

Udemy Finance APIs: Alpha Vantage

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About Alpha Vantage:

- real-time and historical stock data
- foreign exchange and cryptocurrencies
- 50 technical indicators
- global coverage
- composed of a community of researchers, engineers, and business professionals
- leading provider of financial data

Pros and Cons of Alpha Vantage:

Pros

- Free (5 calls per minute, 500 per day), and premium is available
- Large datasets for crypto, stocks, etc
- 50+ technical indicators (such as SMA, Bollinger Bands)

Cons

- Limited call requests
- API key needed, compared to yfinance that requires no key
- No high frequency or real time data
- No data for bonds, funds, indexes, or commodities

```
from helpers_02_04 import *
import_all()
plt.style.use('pinks.mplstyle')
from alpha_vantage.timeseries import TimeSeries
%matplotlib inline
```

```
%%html
<style>
a:link {color: #35193e !important; font-weight: 600 !important;}
a:visited {color: #35193e !important; font-weight: 600 !important;}
</style>
```

Getting Data from Alpha Vantage

```
api_key = 'XMC27CD0UMQPVAPR'  
ts = TimeSeries(key = api_key, output_format = 'pandas')  
ts
```

```
<alpha_vantage.timeseries.TimeSeries at 0x7fb80b19cb20>
```

Time Series Object

```
pretty('TimeSeries()')  
help(ts)
```

TimeSeries()

Help on TimeSeries in module alpha_vantage.timeseries object:

```
class TimeSeries(alpha_vantage.alphavantage.AlphaVantage)  
| TimeSeries(key=None, output_format='json', treat_info_as_error=True,  
indexing_type='date', proxy=None, rapidapi=False)  
|  
| This class implements all the api calls to times series  
|  
| Method resolution order:  
| TimeSeries  
| alpha_vantage.alphavantage.AlphaVantage  
| builtins.object  
|  
| Methods defined here:  
|  
| get_daily(self, symbol, outputsize='compact')  
| Return daily time series in two json objects as data and  
| meta_data. It raises ValueError when problems arise  
|  
| Keyword Arguments:  
| symbol: the symbol for the equity we want to get its data  
| outputsize: The size of the call, supported values are  
| 'compact' and 'full'; the first returns the last 100 points in the  
| data series, and 'full' returns the full-length daily times  
| series, commonly above 1MB (default 'compact')  
|
```

```

| get_daily_adjusted(self, symbol, outputsize='compact')
|     Return daily adjusted (date, daily open, daily high, daily low,
|     daily close, daily split/dividend-adjusted close, daily volume)
|     time series in two json objects as data and
|     meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         outputsize: The size of the call, supported values are
|             'compact' and 'full'; the first returns the last 100 points in the
|             data series, and 'full' returns the full-length daily times
|             series, commonly above 1MB (default 'compact')
|
| get_intraday(self, symbol, interval='15min', outputsize='compact')
|     Return intraday time series in two json objects as data and
|     meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min'
|             (default '15min')
|         outputsize: The size of the call, supported values are
|             'compact' and 'full'; the first returns the last 100 points in the
|             data series, and 'full' returns the full-length intraday times
|             series, commonly above 1MB (default 'compact')
|
| get_intraday_extended(self, symbol, interval='15min', slice='year1month1')
|     Return extended intraday time series in one csv_reader object.
|     It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min'
|             (default '15min')
|         slice: the trailing 2 years of intraday data is evenly divided into
|             24 "slices" - year1month1, year1month2, ..., year2month12
|
| get_monthly(self, symbol)
|     Return monthly time series in two json objects as data and
|     meta_data. It raises ValueError when problems arise
|

```

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

get_monthly_adjusted(self, symbol)

Return monthly time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

get_quote_endpoint(self, symbol)

Return the latest price and volume information for a security of your choice

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

get_symbol_search(self, keywords)

Return best matching symbols and market information based on keywords. It raises ValueError when problems arise

Keyword Arguments:

keywords: the keywords to query on

get_weekly(self, symbol)

Return weekly time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

get_weekly_adjusted(self, symbol)

weekly adjusted time series (last trading day of each week, weekly open, weekly high, weekly low, weekly close, weekly adjusted close, weekly volume, weekly dividend) of the equity specified, covering up to 20 years of historical data.

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

Methods inherited from alpha_vantage.alphavantage.AlphaVantage:

__init__(self, key=None, output_format='json', treat_info_as_error=True,

```
indexing_type='date', proxy=None, rapidapi=False)
```

```
| Initialize the class
```

```
| Keyword Arguments:
```

```
| key: Alpha Vantage api key
```

```
| retries: Maximum amount of retries in case of faulty connection or  
| server not able to answer the call.
```

```
| treat_info_as_error: Treat information from the api as errors
```

```
| output_format: Either 'json', 'pandas' or 'csv'
```

```
| indexing_type: Either 'date' to use the default date string given  
| by the alpha vantage api call or 'integer' if you just want an  
| integer indexing on your dataframe. Only valid, when the  
| output_format is 'pandas'
```

```
| proxy: Dictionary mapping protocol or protocol and hostname to  
| the URL of the proxy.
```

```
| rapidapi: Boolean describing whether or not the API key is  
| through the RapidAPI platform or not
```

```
| map_to_matype(self, matype)
```

```
| Convert to the alpha vantage math type integer. It returns an  
| integer correspondent to the type of math to apply to a function. It  
| raises ValueError if an integer greater than the supported math types  
| is given.
```

```
| Keyword Arguments:
```

```
| matype: The math type of the alpha vantage api. It accepts  
| integers or a string representing the math type.
```

```
| * 0 = Simple Moving Average (SMA),
```

```
| * 1 = Exponential Moving Average (EMA),
```

```
| * 2 = Weighted Moving Average (WMA),
```

```
| * 3 = Double Exponential Moving Average (DEMA),
```

```
| * 4 = Triple Exponential Moving Average (TEMA),
```

```
| * 5 = Triangular Moving Average (TRIMA),
```

```
| * 6 = T3 Moving Average,
```

```
| * 7 = Kaufman Adaptive Moving Average (KAMA),
```

```
| * 8 = MESA Adaptive Moving Average (MAMA)
```

```
| set_proxy(self, proxy=None)
```

```
| Set a new proxy configuration
```

```
| Keyword Arguments:
```

```
| proxy: Dictionary mapping protocol or protocol and hostname to
```

```
|         the URL of the proxy.
|
| -----
| Data descriptors inherited from alpha_vantage.alphavantage.AlphaVantage:
|
| __dict__
|     dictionary for instance variables (if defined)
|
| __weakref__
|     list of weak references to the object (if defined)
```

```
GE = ts.get_daily("GE")
```

```
pretty('ts.get_daily()')
help(ts.get_daily)
```

```
ts.get_daily()
```

Help on method get_daily in module alpha_vantage.timeseries:

get_daily(symbol, outputsize='compact') method of alpha_vantage.timeseries.TimeSeries instance

Return daily time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data
 outputsize: The size of the call, supported values are
 'compact' and 'full'; the first returns the last 100 points in the
 data series, and 'full' returns the full-length daily times
 series, commonly above 1MB (default 'compact')

Resulting Data & Types

```
type(GE)
```

tuple

```
len(GE)
```

```
GE[0][0:5]
```

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00
2023-01-31	80.45	80.91	79.47	80.48	6,883,537.00
2023-01-30	82.41	82.75	80.67	80.83	5,726,899.00

```
pretty('GE[1] contains meta information')
GE[1]
```

GE[1] contains meta information

```
{'1. Information': 'Daily Prices (open, high, low, close) and Volumes',
 '2. Symbol': 'GE',
 '3. Last Refreshed': '2023-02-03',
 '4. Output Size': 'Compact',
 '5. Time Zone': 'US/Eastern'}
```

```
pretty('GE[0] contains the DataFrame')
df_overview(GE[0])
```

GE[0] contains the DataFrame

	DataFrame Columns				
	1. open	2. high	3. low	4. close	5. volume
datatype	float64	float64	float64	float64	float64
missing values	0	0	0	0	0
count	100.00	100.00	100.00	100.00	100.00
mean	76.78	77.95	75.89	77.06	6,827,626.88
std	7.74	7.67	7.71	7.70	2,520,143.25
min	62.64	63.29	61.88	61.91	1,894,075.00
25%	69.97	71.00	68.94	70.16	4,948,897.75
50%	78.06	80.34	77.54	79.06	6,390,139.00
75%	83.29	84.03	81.95	83.50	7,993,457.25
max	87.70	88.38	87.35	88.14	16,784,586.00

DataFrame Key Points

total rows	100
total columns	5
column names	1. open, 2. high, 3. low, 4. close, 5. volume
index start	2023-02-03 00:00:00
index end	2022-09-13 00:00:00
total missing values	0

DataFrame Head and Tail

head(3)

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00

tail(3)

	1. open	2. high	3. low	4. close	5. volume
date					
2022-09-15	69.78	70.79	68.75	68.91	4,927,334.00
2022-09-14	70.70	71.00	68.68	70.03	6,210,344.00
2022-09-13	73.26	73.86	70.62	70.84	7,210,803.00

Setting Specific Time Periods

```
GE = ts.get_daily('GE', outputsize = 'compact')[0]
```

compact returns the last 100 timestamps (default)

```
see(GE.head(3), 'outputsize = "compact"')
```

outputsize = "compact"

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00

```
pretty(len(GE), 'len(GE)')
```


len(GE)

100

```
GE_full = ts.get_daily('GE', outputsize = 'full')[0]
```

full returns the last 100 timestamps

```
see(GE_full.head(3), 'outputsize = "full"')
```

	outputsize = "full"				
	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00

```
pretty(f'{len(GE_full):,}', 'len(GE_full)')
```

len(GE_full)

5,853

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Stock Splits & Dividends

```
import yfinance as yf
```

```
ticker = 'GE'
```

```
GE_full = ts.get_daily(ticker, outputsize = 'full')[0]
```

```
pretty('GE_full meta information')  
ts.get_daily(ticker, outputsize = 'full')[1]
```

GE_full meta information

```
{'1. Information': 'Daily Prices (open, high, low, close) and Volumes',
```

```
'2. Symbol': 'GE',
'3. Last Refreshed': '2023-02-03',
'4. Output Size': 'Full size',
'5. Time Zone': 'US/Eastern'}
```

