Chapter 2 – Reading Time Series Data

Ingesting Time Series Data

In this chapter we will use the pandas library to read different types of files that holds time series data. We will examine the different parameters available that we can leverage to ensure that our time series data is read in properly.

Technical Requirements

In this chapter we will be using pandas 1.2.3 (released March 02, 2021)

conda install pandas=1.2.3

Reading CSV and other Delimited files

CSV is probably one of the most common file formats you will encounter when working with time series data, whether searching the internet for open data, or exporting time series data from another platform. We will be using pandas.read\_csv() function and examine the different options provided to us to ensure the data read is suitable for further analysis related to time series data. We will also look into how to create a datetime index from the data that we are reading all in one step.

Getting Read

We will be reading a CSV file extracted from Box Office Mojo for Avengers: Endgame movie. Here is the URL for the online version of the dataset <https://www.boxofficemojo.com/release/rl3059975681/?ref_=bo_tt_gr_1>

![Graphical user interface, application

Description automatically generated]()

Notice the data format

The file is provided in the GitHub repo for this book which you can find here <URL> the files is named “boxofficemojo\_avengers\_endgame.csv”

In order read local files in pandas, it is important that we know the path to these files, in other words where are they stored in your local machine.

How to do it…

1. Check our current working directory

>>> from pathlib import Path

>>> Path.cwd()

1. Create our Path object

>>> filepath = Path('datasets/boxofficemojo\_avengers\_endgame.csv')

1. Read our CSV file using pandas.read\_csv()

>>> ts = pd.read\_csv(filepath\_or\_buffer=filepath, sep=',', header=0, parse\_dates=[0], index\_col=0)

>>> ts.head()

The following results are returned for the first 5 rows

DOW Rank Daily %± YD %± LW Theaters Avg To Date Day Estimated

Date

2019-04-26 Friday 1 157461641 - - 4662 33775 157461641 1 False

2019-04-27 Saturday 1 109264122 -30.6% - 4662 23437 266725763 2 False

2019-04-28 Sunday 1 90389244 -17.3% - 4662 19388 357115007 3 False

2019-04-29 Monday 1 36874439 -59.2% - 4662 7909 393989446 4 False

2019-04-30 Tuesday 1 33110349 -10.2% - 4662 7102 427099795 5 False

In Jupyter a nicer display which would appear like this

Table

Description automatically generated

1. Lastly, let’s ensure that the index is actually a datetime as we would expect

>>> ts.index

This should return an output like this

DatetimeIndex(['2019-04-26', '2019-04-27', '2019-04-28', '2019-04-29',

'2019-04-30', '2019-05-01', '2019-05-02', '2019-05-03',

'2019-05-04', '2019-05-05',

...

'2019-09-03', '2019-09-04', '2019-09-05', '2019-09-06',

'2019-09-07', '2019-09-08', '2019-09-09', '2019-09-10',

'2019-09-11', '2019-09-12'],

dtype='datetime64[ns]', name='Date', length=140, freq=None)

How it works…

We were able to read the CSV file, convert the data column from a string object to a datetime object and set it as an index to the dataframe all in one step. We leveraged the built-in parse\_dates argument and specified which column we are interested in. In this case, the first column [0]. We then set that column, after being parsed to datetime, as an index.

Let’s break down the arguments we used:

* filepath\_or\_buffer: here we specify our file path. This can also be a URL.
* sep: takes a string to specify the delimiter to use, and the default is “,” which assumes comma separated values (csv). If the file is separated by another delimiter this can be replaced e.g. sep-“|”
  + Another alias to sep is delimiter which can be used as well as an argument
* header: in this case we specified that the first row (0) contains the header information. The default value is “infer” which usually works as is.
* parse\_dates: here we specified that the first column (0) is the column we are intersted in parsing. The argument takes a list of columns e.g. [0,3] indicating first column indexed at 0, and fourth column indexed at 3.

There’s more…

There are situations were parse\_dates may not be sufficient or may not produce the desired results. In most cases, were it fails, the column will be returned unchanged. This where we the date\_parser comes in handy.

We can still use this method on the same dataset, even though it is not needed, it is a good way to demonstrated how it works.

>>> from datetime import datetime

>>> date\_parser = lambda x: datetime.strptime(x, "%b %d, %Y")

>>> ts = pd.read\_csv(filepath\_or\_bufferfilepath, sep=',', header=0, index\_col=0, parse\_dates=[0], date\_parser=date\_parser)

Let’s break it down:

1. Since the date is coming as text in the format “Apr 26, 2019”, we will need to use the date\_parser argument in pandas.read\_csv to convert the sequence of string columns to an array of datetime instances. The date\_parser argument, which is an optional argument, takes a function that will be applied on the specified date column.
2. Using datetime.strptime to create a datetime object from a string. Here we create a lambda function that we can later pass to date\_parser argument in the pandas.read\_csv. For convenience, we saved this function under a variable named date\_parser lambda x: datetime.strptime(x, "%b %d, %Y"). For strptime we provide two arguments, the string date that we want to transform, and the format code.
   1. %b for the abbreviated month name e.g. Apr, May, Jun
   2. %d for the day of the month e.g. 01, 02, ..26, 28
   3. %Y for 4-digit year e.g. 2019, 2020, 2021 ..etc
3. We used the parse\_dates argument and provided a list of columns that we want to parse. In our case, it is just the first column [0]. This is used by date\_parser as a reference to identify which columns we are applying the date\_parser on.
4. Lastly, the index\_col argument let’s panda know which column we want to move as an index. In this case, after the ‘Date’ column is parsed to datetime, it becomes an index for our dataframe and removed from the columns list.

See also

According to pandas’ documentation, infer\_datetime\_format can speed the parsing by 5-10x. Here is how we can add this to our original script

>>> ts = pd.read\_csv(filepath\_or\_buffer=filepath,

sep=',',

header=0,

parse\_dates=[0],

index\_col=0,

infer\_datetime\_format=True)

Note, that given our dataset being small, the improvement in speed may be insignificant.

* For more information please refer to pandas.read\_csv documentation <https://pandas.pydata.org/docs/reference/api/pandas.read_csv.html>
* For more information on Python’s strptime and strftime format codes visit https://strftime.org

Reading data from an Excel file