2600
2400
2200
2000
1800
1600
1400
2014
2015
2016
2017
2018
Date

Datetimes



Trade deficit of Cuba, 2000-2011
0 %
-10,00 %
-20,00 %
-30,00 %
-40,00 %
-50,00 %
Deficit in % of trade

Datetimes

```
from datetime import datetime
```

These objects have attributes representing the year, month, date, hour, second, microsecond, and timezone.

```
black_monday = datetime(1987, 10, 19)
print(black_monday)
```

In order to create a datetime object, you must at least provide the year, month, and date.

```
datetime.datetime(1987, 10, 19, 0, 0)
```

Datetime now

```
datetime.now()
```

```
datetime.datetime(2019, 11, 6, 3, 48, 30, 886713)
```

Datetime from string

```
black_monday_str = "Monday, October 19, 1987. 9:30 am"
format_str = "%A, %B %d, %Y. %I:%M %p"
datetime.datetime.strptime(black_monday_str, format_str)
```

string-parse-time

```
datetime.datetime(1987, 10, 19, 9, 30)
```

Datetime from string

Year

- `%y` Without century (01, 02, ..., 98, 99)
- `%Y` With century (0001, 0002, ..., 1998, 1999, ..., 9999)

Month

- `%b` Abbreviated names (Jan, Feb, ..., Nov, Dec)
- `%B` Full names (January, February, ... November, December)
- `%m` As numbers (01, 02, ..., 11, 12)

Day of Month

- `%d` (01, 02, ..., 30, 31)

Datetime from string

Weekday

- `%a` Abbreviated name (Sun, ... Sat)
- `%A` Full name (Sunday, ... Saturday)
- `%w` Number (0, ..., 6)

Hour

- `%H` 24 hour (00, 01, ... 23)
- `%I` 12 hour (01, 02, ... 12)
- `%M` (01, 02, ..., 59)

Datetime from string

Seconds

- `%S` (00, 01, ... 59)

Micro-seconds

- `%f` (000000, 000001, ... 999999)

AM/PM

- `%p` (AM, PM)

Datetime from string

`%m` Months

`%M` Minutes

Datetime from string

```
"1837-05-10"
```

`%Y`

`%m`

`%d`

```
"%Y-%m-%d"
```

Datetime from string

```
"Friday, 17 May 01"
```

`%A`

`%d`

`%B`

`%y`

```
"%A, %d %B %y"
```

String from datetime

```
dt.strftime(format_string)
```

string-from-time

String from datetime

```
great_depression_crash = datetime.datetime(1929, 10, 29)
great_depression_crash
```

```
datetime.datetime(1929, 10, 29, 0, 0)
```

```
great_depression_crash.strftime("%a, %b %d, %Y")
```

```
'Tue, Oct 29, 1929'
```

Let's practice!

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Working with datetimes

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Datetime attributes

```python
now.year
now.month
now.day
```

```
2019
11
13
```

```python
now.hour
now.minute
now.second
```

```
22
34
56
```

Comparing datetimes

equals `==`

less than `<`

more than `>`

Comparing datetimes

```
from datetime import datetime
asian_crisis = datetime(1997, 7, 2)
world_mini_crash = datetime(1997, 10, 27)
```

```
asian_crisis > world_mini_crash
```

```
False
```

```
asian_crisis < world_mini_crash
```

```
True
```

Comparing datetimes

```
asian_crisis = datetime(1997, 7, 2)
world_mini_crash = datetime(1997, 10, 27)
```

```
text = "10/27/1997"
format_str =  "%m/%d/%Y"
sell_date = datetime.strptime(text, format_str)
```

```
sell_date == world_mini_crash
```

```
True
```

Difference between datetimes

- Compare with `<` , `>` , or `==` .
- Subtraction returns a `timedelta` object.
- `timedelta` attributes: weeks, days, minutes, seconds, microseconds

Difference between datetimes

```
delta = world_mini_crash - asian_crisis
```

```
type(delta)
```

```
datetime.timedelta
```

```
delta.days
```

```
117
```

Creating relative datetimes

```
dt
```

```
datetime.datetime(2019, 1, 14, 0, 0)
```

```
datetime(dt.year, dt.month, dt.day - 7)
```

```
datetime.datetime(2019, 1, 7, 0, 0)
```

```
datetime(dt.year, dt.month, dt.day - 15)
```

```
ValueError                                Traceback (most recent call last)
<ipython-input-28-804001f45cdb> in <module>()
-> 1 datetime(dt.year, dt.month, dt.day - 15)
ValueError: day is out of range for month
```

Creating relative datetimes

```
delta = world_mini_crash - asian_crisis
type(delta)
```

```
datetime.timedelta
```

Creating relative datetimes

```python
from datetime import timedelta
```

```python
offset = timedelta(weeks = 1)
offset
```

```
datetime.timedelta(7)
```

```python
dt - offset
```

```
datetime.datetime(2019, 1, 7, 0, 0)
```

Creating relative datetimes

```
offset = timedelta(days=16)
dt - offset
```

```
datetime.datetime(2018, 12, 29, 0, 0)
```

```
cur_week = last_week + timedelta(weeks=1)
# Do some work with date
# set last week variable to cur week and repeat
last_week = cur_week
```

```
source_dt = event_dt - timedelta(weeks=4)
# Use source datetime to look up market factors
```

Let's practice!