Observing differences in importing from Alpha Vantage versus yfinance

```
see(GE_full.head(3), 'Alpha Vantage Version, outputsize = "full"')
```

Alpha Vantage Version, outputsize = "full"					
	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00

Adj Close - Adjusted for stock splits and dividends

```
see(yf.download(ticker, start = GE_full.index[0]),
    'yfinance version, same time period')
```

[*****100%*****] 1 of 1 completed

yfinance version, same time period						
	Open	High	Low	Close	Adj Close	Volume
Date						
2023-02-03	83.51	83.69	81.82	81.96	81.96	5777400

ts.get_daily_adjusted() - also returns the dividend amount and split coefficient

```
GE_adj = ts.get_daily_adjusted(ticker, outputsize = 'full')[0]
```

```
pretty('ts.get_daily_adjusted()')
help(ts.get_daily_adjusted)
```

ts.get_daily_adjusted()

Help on method get_daily_adjusted in module alpha_vantage.timeseries:

get_daily_adjusted(symbol, outputsize='compact') method of
alpha_vantage.timeseries.TimeSeries instance

Return daily adjusted (date, daily open, daily high, daily low,
daily close, daily split/dividend-adjusted close, daily volume)

time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

- symbol: the symbol for the equity we want to get its data
- outputsize: The size of the call, supported values are 'compact' and 'full'; the first returns the last 100 points in the data series, and 'full' returns the full-length daily times series, commonly above 1MB (default 'compact')

```
pretty('GE_adj meta informtation')
ts.get_daily_adjusted(ticker, outputsize = 'full')[1]
```

GE_adj meta informtation

```
{'1. Information': 'Daily Time Series with Splits and Dividend Events',
'2. Symbol': 'GE',
'3. Last Refreshed': '2023-02-03',
'4. Output Size': 'Full size',
'5. Time Zone': 'US/Eastern'}
```

```
df_overview(GE_adj, title = "GE 'get_daily_adjusted'")
```

GE 'get_daily_adjusted' Columns

	1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount	8. split coefficient
datatype	float64	float64	float64	float64	float64	float64	float64	float64
missing values	0	0	0	0	0	0	0	0
count	5,853.00	5,853.00	5,853.00	5,853.00	5,853.00	5,853.00	5,853.00	5,853.00
mean	32.28	32.65	31.89	32.28	109.51	46,176,936.51	0.00	1.00
std	25.15	25.52	24.80	25.17	37.54	43,541,739.59	0.03	0.03
min	5.61	5.66	5.48	5.49	28.93	1,779,700.00	0.00	0.12
25%	17.45	17.69	17.09	17.39	76.86	20,144,600.00	0.00	1.00
50%	27.31	27.55	27.07	27.32	112.15	33,891,600.00	0.00	1.00
75%	35.33	35.58	35.09	35.30	136.48	58,201,149.00	0.00	1.00
max	166.13	167.94	161.31	166.00	199.77	752,904,400.00	0.42	3.00

total rows	5,853
total columns	8
column names	1. open, 2. high, 3. low, 4. close, 5. adjusted close, 6. volume, 7. dividend amount, 8. split coefficient
index start	2023-02-03 00:00:00
index end	1999-11-01 00:00:00
missing values	0

date	head(3)				5. adjusted close	6. volume	7. dividend amount	8. split coefficient
	1. open	2. high	3. low	4. close				
2022-03	83.51	83.69	81.82	81.96	81.96	5,778,181.00	0.00	1.00
2022-02	82.19	84.03	81.90	83.94	83.94	8,293,043.00	0.00	1.00
2022-01	80.27	82.47	80.01	82.32	82.32	7,272,316.00	0.00	1.00

	1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount	8. split coefficient
date								
1-03	132.88	132.94	130.00	131.38	144.61	4,589,000.00	0.00	1.00
1-02	129.69	133.13	128.19	129.00	141.99	6,340,600.00	0.00	1.00
1-01	133.63	134.38	129.25	129.38	142.41	6,795,500.00	0.00	1.00

```
see(GE_adj.iloc[:, -1].value_counts(), 'Value counts for split coefficient column')
```

8. split coefficient	
1.00	5850
1.28	1
0.12	1
3.00	1

```
GE_adj[GE_adj.iloc[:, -1] == 3]
```

1. open 2. high 3. low 4. close 5. adjusted close 6. volume 7. dividend amount 8. split coefficient

1. open 2. high 3. low 4. close 5. adjusted close 6. volume 7. dividend amount 8. split coefficient

date

2000-05-08	52.13	52.88	51.63	52.44	174.13	3,892,167.00	0.00	3.00
------------	-------	-------	-------	-------	--------	--------------	------	------

```
header_text('Price Effects of Stock Split')
```

```
apply_style(GE_adj.loc['2000-05-03' : '2000-05-10'],
            lambda value: 'color: #ad1759;\n'
                           'font-weight: 600;\n'
                           'font-size: 16px;\n'
                           'background-color: yellow'
            if (value < 100) & (value > 3) else None).format(precision = 2)
```

Price Effects of Stock Split

	1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount	8. split coefficient
date								
2000-05-10 00:00:00	51.50	52.06	50.06	50.63	168.12	15059400.00	0.00	1.00
2000-05-09 00:00:00	52.38	52.69	50.88	52.13	173.10	13439400.00	0.00	1.00
2000-05-08 00:00:00	52.13	52.88	51.63	52.44	174.13	3892167.00	0.00	3.00
2000-05-05 00:00:00	154.00	160.00	153.50	158.00	174.88	6895300.00	0.00	1.00
2000-05-04 00:00:00	157.44	157.50	152.75	154.00	170.45	5137000.00	0.00	1.00
2000-05-03 00:00:00	159.50	160.00	154.56	156.06	172.73	5531600.00	0.00	1.00

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Datetime Index

```
see(GE_full.head(3), 'Alpha Vantage Data')
```

Alpha Vantage Data

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03	83.51	83.69	81.82	81.96	5,778,181.00
2023-02-02	82.19	84.03	81.90	83.94	8,293,043.00
2023-02-01	80.27	82.47	80.01	82.32	7,272,316.00

```
GE_full.columns = ['open', 'high', 'low', 'close', 'volume']
```

```
timeseries_overview(GE_full, 'close')
```

DataFrame Overview | Primary Metric: close

measurement	
total records	5,853
start date	11/01/1999
end date	02/03/2023
total columns	5
column labels	open, high, low, close, volume
total missing values	0
close average	32
close std	25
close min	5
close 25%	17
close 50%	27
close 75%	35
close max	166

Getting a single year

```
GE_full.loc['2017']
```

	open	high	low	close	volume
date					
2017-12-29	17.27	17.53	17.27	17.45	75,906,686.00
2017-12-28	17.35	17.40	17.25	17.36	60,756,258.00
2017-12-27	17.46	17.63	17.31	17.38	58,655,208.00
2017-12-26	17.45	17.66	17.40	17.43	55,337,900.00
2017-12-22	17.51	17.56	17.40	17.50	46,370,400.00
...
2017-01-09	31.64	31.66	31.43	31.46	21,262,120.00
2017-01-06	31.58	31.77	31.36	31.61	22,120,800.00
2017-01-05	31.57	31.75	31.31	31.52	25,856,523.00
2017-01-04	31.75	31.83	31.62	31.70	21,438,996.00
2017-01-03	31.67	31.84	31.40	31.69	32,149,537.00

251 rows × 5 columns

Frequency & Interval Settings

```
ticker = 'MSFT'
```

get_monthly_adjusted() - monthly data

```
pretty('ts.get_monthly_adjusted()')  
help(ts.get_monthly_adjusted)
```

```
ts.get_monthly_adjusted()
```

Help on method get_monthly_adjusted in module alpha_vantage.timeseries:

get_monthly_adjusted(symbol) method of alpha_vantage.timeseries.TimeSeries instance
Return monthly time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

```
ts.get_monthly_adjusted(ticker)[0].head(3)
```

	1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount
date							
2023-02-03	248.00	264.69	245.47	258.35	258.35	100,277,605.00	0.00
2023-01-31	243.08	249.83	219.35	247.81	247.81	666,168,068.00	0.00
2022-12-30	253.87	263.92	233.87	239.82	239.82	591,366,468.00	0.00

get_weekly_adjusted() - weekly data

```
pretty('ts.get_weekly_adjusted()')  
help(ts.get_weekly_adjusted)
```

```
ts.get_weekly_adjusted()
```

Help on method get_weekly_adjusted in module alpha_vantage.timeseries:

get_weekly_adjusted(symbol) method of alpha_vantage.timeseries.TimeSeries instance
weekly adjusted time series (last trading day of each week, weekly open, weekly high, weekly low, weekly close, weekly adjusted close, weekly volume, weekly dividend) of the equity specified,

covering up to 20 years of historical data.

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

```
ts.get_weekly_adjusted(ticker)[0].head(3)
```

	1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount
date							
2023-02-03	244.51	264.69	242.20	258.35	258.35	152,686,042.00	0.00
2023-01-27	241.10	249.83	230.90	248.16	248.16	198,648,466.00	0.00
2023-01-20	237.97	242.38	230.68	240.22	240.22	123,872,791.00	0.00

intraday - interval of 60 minutes (default = 15 minutes)

```
pretty('ts.get_intraday()')  
help(ts.get_intraday)
```

ts.get_intraday()

Help on method get_intraday in module alpha_vantage.timeseries:

get_intraday(symbol, interval='15min', outputsize='compact') method of alpha_vantage.timeseries.TimeSeries instance

Return intraday time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

interval: time interval between two consecutive values,
supported values are '1min', '5min', '15min', '30min', '60min'
(default '15min')

outputsize: The size of the call, supported values are
'compact' and 'full'; the first returns the last 100 points in the
data series, and 'full' returns the full-length intraday times
series, commonly above 1MB (default 'compact')

```
ts.get_intraday(ticker, outputsize = 'full', interval = '60min')[0].head(3)
```

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03 20:00:00	258.22	258.25	258.00	258.00	7,798.00
2023-02-03 19:00:00	258.24	258.30	258.11	258.22	6,339.00

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03 18:00:00	258.35	258.35	258.01	258.33	9,124.00

intraday - interval of 1 minute

```
ts.get_intraday(ticker, outputsize = 'full', interval = '1min')[0].head(3)
```

	1. open	2. high	3. low	4. close	5. volume
date					
2023-02-03 20:00:00	258.00	258.00	258.00	258.00	465.00
2023-02-03 19:59:00	258.00	258.00	258.00	258.00	449.00
2023-02-03 19:58:00	258.00	258.00	258.00	258.00	228.00

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Technical Indicators

- Typically used by day traders and technical analysts to find patterns in historical price and volume data
- Alpha Vantage offers 50 technical indicators

```
from alpha_vantage.techindicators import TechIndicators
```

```
indicator = TechIndicators(key = api_key, output_format = 'pandas')
```

```
pretty('TechIndicators()')
help(indicator)
```

TechIndicators()

Help on TechIndicators in module alpha_vantage.techindicators object:

```
class TechIndicators(alpha_vantage.alphavantage.AlphaVantage)
|   TechIndicators(*args, **kwargs)
|
|   This class implements all the technical indicator api calls
|
|   Method resolution order:
|       TechIndicators
|       alpha_vantage.alphavantage.AlphaVantage
|       builtins.object
```

```

|
| Methods defined here:
|
| __init__(self, *args, **kwargs)
|     Inherit AlphaVantage base class with its default arguments
|
| get_ad(self, symbol, interval='daily')
|     Return the Chaikin A/D line values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|
| get_adosc(self, symbol, interval='daily', fastperiod=None, slowperiod=None)
|     Return the Chaikin A/D oscillator values in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         fastperiod: Positive integers are accepted (default=None)
|         slowperiod: Positive integers are accepted (default=None)
|
| get_adx(self, symbol, interval='daily', time_period=20)
|     Return the average directional movement index values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|

```

```

|  get_adxr(self, symbol, interval='daily', time_period=20)
|      Return the average directional movement index rating in two json
|      objects as data and meta_data. It raises ValueError when problems arise
|
|      Keyword Arguments:
|          symbol: the symbol for the equity we want to get its data
|          interval: time interval between two consecutive values,
|                  supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                  'weekly', 'monthly' (default 'daily')
|          time_period: How many data points to average (default 20)
|
|  get_apo(self, symbol, interval='daily', series_type='close', fastperiod=None,
slowperiod=None, matype=None)
|      Return the absolute price oscillator values in two
|      json objects as data and meta_data. It raises ValueError when problems
|      arise
|
|      Keyword Arguments:
|          symbol: the symbol for the equity we want to get its data
|          interval: time interval between two consecutive values,
|                  supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                  'weekly', 'monthly' (default '60min')
|          series_type: The desired price type in the time series. Four types
|                      are supported: 'close', 'open', 'high', 'low' (default 'close')
|          fastperiod: Positive integers are accepted (default=None)
|          slowperiod: Positive integers are accepted (default=None)
|          matype : Moving average type. By default, fastmatype=0.
|                  Integers 0 - 8 are accepted (check down the mappings) or the string
|                  containing the math type can also be used.
|
|          * 0 = Simple Moving Average (SMA),
|          * 1 = Exponential Moving Average (EMA),
|          * 2 = Weighted Moving Average (WMA),
|          * 3 = Double Exponential Moving Average (DEMA),
|          * 4 = Triple Exponential Moving Average (TEMA),
|          * 5 = Triangular Moving Average (TRIMA),
|          * 6 = T3 Moving Average,
|          * 7 = Kaufman Adaptive Moving Average (KAMA),
|          * 8 = MESA Adaptive Moving Average (MAMA)
|
|  get_aroon(self, symbol, interval='daily', time_period=20, series_type='close')

```

```

|     Return the aroon values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
|     get_aroosc(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the aroon oscillator values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
|     get_atr(self, symbol, interval='daily', time_period=20)
|     Return the average true range values in two json objects as
|     data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
|     get_bbands(self, symbol, interval='daily', time_period=20, series_type='close',
nbdevup=None, nbdevdn=None, matype=None)
|     Return the bollinger bands values in two
|     json objects as data and meta_data. It raises ValueError when problems

```

```

|         arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         time_period: Number of data points used to calculate each BBANDS value.
|                   Positive integers are accepted (e.g., time_period=60, time_period=200)
|                   (default=20)
|         series_type: The desired price type in the time series. Four types
|                   are supported: 'close', 'open', 'high', 'low' (default 'close')
|         nbdevup: The standard deviation multiplier of the upper band. Positive
|                   integers are accepted as default (default=2)
|         nbdevdn: The standard deviation multiplier of the lower band. Positive
|                   integers are accepted as default (default=2)
|         matype : Moving average type. By default, matype=0.
|                   Integers 0 - 8 are accepted (check down the mappings) or the string
|                   containing the math type can also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),
|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
|     get_bop(self, symbol, interval='daily', time_period=20)
|         Return the balance of power values in two json
|         objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|

```

```

| get_cci(self, symbol, interval='daily', time_period=20)
|     Return the commodity channel index values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_cmo(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the Chande momentum oscillator in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_dema(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return double exponential moving average time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_dx(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the directional movement index values in two json objects as
|     data and meta_data. It raises ValueError when problems arise

```

```

|
|     Keyword Arguments:
|         symbol:  the symbol for the equity we want to get its data
|         interval:  time interval between two consecutive values,
|                     supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                     'weekly', 'monthly' (default 'daily')
|         time_period:  How many data points to average (default 20)
|         series_type:  The desired price type in the time series. Four types
|                       are supported: 'close', 'open', 'high', 'low' (default 'close')
|
|     get_ema(self, symbol, interval='daily', time_period=20, series_type='close')
|         Return exponential moving average time series in two json objects
|         as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol:  the symbol for the equity we want to get its data
|         interval:  time interval between two consecutive values,
|                     supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                     'weekly', 'monthly' (default 'daily')
|         time_period:  How many data points to average (default 20)
|         series_type:  The desired price type in the time series. Four types
|                       are supported: 'close', 'open', 'high', 'low' (default 'close')
|
|     get_ht_dcperiod(self, symbol, interval='daily', series_type='close')
|         Return the Hilbert transform, dominant cycle period in two
|         json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol:  the symbol for the equity we want to get its data
|         interval:  time interval between two consecutive values,
|                     supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                     'weekly', 'monthly' (default 'daily')
|         series_type:  The desired price type in the time series. Four types
|                       are supported: 'close', 'open', 'high', 'low' (default 'close')
|
|     get_ht_dcphase(self, symbol, interval='daily', series_type='close')
|         Return the Hilbert transform, dominant cycle phase in two
|         json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:

```

```

|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|                   are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_ht_phasor(self, symbol, interval='daily', series_type='close')
|     Return the Hilbert transform, phasor components in two
|     json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|                   are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_ht_sine(self, symbol, interval='daily', series_type='close')
|     Return the Hilbert transform, sine wave values in two
|     json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|                   are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_ht_trendline(self, symbol, interval='daily', series_type='close')
|     Return the Hilbert transform, instantaneous trendline values in two
|     json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',

```



```

|         'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|         are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_ht_trendmode(self, symbol, interval='daily', series_type='close')
|     Return the Hilbert transform, trend vs cycle mode in two
|     json objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|         are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_kama(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return Kaufman adaptive moving average time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|         are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_macd(self, symbol, interval='daily', series_type='close', fastperiod=None,
slowperiod=None, signalperiod=None)
|     Return the moving average convergence/divergence time series in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')

```

```

|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|         fastperiod: Positive integers are accepted (default=None)
|         slowperiod: Positive integers are accepted (default=None)
|         signalperiod: Positive integers are accepted (default=None)
|
|     get_macdext(self, symbol, interval='daily', series_type='close', fastperiod=None,
slowperiod=None, signalperiod=None, fastmatype=None, slowmatype=None,
signalmatype=None)
|
|     Return the moving average convergence/divergence time series in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|         fastperiod: Positive integers are accepted (default=None)
|         slowperiod: Positive integers are accepted (default=None)
|         signalperiod: Positive integers are accepted (default=None)
|         fastmatype: Moving average type for the faster moving average.
|             By default, fastmatype=0. Integers 0 - 8 are accepted
|             (check down the mappings) or the string containing the math type can
|             also be used.
|         slowmatype: Moving average type for the slower moving average.
|             By default, slowmatype=0. Integers 0 - 8 are accepted
|             (check down the mappings) or the string containing the math type can
|             also be used.
|         signalmatype: Moving average type for the signal moving average.
|             By default, signalmatype=0. Integers 0 - 8 are accepted
|             (check down the mappings) or the string containing the math type can
|             also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),

```

```

|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
| get_mama(self, symbol, interval='daily', series_type='close', fastlimit=None,
slowlimit=None)
|
| Return MESA adaptative moving average time series in two json
| objects as data and meta_data. It raises ValueError when problems arise
|
| Keyword Arguments:
|     symbol: the symbol for the equity we want to get its data
|     interval: time interval between two conscutive values,
|               supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|               'weekly', 'monthly' (default 'daily')
|     series_type: The desired price type in the time series. Four types
|                 are supported: 'close', 'open', 'high', 'low' (default 'close')
|     fastlimit: Positive floats for the fast limit are accepted
|               (default=None)
|     slowlimit: Positive floats for the slow limit are accepted
|               (default=None)
|
| get_mfi(self, symbol, interval='daily', time_period=20, series_type='close')
|
| Return the money flow index values in two json
| objects as data and meta_data. It raises ValueError when problems arise
|
| Keyword Arguments:
|     symbol: the symbol for the equity we want to get its data
|     interval: time interval between two conscutive values,
|               supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|               'weekly', 'monthly' (default 'daily')
|     time_period: How many data points to average (default 20)
|     series_type: The desired price type in the time series. Four types
|                 are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_midpoint(self, symbol, interval='daily', time_period=20, series_type='close')
|
| Return the midpoint values in two json objects as
| data and meta_data. It raises ValueError when problems arise
|
| Keyword Arguments:
|     symbol: the symbol for the equity we want to get its data
|     interval: time interval between two conscutive values,

```

```

|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|         are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_midprice(self, symbol, interval='daily', time_period=20)
|     Return the midprice values in two json objects as
|     data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_minus_di(self, symbol, interval='daily', time_period=20)
|     Return the minus directional indicator values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_minus_dm(self, symbol, interval='daily', time_period=20)
|     Return the minus directional movement values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|
| get_mom(self, symbol, interval='daily', time_period=20, series_type='close')