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Dictionaries

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Lookup by index

```
my_list = ['a','b','c','d']
```

```
  0    1    2    3
['a','b','c','d']
```

```
my_list[0]
```

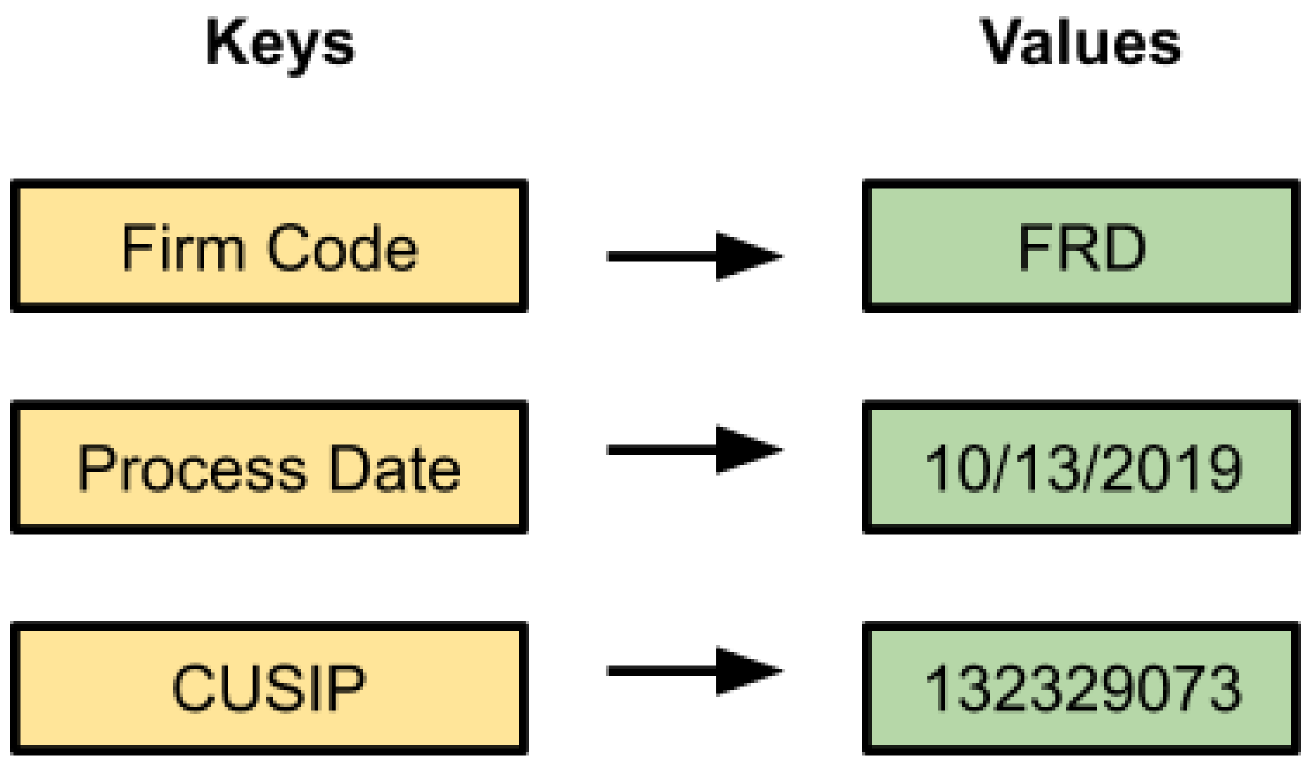
```
'a'
```

```
my_list.index('c')
```

```
2
```

Lookup by key

Dictionaries



Representation

```
{ 'key-1':'value-1', 'key-2':'value-2', 'key-3':'value-3'}
```

Creating dictionaries

```python
my_dict = {}
my_dict
```

```
{}
```

```python
my_dict = dict()
my_dict
```

```
{}
```

Creating dictionaries

```
ticker_symbols = {'AAPL':'Apple', 'F':'Ford', 'LUV':'Southwest'}
print(ticker_symbols)
```

```
{'AAPL':'Apple', 'F':'Ford', 'LUV':'Southwest'}
```

```
ticker_symbols = dict([['APPL','Apple'],['F','Ford'],['LUV','Southwest']])
print(ticker_symbols)
```

```
{'AAPL':'Apple', 'F':'Ford', 'LUV':'Southwest'}
```

Adding to dictionaries

```
ticker_symbols['XON'] = 'Exxon'
ticker_symbols
```

```
{'APPL': 'Apple', 'F': 'Ford', 'LUV': 'Southwest', 'XON': 'Exxon'}
```

```
ticker_symbols['XON'] = 'Exxon OLD'
ticker_symbols
```

```
{'APPL': 'Apple','F': 'Ford','LUV': 'Southwest','XON': 'Exxon OLD'}
```

Accessing values

```python
ticker_symbols['F']
```

```
'Ford'
```

Accessing values

```
ticker_symbols['XOM']
```

```
KeyError                                  Traceback (most recent call last)
<ipython-input-6-782fbf617bf7> in <module>()
-> 1 ticker_symbols['XOM']

   KeyError: 'XOM'
```

Accessing values

```
company = ticker_symbols.get('LUV')
print(company)
```

```
'Southwest'
```

```
company = ticker_symbols.get('XOM')
print(company)
```

```
None
```

```
company = ticker_symbols.get('XOM', 'MISSING')
print(company)
```

```
'MISSING'
```

Deleting from dictionaries

```
ticker_symbols
```

```
{'APPL': 'Apple', 'F': 'Ford', 'LUV': 'Southwest', 'XON': 'Exxon OLD'}
```

```
del(ticker_symbols['XON'])
```

```
ticker_symbols
```

```
{'APPL': 'Apple', 'F': 'Ford', 'LUV': 'Southwest'}
```

Let's practice!

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