```

```

|     Return the momentum values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|                   are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_natr(self, symbol, interval='daily', time_period=20)
|     Return the normalized average true range values in two json objects
|     as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_obv(self, symbol, interval='daily')
|     Return the on balance volume values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|                   supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                   'weekly', 'monthly' (default 'daily')
|
| get_plus_di(self, symbol, interval='daily', time_period=20)
|     Return the plus directional indicator values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,

```

```

|         supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|         'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_plus_dm(self, symbol, interval='daily', time_period=20)
|     Return the plus directional movement values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|
| get_ppo(self, symbol, interval='daily', series_type='close', fastperiod=None,
slowperiod=None, matype=None)
|     Return the percentage price oscillator values in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|         fastperiod: Positive integers are accepted (default=None)
|         slowperiod: Positive integers are accepted (default=None)
|         matype : Moving average type. By default, fastmatype=0.
|             Integers 0 - 8 are accepted (check down the mappings) or the string
|             containing the math type can also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),
|         * 6 = T3 Moving Average,

```

```

|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
| get_roc(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the rate of change values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_rocr(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the rate of change ratio values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_rsi(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the relative strength index time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types

```

```

|         are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_sar(self, symbol, interval='daily', acceleration=None, maximum=None)
|     Return the midprice values in two json objects as
|     data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         acceleration: The acceleration factor. Positive floats are accepted (
|             default 0.01)
|         maximum: The acceleration factor maximum value. Positive floats
|             are accepted (default 0.20 )
|
| get_sma(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return simple moving average time series in two json objects as data and
|     meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_stoch(self, symbol, interval='daily', fastkperiod=None, slowkperiod=None,
slowdperiod=None, slowkmatype=None, slowdmatype=None)
|     Return the stochastic oscillator values in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')

```



```

|         fastkperiod: The time period of the fastk moving average. Positive
|             integers are accepted (default=None)
|         slowkperiod: The time period of the slowk moving average. Positive
|             integers are accepted (default=None)
|         slowdperiod: The time period of the slowd moving average. Positive
|             integers are accepted (default=None)
|         slowkmatype: Moving average type for the slowk moving average.
|             By default, fastmatype=0. Integers 0 - 8 are accepted
|             (check down the mappings) or the string containing the math type can
|             also be used.
|         slowdmatype: Moving average type for the slowd moving average.
|             By default, slowmatype=0. Integers 0 - 8 are accepted
|             (check down the mappings) or the string containing the math type can
|             also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),
|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
|     get_stochf(self, symbol, interval='daily', fastkperiod=None, fastdperiod=None,
fastdmatype=None)
|
|     Return the stochastic oscillator values in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         fastkperiod: The time period of the fastk moving average. Positive
|             integers are accepted (default=None)
|         fastdperiod: The time period of the fastd moving average. Positive
|             integers are accepted (default=None)
|         fastdmatype: Moving average type for the fastdmatype moving average.
|             By default, fastmatype=0. Integers 0 - 8 are accepted

```

```

|         (check down the mappings) or the string containing the math type can
|         also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),
|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
|     get_stochrsi(self, symbol, interval='daily', time_period=20, series_type='close',
fastkperiod=None, fastdperiod=None, fastdmatype=None)
|
|     Return the stochastic relative strength index in two
|     json objects as data and meta_data. It raises ValueError when problems
|     arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|                 supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|                 'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|                     are supported: 'close', 'open', 'high', 'low' (default 'close')
|         fastkperiod: The time period of the fastk moving average. Positive
|                     integers are accepted (default=None)
|         fastdperiod: The time period of the fastd moving average. Positive
|                     integers are accepted (default=None)
|         fastdmatype: Moving average type for the fastdmatype moving average.
|                     By default, fastmatype=0. Integers 0 - 8 are accepted
|                     (check down the mappings) or the string containing the math type can
|                     also be used.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),

```

```

|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
| get_t3(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return triple exponential moving average time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_tema(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return triple exponential moving average time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_trange(self, symbol, interval='daily')
|     Return the true range values in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two conscutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|

```

```

| get_trima(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return triangular moving average time series in two json
|     objects as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_trix(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return the 1-day rate of change of a triple smooth exponential
|     moving average in two json objects as data and meta_data.
|     It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| get_ultosc(self, symbol, interval='daily', timeperiod1=None, timeperiod2=None,
timeperiod3=None)
|     Return the ultimate oscillator values in two json objects as
|     data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         timeperiod1: The first time period indicator. Positive integers are
|             accepted. By default, timeperiod1=7
|         timeperiod2: The second time period indicator. Positive integers are

```

```

|         accepted. By default, timeperiod2=14
|         timeperiod3: The first time period indicator. Positive integers are
|         accepted. By default, timeperiod3=28
|
| get_vwap(self, symbol, interval='5min')
|     Returns the volume weighted average price (VWAP) for intraday time series.
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min'
|             (default 5min)
|
| get_willr(self, symbol, interval='daily', time_period=20)
|     Return the Williams' %R (WILLR) values in two json objects as data
|     and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|
| get_wma(self, symbol, interval='daily', time_period=20, series_type='close')
|     Return weighted moving average time series in two json objects
|     as data and meta_data. It raises ValueError when problems arise
|
|     Keyword Arguments:
|         symbol: the symbol for the equity we want to get its data
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min',
'daily',
|             'weekly', 'monthly' (default 'daily')
|         time_period: How many data points to average (default 20)
|         series_type: The desired price type in the time series. Four types
|             are supported: 'close', 'open', 'high', 'low' (default 'close')
|
| -----
| Methods inherited from alpha_vantage.alphavantage.AlphaVantage:
|
| map_to_matype(self, matype)

```

Convert to the alpha vantage math type integer. It returns an integer correspondent to the type of math to apply to a function. It raises ValueError if an integer greater than the supported math types is given.

Keyword Arguments:

matype: The math type of the alpha vantage api. It accepts integers or a string representing the math type.

- * 0 = Simple Moving Average (SMA),
- * 1 = Exponential Moving Average (EMA),
- * 2 = Weighted Moving Average (WMA),
- * 3 = Double Exponential Moving Average (DEMA),
- * 4 = Triple Exponential Moving Average (TEMA),
- * 5 = Triangular Moving Average (TRIMA),
- * 6 = T3 Moving Average,
- * 7 = Kaufman Adaptive Moving Average (KAMA),
- * 8 = MESA Adaptive Moving Average (MAMA)

set_proxy(self, proxy=None)

Set a new proxy configuration

Keyword Arguments:

proxy: Dictionary mapping protocol or protocol and hostname to the URL of the proxy.

Data descriptors inherited from `alpha_vantage.alphavantage.AlphaVantage`:

`__dict__`

dictionary for instance variables (if defined)

`__weakref__`

list of weak references to the object (if defined)

sma50 - 50 day moving average

- 50 and 200 days are typically used

```
pretty('indicator.get_sma()')  
help(indicator.get_sma)
```

`indicator.get_sma()`

Help on method get_sma in module alpha_vantage.techindicators:

get_sma(symbol, interval='daily', time_period=20, series_type='close') method of alpha_vantage.techindicators.TechIndicators instance

Return simple moving average time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

interval: time interval between two consecutive values,

supported values are '1min', '5min', '15min', '30min', '60min', 'daily', 'weekly', 'monthly' (default 'daily')

time_period: How many data points to average (default 20)

series_type: The desired price type in the time series. Four types are supported: 'close', 'open', 'high', 'low' (default 'close')

```
sma50 = indicator.get_sma('MSFT', interval = 'daily', time_period = 50)[0]
```

```
pretty('sma50 meta information')
indicator.get_sma('MSFT', interval = 'daily', time_period = 50)[1]
```

sma50 meta information

```
{'1: Symbol': 'MSFT',
 '2: Indicator': 'Simple Moving Average (SMA)',
 '3: Last Refreshed': '2023-02-03',
 '4: Interval': 'daily',
 '5: Time Period': 50,
 '6: Series Type': 'close',
 '7: Time Zone': 'US/Eastern'}
```

```
head_tail_horz(sma50, 5, '50 Day SMA for MSFT')
```

50 Day SMA for MSFT

head(5)		tail(5)	
SMA		SMA	
date		date	
2000-01-11	31.34	2023-01-30	242.01
2000-01-12	31.43	2023-01-31	242.13
2000-01-13	31.52	2023-02-01	242.35
2000-01-14	31.65	2023-02-02	242.82
2000-01-18	31.80	2023-02-03	243.14

50-day slow moving average overview

```
timeseries_overview(sma50, 'SMA')
```

DataFrame Overview | Primary Metric: SMA

	measurement
total records	5,804
start date	01/11/2000
end date	02/03/2023
total columns	1
column labels	SMA
total missing values	0
SMA average	62
SMA std	77
SMA min	13
SMA 25%	19
SMA 50%	23
SMA 75%	61
SMA max	330

Microsoft closing data for same period

```
msft = ts.get_daily('MSFT', outputsize = 'full')[0]
```

```
msft_close = msft['4. close']
msft_close = pd.DataFrame(msft_close)
msft_close.columns = ['close']
```

```
timeseries_overview(msft_close, 'close')
```

DataFrame Overview | Primary Metric: close

	measurement
total records	5,853
start date	11/01/1999
end date	02/03/2023
total columns	1
column labels	close

measurement	
total missing values	0
close average	74
close std	75
close min	15
close 25%	27
close 50%	43
close 75%	78
close max	343

Dataframes combined (removing days with NaN values)

```
msft_close['sma50'] = sma50
```

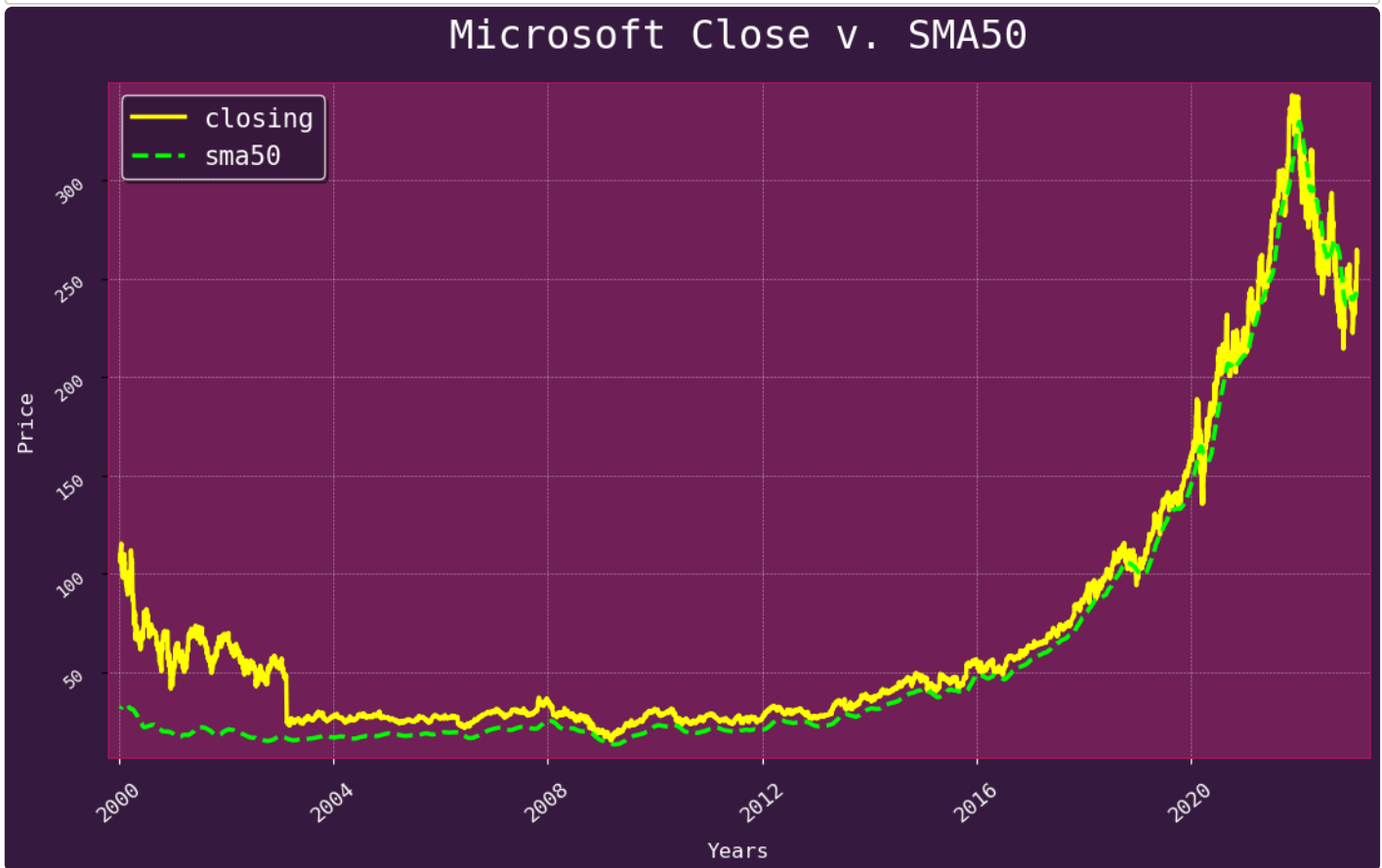
```
msft = msft_close.loc['2000-01-11':]
```

```
df_overview(msft, title = 'Microsoft & SMA50', fontsize = '16px')
```

Microsoft & SMA50 Columns			Microsoft & SMA50 Key Points	
	close	sma50		
datatype	float64	float64	total rows	5,804
missing values	0	0	total columns	2
count	5,804.00	5,804.00	column names	close, sma50
mean	73.81	62.04	index start	2023-02-03 00:00:00
std	74.84	76.76	index end	2000-01-11 00:00:00
min	15.15	13.18	total missing values	0
25%	27.35	19.09		
50%	42.20	22.96		
75%	74.19	60.60		
max	343.11	329.66		

Microsoft & SMA50 Head and Tail		
head(3)		
	close	sma50
date		
2023-02-03	258.35	243.14
2023-02-02	264.60	242.82
2023-02-01	252.75	242.35
tail(3)		
	close	sma50
date		
2000-01-13	107.81	31.52
2000-01-12	105.81	31.43
2000-01-11	109.37	31.34

```
plot_lines([(msft.close, 'closing', 'yellow'),
            (msft.sma50, 'sma50', 'lime')],
           title = 'Microsoft Close v. SMA50',
           xlabel = 'Years',
           ylabel = 'Price')
```



Bollinger Bands

- Middle Band is the same as the SMA50
- Lower is minus 2 std from the SMA
- Upper is plus 2 std from the SMA

```
pretty('indicator.get_bbands()')
help(indicator.get_bbands)
```

indicator.get_bbands()

Help on method get_bbands in module alpha_vantage.techindicators:

get_bbands(symbol, interval='daily', time_period=20, series_type='close', nbdevup=None, nbdevdn=None, matype=None) method of alpha_vantage.techindicators.TechIndicators instance

Return the bollinger bands values in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data

interval: time interval between two consecutive values,
supported values are '1min', '5min', '15min', '30min', '60min', 'daily', 'weekly', 'monthly' (default 'daily')

time_period: Number of data points used to calculate each BBANDS value.
Positive integers are accepted (e.g., time_period=60, time_period=200) (default=20)

series_type: The desired price type in the time series. Four types are supported: 'close', 'open', 'high', 'low' (default 'close')

nbdevup: The standard deviation multiplier of the upper band. Positive integers are accepted as default (default=2)

nbdevdn: The standard deviation multiplier of the lower band. Positive integers are accepted as default (default=2)

matype : Moving average type. By default, matype=0.
Integers 0 - 8 are accepted (check down the mappings) or the string containing the math type can also be used.

- * 0 = Simple Moving Average (SMA),
- * 1 = Exponential Moving Average (EMA),
- * 2 = Weighted Moving Average (WMA),
- * 3 = Double Exponential Moving Average (DEMA),
- * 4 = Triple Exponential Moving Average (TEMA),
- * 5 = Triangular Moving Average (TRIMA),
- * 6 = T3 Moving Average,
- * 7 = Kaufman Adaptive Moving Average (KAMA),
- * 8 = MESA Adaptive Moving Average (MAMA)

```
bollinger = indicator.get_bbands('MSFT', interval = 'daily', time_period = 50)[0]
```

```
pretty('bollinger meta information')
indicator.get_bbands('MSFT', interval = 'daily', time_period = 50)[1]
```

bollinger meta information

```
{'1: Symbol': 'MSFT',
 '2: Indicator': 'Bollinger Bands (BBANDS)',
 '3: Last Refreshed': '2023-02-03',
 '4: Interval': 'daily',
 '5: Time Period': 50,
 '6.1: Deviation multiplier for upper band': 2,
 '6.2: Deviation multiplier for lower band': 2,
```

```
'6.3: MA Type': 0,
'7: Series Type': 'close',
'8: Time Zone': 'US/Eastern Time'}
```

```
head_tail_horz(bollinger, 5, "Bollinger Bands")
```

Bollinger Bands

head(5)			
	Real Upper Band	Real Middle Band	Real Lower Band
date			
2023-02-03	260.65	243.14	225.64
2023-02-02	259.78	242.82	225.86
2023-02-01	258.13	242.35	226.57
2023-01-31	257.62	242.13	226.63
2023-01-30	257.42	242.01	226.59

tail(5)			
	Real Upper Band	Real Middle Band	Real Lower Band
date			
2000-01-18	39.26	31.80	24.33
2000-01-14	39.06	31.65	24.24
2000-01-13	38.90	31.52	24.14
2000-01-12	38.81	31.43	24.04
2000-01-11	38.74	31.34	23.94

combining with Microsoft close and SMA50

```
msft_full = msft.merge(bollinger,
                        how = 'left',
                        left_on = 'date',
                        right_on = 'date').drop(columns = ['Real Middle Band'])
msft_full.columns = ['close', 'sma50', 'upper_bband', 'lower_bband']
```

```
head_tail_vert(msft_full, 3, 'Microsoft Data with Upper & Lower Bollinger Bands')
```

Microsoft Data with Upper & Lower Bollinger Bands: head(3)

	close	sma50	upper_bband	lower_bband
date				
2023-02-03	258.35	243.14	260.65	225.64
2023-02-02	264.60	242.82	259.78	225.86
2023-02-01	252.75	242.35	258.13	226.57

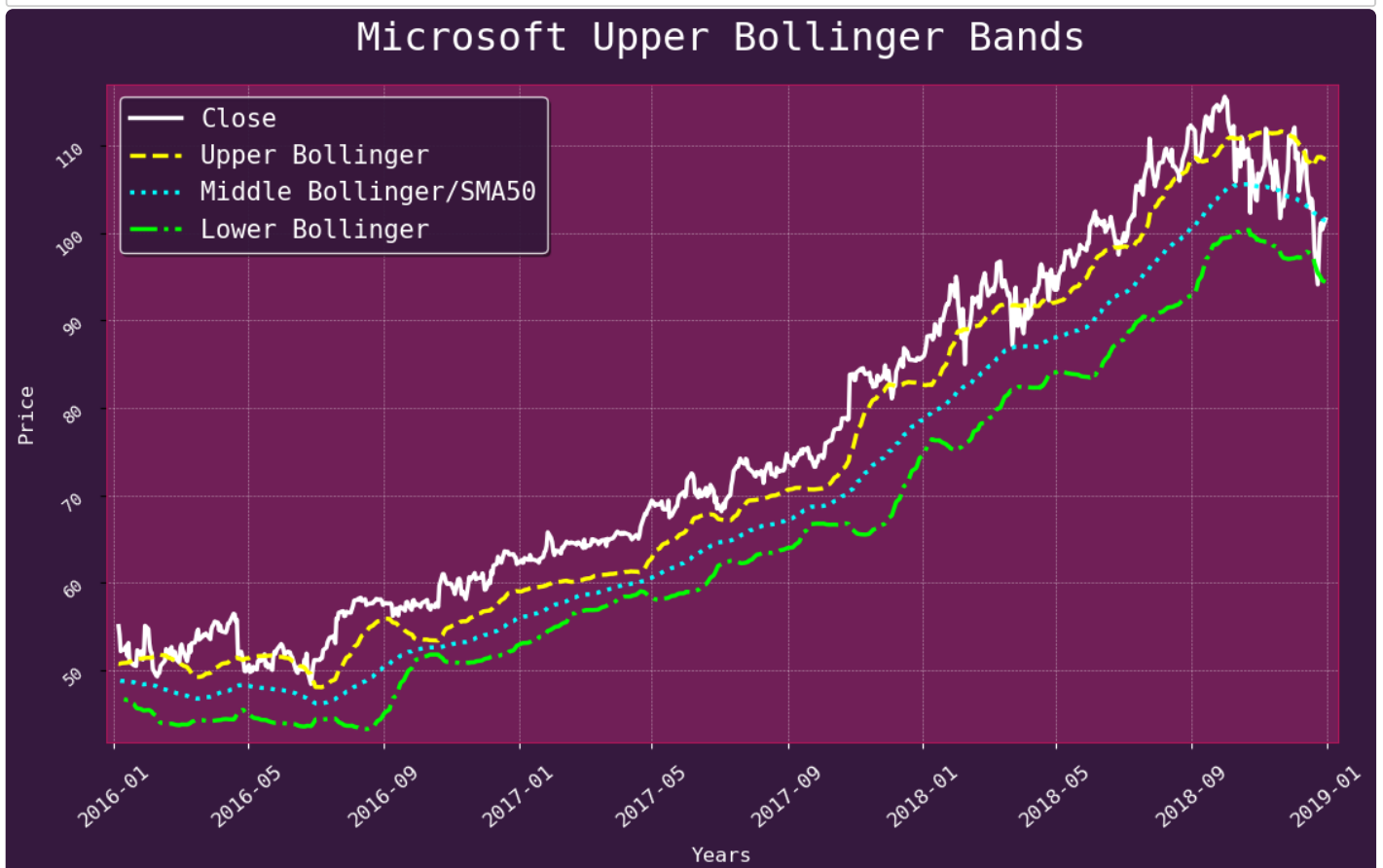
Microsoft Data with Upper & Lower Bollinger Bands: tail(3)

	close	sma50	upper_bband	lower_bband
date				
2000-01-13	107.81	31.52	38.90	24.14
2000-01-12	105.81	31.43	38.81	24.04
2000-01-11	109.37	31.34	38.74	23.94

Bands indicate volatility:

- if bands are close together, it indicates low volatility
- if they are farther apart, it indicates higher volatility
- if current price is above the upper band, signals selling
- if current price is below the lower band, signals buying

```
plot_lines([(msft_full.loc['2016-01-05':'2018-12-31'].close,  
            'Close', 'white'),  
            (msft_full.loc['2016-01-05':'2018-12-31'].upper_bband,  
            'Upper Bollinger', 'yellow'),  
            (msft_full.loc['2016-01-05':'2018-12-31'].sma50,  
            'Middle Bollinger/SMA50', 'cyan'),  
            (msft_full.loc['2016-01-05':'2018-12-31'].lower_bband,  
            'Lower Bollinger', 'lime')]),  
title = 'Microsoft Upper Bollinger Bands',  
xlabel = 'Years',  
ylabel = 'Price')
```



***macd* - moving average convergence divergence**

[\(from Investopedia\)](#)

Moving average convergence/divergence (MACD, or MAC-D) is a trend-following momentum indicator that shows the relationship between two exponential moving averages (EMAs) of a security's price. The MACD line is calculated by subtracting the 26-period EMA from the 12-period EMA.

The result of that calculation is the MACD line. A nine-day EMA of the MACD line is called the signal line, which is then plotted on top of the MACD line, which can function as a trigger for buy or sell signals. Traders may buy the security when the MACD line crosses above the signal line and sell—or short—the security when the MACD line crosses below the signal line. MACD indicators can be interpreted in several ways, but the more common methods are crossovers, divergences, and rapid rises/falls.

```
pretty('indicator.get_macd()')  
help(indicator.get_macd)
```

indicator.get_macd()

Help on method get_macd in module alpha_vantage.techindicators:

get_macd(symbol, interval='daily', series_type='close', fastperiod=None, slowperiod=None, signalperiod=None) method of alpha_vantage.techindicators.TechIndicators instance

Return the moving average convergence/divergence time series in two json objects as data and meta_data. It raises ValueError when problems arise

Keyword Arguments:

symbol: the symbol for the equity we want to get its data
interval: time interval between two consecutive values,
supported values are '1min', '5min', '15min', '30min', '60min', 'daily', 'weekly', 'monthly' (default 'daily')
series_type: The desired price type in the time series. Four types are supported: 'close', 'open', 'high', 'low' (default 'close')
fastperiod: Positive integers are accepted (default=None)
slowperiod: Positive integers are accepted (default=None)
signalperiod: Positive integers are accepted (default=None)

```
macd = indicator.get_macd('MSFT', interval = 'daily')[0]
```

```
pretty('macd meta information')  
indicator.get_macd('MSFT', interval = 'daily')[1]
```

```
{'1: Symbol': 'MSFT',
 '2: Indicator': 'Moving Average Convergence/Divergence (MACD)',
 '3: Last Refreshed': '2023-02-03',
 '4: Interval': 'daily',
 '5.1: Fast Period': 12,
 '5.2: Slow Period': 26,
 '5.3: Signal Period': 9,
 '6: Series Type': 'close',
 '7: Time Zone': 'US/Eastern'}
```

```
head_tail_horz(macd, 5, 'Moving Average Convergence Divergence')
```

Moving Average Convergence Divergence

head(5)				tail(5)			
	MACD	MACD_Signal	MACD_Hist		MACD	MACD_Signal	MACD_Hist
date				date			
2023-02-03	4.56	2.00	2.56	1999-12-23	2.24	1.52	0.71
2023-02-02	3.95	1.36	2.59	1999-12-22	2.13	1.34	0.79
2023-02-01	2.48	0.71	1.77	1999-12-21	1.97	1.15	0.82
2023-01-31	1.78	0.26	1.51	1999-12-20	1.78	0.94	0.84
2023-01-30	1.36	-0.12	1.47	1999-12-17	1.61	0.73	0.88

combining with Microsoft close and MACDs

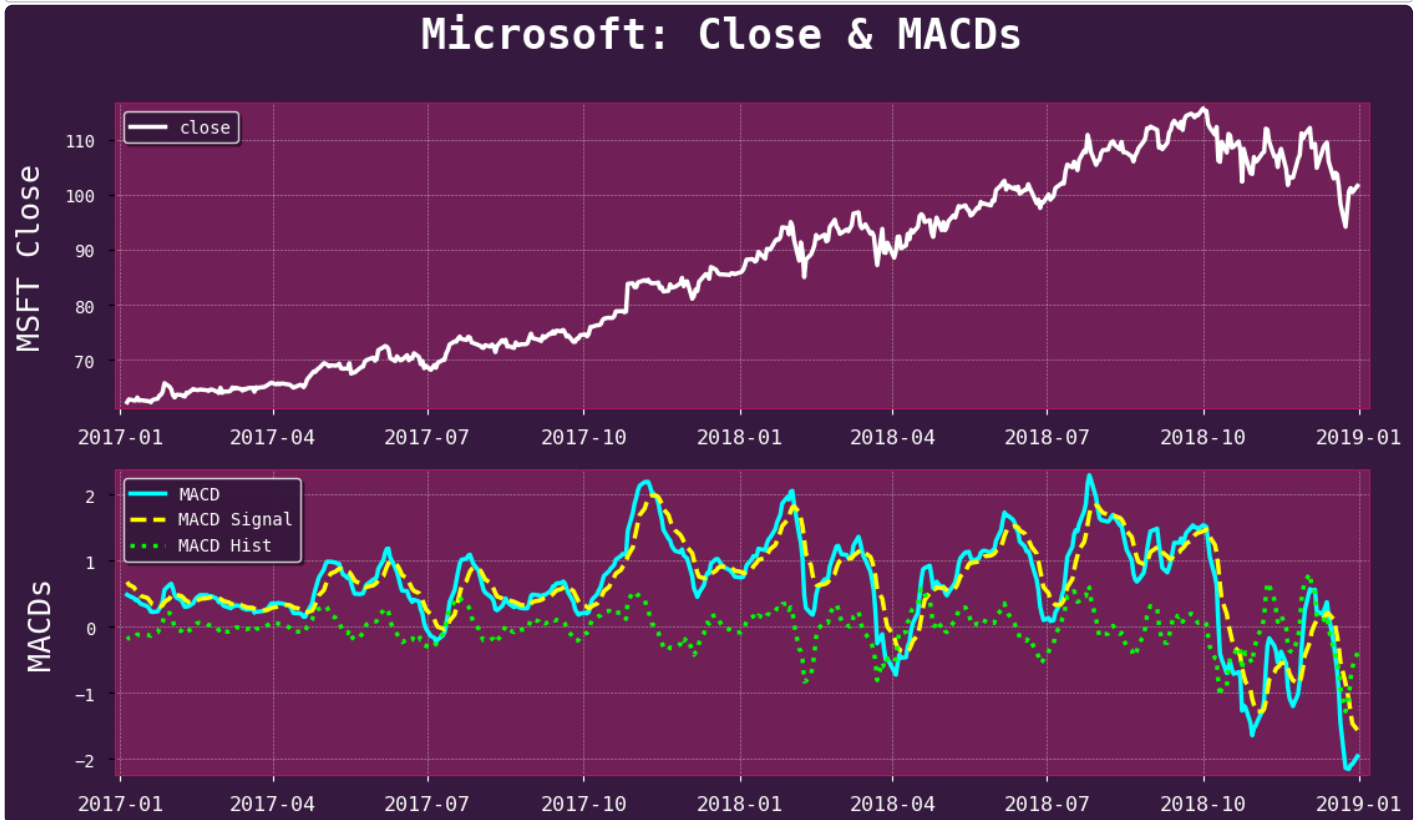
```
msft_full = msft_full.merge(macd,
                             how = 'left',
                             left_on = 'date',
                             right_on = 'date')
```

```
plt.style.use('pinks.mplstyle')
fig, axs = plt.subplots(2)
fig.suptitle('Vertically stacked subplots')
axs[0].plot(msft_full.loc['2017-01-05':'2018-12-31'].close,
            label = 'close', color = 'white');
axs[0].set_ylabel('MSFT Close')
axs[0].legend(loc = 2, fontsize = 10);
axs[1].plot(msft_full.loc['2017-01-05':'2018-12-31'].MACD,
            label = 'MACD', color = 'cyan');
axs[1].plot(msft_full.loc['2017-01-05':'2018-12-31'].MACD_Signal,
            label = 'MACD Signal', color = 'yellow');
axs[1].plot(msft_full.loc['2017-01-05':'2018-12-31'].MACD_Hist,
            label = 'MACD Hist', color = 'lime');
axs[1].legend(loc = 2, fontsize = 10);
```

```

axs[1].set_ylabel('MACDs');
plt.suptitle('Microsoft: Close & MACDs');

```



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Currencies / Foreign Exchanges

```

from alpha_vantage.foreignexchange import ForeignExchange

```

```

foreign = ForeignExchange(key = api_key, output_format = 'pandas')

```

```

pretty('ForeignExchange()')
help(foreign)

```

ForeignExchange()

Help on ForeignExchange in module alpha_vantage.foreignexchange object:

```

class ForeignExchange(alpha_vantage.alphavantage.AlphaVantage)
|   ForeignExchange(*args, **kwargs)
|
|   Realtime currency exchange rates for physical and digital currencies.
|
|   Method resolution order:

```



```

|     ForeignExchange
|     alpha_vantage.alphavantage.AlphaVantage
|     builtins.object
|
| Methods defined here:
|
| __init__(self, *args, **kwargs)
|     Inherit AlphaVantage base class with its default arguments
|
| get_currency_exchange_daily(self, from_symbol, to_symbol, outputsize='compact')
|     Returns the daily exchange rate for any pair of physical
|     currency (e.g., EUR) or physical currency (e.g., USD).
|
| Keyword Arguments:
|     from_symbol: The currency you would like to get the exchange rate
|     for.
|     For example: from_symbol=EUR or from_symbol=USD.
|     to_symbol: The destination currency for the exchange rate.
|     For example: to_symbol=USD or to_symbol=JPY.
|     outputsize: The size of the call, supported values are
|     'compact' and 'full'; the first returns the last 100 points in the
|     data series, and 'full' returns the full-length daily times
|     series, commonly above 1MB (default 'compact')
|
| get_currency_exchange_intraday(self, from_symbol, to_symbol, interval='15min',
| outputsize='compact')
|     Returns the intraday exchange rate for any pair of physical
|     currency (e.g., EUR) or physical currency (e.g., USD).
|
| Keyword Arguments:
|     from_symbol: The currency you would like to get the exchange rate
|     for.
|     For example: from_currency=EUR or from_currency=USD.
|     to_symbol: The destination currency for the exchange rate.
|     For example: to_currency=USD or to_currency=JPY.
|     interval: time interval between two conscutive values,
|     supported values are '1min', '5min', '15min', '30min', '60min'
|     (default '15min')
|     outputsize: The size of the call, supported values are
|     'compact' and 'full'; the first returns the last 100 points in the
|     data series, and 'full' returns the full-length intraday times
|     series, commonly above 1MB (default 'compact')
|

```

```

| get_currency_exchange_monthly(self, from_symbol, to_symbol, outputsize='compact')
|     Returns the monthly exchange rate for any pair of physical
|     currency (e.g., EUR) or physical currency (e.g., USD).
|
|     Keyword Arguments:
|         from_symbol: The currency you would like to get the exchange rate
|             for.
|             For example: from_symbol=EUR or from_symbol=USD.
|         to_symbol: The destination currency for the exchange rate.
|             For example: to_symbol=USD or to_symbol=JPY.
|         interval: time interval between two consecutive values,
|             supported values are '1min', '5min', '15min', '30min', '60min'
|             (default '15min')
|         outputsize: The size of the call, supported values are
|             'compact' and 'full'; the first returns the last 100 points in the
|             data series, and 'full' returns the full-length monthly times
|             series, commonly above 1MB (default 'compact')
|
| get_currency_exchange_rate(self, from_currency, to_currency)
|     Returns the realtime exchange rate for any pair of physical
|     currency (e.g., EUR) or physical currency (e.g., USD).
|
|     Keyword Arguments:
|         from_currency: The currency you would like to get the exchange rate
|             for. It can either be a physical currency or digital/crypto currency.
|             For example: from_currency=USD or from_currency=BTC.
|         to_currency: The destination currency for the exchange rate.
|             It can either be a physical currency or digital/crypto currency.
|             For example: to_currency=USD or to_currency=BTC.
|
| get_currency_exchange_weekly(self, from_symbol, to_symbol, outputsize='compact')
|     Returns the weekly exchange rate for any pair of physical
|     currency (e.g., EUR) or physical currency (e.g., USD).
|
|     Keyword Arguments:
|         from_symbol: The currency you would like to get the exchange rate
|             for.
|             For example: from_symbol=EUR or from_symbol=USD.
|         to_symbol: The destination currency for the exchange rate.
|             For example: to_symbol=USD or to_symbol=JPY.
|         outputsize: The size of the call, supported values are
|             'compact' and 'full'; the first returns the last 100 points in the
|             data series, and 'full' returns the full-length weekly times

```

```

|         series, commonly above 1MB (default 'compact')
|
| -----
| Methods inherited from alpha_vantage.alphavantage.AlphaVantage:
|
| map_to_matype(self, matype)
|     Convert to the alpha vantage math type integer. It returns an
|     integer correspondent to the type of math to apply to a function. It
|     raises ValueError if an integer greater than the supported math types
|     is given.
|
|     Keyword Arguments:
|         matype: The math type of the alpha vantage api. It accepts
|         integers or a string representing the math type.
|
|         * 0 = Simple Moving Average (SMA),
|         * 1 = Exponential Moving Average (EMA),
|         * 2 = Weighted Moving Average (WMA),
|         * 3 = Double Exponential Moving Average (DEMA),
|         * 4 = Triple Exponential Moving Average (TEMA),
|         * 5 = Triangular Moving Average (TRIMA),
|         * 6 = T3 Moving Average,
|         * 7 = Kaufman Adaptive Moving Average (KAMA),
|         * 8 = MESA Adaptive Moving Average (MAMA)
|
| set_proxy(self, proxy=None)
|     Set a new proxy configuration
|
|     Keyword Arguments:
|         proxy: Dictionary mapping protocol or protocol and hostname to
|         the URL of the proxy.
|
| -----
| Data descriptors inherited from alpha_vantage.alphavantage.AlphaVantage:
|
| __dict__
|     dictionary for instance variables (if defined)
|
| __weakref__
|     list of weak references to the object (if defined)

```

Euro to USD

```
eur_usd = foreign.get_currency_exchange_daily('USD', 'EUR', outputsize = 'full')[0]
```

```
pretty('foreign.get_currency_exchange_daily()')  
help(foreign.get_currency_exchange_daily)
```

foreign.get_currency_exchange_daily()

Help on method get_currency_exchange_daily in module alpha_vantage.foreignexchange:

get_currency_exchange_daily(from_symbol, to_symbol, outputsize='compact') method of alpha_vantage.foreignexchange.ForeignExchange instance

Returns the daily exchange rate for any pair of physical currency (e.g., EUR) or physical currency (e.g., USD).

Keyword Arguments:

from_symbol: The currency you would like to get the exchange rate for.

For example: from_symbol=EUR or from_symbol=USD.

to_symbol: The destination currency for the exchange rate.

For example: to_symbol=USD or to_symbol=JPY.

outputsize: The size of the call, supported values are 'compact' and 'full'; the first returns the last 100 points in the data series, and 'full' returns the full-length daily times series, commonly above 1MB (default 'compact')

```
pretty('usd_eur meta information')  
foreign.get_currency_exchange_daily('USD', 'EUR', outputsize = 'full')[1]
```

usd_eur meta information

```
{'1. Information': 'Forex Daily Prices (open, high, low, close)',  
'2. From Symbol': 'USD',  
'3. To Symbol': 'EUR',  
'4. Output Size': 'Full size',  
'5. Last Refreshed': '2023-02-03 21:55:00',  
'6. Time Zone': 'UTC'}
```

```
head_tail_horz(eur_usd, 3, 'Euro to USD')
```

Euro to USD

head(3)					tail(3)				
	1. open	2. high	3. low	4. close		1. open	2. high	3. low	4. close
date					date				
2023-02-03	0.92	0.93	0.91	0.93	2014-11-26	0.80	0.80	0.80	0.80
2023-02-02	0.91	0.92	0.91	0.92	2014-11-25	0.80	0.81	0.80	0.80
2023-02-01	0.92	0.92	0.91	0.91	2014-11-24	0.81	0.81	0.80	0.80

USD to Euro

```
usd_eur = foreign.get_currency_exchange_intraday('USD', 'EUR', outputsize = 'full')[0]
```

```
pretty('foreign.get_currency_exchange_intraday()')
help(foreign.get_currency_exchange_intraday)
```

```
foreign.get_currency_exchange_intraday()
```

Help on method `get_currency_exchange_intraday` in module `alpha_vantage.foreignexchange`:

`get_currency_exchange_intraday(from_symbol, to_symbol, interval='15min', outputsize='compact')` method of `alpha_vantage.foreignexchange.ForeignExchange` instance
Returns the intraday exchange rate for any pair of physical currency (e.g., EUR) or physical currency (e.g., USD).

Keyword Arguments:

`from_symbol`: The currency you would like to get the exchange rate for.

For example: `from_currency=EUR` or `from_currency=USD`.

`to_symbol`: The destination currency for the exchange rate.

For example: `to_currency=USD` or `to_currency=JPY`.

`interval`: time interval between two consecutive values, supported values are '1min', '5min', '15min', '30min', '60min' (default '15min')

`outputsize`: The size of the call, supported values are 'compact' and 'full'; the first returns the last 100 points in the data series, and 'full' returns the full-length intraday times series, commonly above 1MB (default 'compact')

```
pretty('foreign.usd_eur meta information')
foreign.get_currency_exchange_intraday('USD', 'EUR', outputsize = 'full')[1]
```

```
foreign.usd_eur meta information
```

```
{'1. Information': 'FX Intraday (15min) Time Series',
'2. From Symbol': 'USD',
'3. To Symbol': 'EUR',
'4. Last Refreshed': '2023-02-03 21:45:00',
'5. Interval': '15min',
'6. Output Size': 'Full size',
'7. Time Zone': 'UTC'}
```

```
head_tail_horz(usd_eur, 3, 'USD to EUR')
```

USD to EUR									
head(3)					tail(3)				
	1. open	2. high	3. low	4. close		1. open	2. high	3. low	4. close
date					date				
2023-02-03	0.93	0.93	0.93	0.93	2023-01-20	0.92	0.92	0.92	0.92
2023-02-03	0.93	0.93	0.93	0.93	2023-01-20	0.92	0.92	0.92	0.92
2023-02-03	0.93	0.93	0.93	0.93	2023-01-20	0.92	0.92	0.92	0.92

Euro to USD intraday, 60 min

```
see(foreign.get_currency_exchange_intraday('EUR', 'USD',
interval = '60min',
outputsize = 'full')[0].head(5),
'EUR-USD Intraday: 60 min')
```

EUR-USD Intraday: 60 min				
	1. open	2. high	3. low	4. close
date				
2023-02-03	1.08	1.08	1.08	1.08
2023-02-03	1.08	1.08	1.08	1.08
2023-02-03	1.08	1.08	1.08	1.08
2023-02-03	1.08	1.08	1.08	1.08
2023-02-03	1.09	1.09	1.08	1.08

USD to Euro intraday, 1 min

```
see(foreign.get_currency_exchange_intraday('USD', 'EUR',
interval = '1min',
outputsize = 'full')[0].head(5),
'USD-EUR Intraday: 1 min')
```

USD-EUR Intraday: 1 min

1. open 2. high 3. low 4. close

date				
2023-02-03	0.93	0.93	0.93	0.93
2023-02-03	0.93	0.93	0.93	0.93
2023-02-03	0.93	0.93	0.93	0.93
2023-02-03	0.93	0.93	0.93	0.93
2023-02-03	0.93	0.93	0.93	0.93

CURRENCIES PLAYGROUND:

```
currencies = pd.read_csv('https://mydatabucky.s3.amazonaws.com/global_currencies.csv')[
```

```
df_overview(currencies)
```

DataFrame Columns

	country	currency_name	currency_code
datatype	object	object	object
missing values	0	0	0
count	272	272	272
unique	254	172	174
top	SWITZERLAND	Euro	EUR
freq	3	36	36

DataFrame Key Points

total rows	272
total columns	3
column names	country, currency_name, currency_code
index start	0
index end	271
total missing values	0

DataFrame Head and Tail

head(3)				tail(3)			
	country	currency_name	currency_code		country	currency_name	currency_code
0	AFGHANISTAN	Afghani	AFN	269	Palladium	Palladium	XPB
1	ÅLAND ISLANDS	Euro	EUR	270	Platinum	Platinum	XPT
2	ALBANIA	Lek	ALL	271	Silver	Silver	XAG

```
currencies[currencies.country.str.startswith('R')]
```

	country	currency_name	currency_code
193	RÉUNION	Euro	EUR
194	ROMANIA	Romanian Leu	RON
195	RUSSIAN FEDERATION (THE)	Russian Ruble	RUB
196	RWANDA	Rwanda Franc	RWF

exchange_rate(from_currency, to_currency)

```
def exchange_rate(from_currency, to_currency):
    import requests

    # replace the "demo" apikey below with your own key from https://www.alphavantage.co
    url = f'https://www.alphavantage.co/query?function=CURRENCY_EXCHANGE_RATE&from_curr'
    r = requests.get(url)
    data = r.json()

    results = pd.DataFrame(pd.Series(data['Realtime Currency Exchange Rate']))
    results = results.drop(labels = ['1. From_Currency Code', '3. To_Currency Code'],
                           axis = 0)
    results.index = ['From Currency', 'To Currency', 'Exchange Rate', 'Last Refreshed',
                    'Time Zone', 'Bid Price', 'Ask Price']
    results = results.reset_index()

    styles = [{ 'selector': '.col0',
                  'props': [('font-size', '13px'),
                             ('text-align', 'left'),
                             ('padding-right', '15px'),
                             ('font-weight', 'bold')]},
               { 'selector': '.col1',
                  'props': [('font-weight', 'medium'),
                             ('text-align', 'left'),
                             ('font-size', '13px'),
                             ('padding-right', '15px'),
                             ('padding-left', '15px')]},
               { 'selector': 'caption',
                  'props': [('font-weight', 'bold'),
                             ('font-size', '23px'),]},
               { 'selector': '.row2',
                  'props': [('font-weight', 'bold'),
                             ('background-color', 'cyan'),]}]

    display(results.style.hide(axis = 'index')\
              .hide(axis = 'columns')\
              .set_caption('Exchange Results')\
              .set_table_attributes("style='margin-left: auto;\n\nmargin-right: auto;'"))
```



```
.set_table_styles(styles).format(precision = 2,  
                                thousands = ', '))
```

```
results = exchange_rate('USD', 'EUR')
```

Exchange Results	
From Currency	United States Dollar
To Currency	Euro
Exchange Rate	0.92610000
Last Refreshed	2023-02-04 19:51:44
Time Zone	UTC
Bid Price	0.92609000
Ask Price	0.92613000

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Cryptocurrencies

- Alpha Vantage offers data on over 500 cryptocurrencies

```
from alpha_vantage.cryptocurrencies import CryptoCurrencies
```

```
crypto = CryptoCurrencies(key = api_key, output_format = 'pandas')
```

```
crypto
```

```
<alpha_vantage.cryptocurrencies.CryptoCurrencies at 0x7fb7b02d6380>
```

Bitcoin to USD

```
BTC = crypto.get_digital_currency_daily(symbol = 'BTC', market = 'USD')
```

```
pretty('BTC to USD meta data')  
BTC[1]
```

BTC to USD meta data

```
{'1. Information': 'Daily Prices and Volumes for Digital Currency',  
'2. Digital Currency Code': 'BTC',  
'3. Digital Currency Name': 'Bitcoin',  
'4. Market Code': 'USD',  
'5. Market Name': 'United States Dollar',
```

```
'6. Last Refreshed': '2023-02-04 00:00:00',  
'7. Time Zone': 'UTC'}
```

```
see(BTC[0].head(5),  
    'Most Recent Bitcoin Data')
```

Most Recent Bitcoin Data

	1a. open (USD)	1b. open (USD)	2a. high (USD)	2b. high (USD)	3a. low (USD)	3b. low (USD)	4a. close (USD)	4b. close (USD)	5. volume	6. market cap (USD)
date										
2023-02-04	23,431.90	23,431.90	23,465.15	23,465.15	23,382.01	23,382.01	23,435.65	23,435.65	11,789.15	11,789.1
2023-02-03	23,489.33	23,489.33	23,715.70	23,715.70	23,204.62	23,204.62	23,431.90	23,431.90	332,571.03	332,571.0
2023-02-02	23,731.41	23,731.41	24,255.00	24,255.00	23,363.27	23,363.27	23,488.94	23,488.94	364,177.21	364,177.2
2023-02-01	23,125.13	23,125.13	23,812.66	23,812.66	22,760.23	22,760.23	23,732.66	23,732.66	310,790.42	310,790.4
2023-01-31	22,827.38	22,827.38	23,320.00	23,320.00	22,714.77	22,714.77	23,125.13	23,125.13	264,649.35	264,649.3

Bitcoin to Euro

```
BTC = crypto.get_digital_currency_daily(symbol = 'BTC', market = 'EUR')  
pretty('BTC to EUR meta data')  
BTC[1]
```

BTC to EUR meta data

```
{'1. Information': 'Daily Prices and Volumes for Digital Currency',  
'2. Digital Currency Code': 'BTC',  
'3. Digital Currency Name': 'Bitcoin',  
'4. Market Code': 'EUR',  
'5. Market Name': 'Euro',  
'6. Last Refreshed': '2023-02-04 00:00:00',  
'7. Time Zone': 'UTC'}
```

```
see(BTC[0].head(5),  
    'Bitcoin to Euro (keeping USD market data)')
```

Bitcoin to Euro (keeping USD market data)

	1a. open (EUR)	1b. open (USD)	2a. high (EUR)	2b. high (USD)	3a. low (EUR)	3b. low (USD)	4a. close (EUR)	4b. close (USD)	5. volume	6. market cap (USD)
date										
2023-02-04	21,702.63	23,431.90	21,733.42	23,465.15	21,656.42	23,382.01	21,706.42	23,436.00	11,788.53	11,788.5

	1a. open (EUR)	1b. open (USD)	2a. high (EUR)	2b. high (USD)	3a. low (EUR)	3b. low (USD)	4a. close (EUR)	4b. close (USD)	5. volume	6. market cap (USD)
date										
2023-02-03	21,755.82	23,489.33	21,965.48	23,715.70	21,492.12	23,204.62	21,702.63	23,431.90	332,571.03	332,571.0
2023-02-02	21,980.03	23,731.41	22,464.98	24,255.00	21,639.06	23,363.27	21,755.46	23,488.94	364,177.21	364,177.2
2023-02-01	21,418.50	23,125.13	22,055.29	23,812.66	21,080.53	22,760.23	21,981.19	23,732.66	310,790.42	310,790.4
2023-01-31	21,142.72	22,827.38	21,598.98	23,320.00	21,038.42	22,714.77	21,418.50	23,125.13	264,649.35	264,649.3

Ethereum

```
pretty('ETH meta data')
crypto.get_digital_currency_daily(symbol = 'ETH', market = 'USD')[1]
```

ETH meta data

```
{'1. Information': 'Daily Prices and Volumes for Digital Currency',
 '2. Digital Currency Code': 'ETH',
 '3. Digital Currency Name': 'Ethereum',
 '4. Market Code': 'USD',
 '5. Market Name': 'United States Dollar',
 '6. Last Refreshed': '2023-02-04 00:00:00',
 '7. Time Zone': 'UTC'}
```

```
see(crypto.get_digital_currency_daily(symbol = 'ETH', market = 'USD')[0].head(5),
    'Most Current Ethereum Data')
```

Most Current Ethereum Data

	1a. open (USD)	1b. open (USD)	2a. high (USD)	2b. high (USD)	3a. low (USD)	3b. low (USD)	4a. close (USD)	4b. close (USD)	5. volume	6. market cap (USD)
date										
2023-02-04	1,663.52	1,663.52	1,665.95	1,665.95	1,658.01	1,658.01	1,663.09	1,663.09	18,334.72	18,334.72
2023-02-03	1,643.12	1,643.12	1,676.00	1,676.00	1,625.93	1,625.93	1,663.52	1,663.52	464,815.03	464,815.03
2023-02-02	1,641.67	1,641.67	1,714.68	1,714.68	1,626.85	1,626.85	1,643.12	1,643.12	629,188.89	629,188.89
2023-02-01	1,585.32	1,585.32	1,647.77	1,647.77	1,555.18	1,555.18	1,641.68	1,641.68	474,617.17	474,617.17
2023-01-31	1,566.21	1,566.21	1,605.18	1,605.18	1,561.63	1,561.63	1,585.33	1,585.33	348,856.68	348,856.68

