week09–market-data

March 24, 2025

[1]:
```
import pandas as pd
import numpy as np

import json


def read_json(filename):
    with open(filename) as f:
        return json.load(f)

def write_json(filename,data):
    with open(filename,'w') as f:
        json.dump(data,f,indent=3)
```

[2]:
```
import os

os.chdir('/home/george/Prof-VC/classes-and-advising/2025-Sp-Math087/
 ↪course-content/')

# this `json` file contains 20 years of (fictional) market state

a = np.array(read_json('./week09--data-market-new.json'))
```

[3]:
```
a[:10]
```

[3]:
```
array(['bull', 'bull', 'bear', 'bear', 'bear', 'bear', 'bear', 'bear',
       'bear', 'bear'], dtype='<U6')
```

[4]:
```
def get_indices(a,state):
    return np.array([i for i in range(len(a)) if a[i] == state ])
```

[5]:
```
get_indices(a,'recess')
```

[5]:
```
array([  18,   19,   20,   73,  118,  135,  136,  193,  194,  199,  200,
        201,  217,  240,  241,  242,  243,  244,  245,  246,  262,  279,
        285,  286,  306,  382,  383,  389,  391,  415,  438,  439,  451,
        452,  453,  454,  463,  464,  465,  466,  467,  468,  469,  470,
        487,  496,  511,  527,  528,  529,  530,  549,  550,  551,  553,
```

```
       554,  567,  587,  589,  590,  591,  592,  628,  629,  648,  649,
       650,  651,  652,  672,  673,  674,  675,  676,  695,  696,  697,
       744,  745,  746,  757,  867,  873,  907,  908,  909,  910,  916,
       975,  984,  985, 1012, 1017, 1018])
```

[6]:
```
states = [ 'bull', 'bear', 'recess' ]

def get_next_week_probs(a,state):
    inds = get_indices(a,state)

    if (len(a)-1) in inds:
         n=len(inds)-1
    else:
         n=len(inds)
    N = len(a)

    # get the list of states for weeks following weeks of the input state
    nxt = { ns: [ i for i in inds if i+1<N and a[i+1] == ns] for ns in states }

    return { ns: len(nxt[ns])/n for ns in states }
```

[7]:
```
pbull = get_next_week_probs(a,'bull')
pbull
```

[7]:
```
{'bull': 0.806378132118451,
 'bear': 0.16400911161731208,
 'recess': 0.029612756264236904}
```

[8]:
```
sum([ pbull[i] for i in pbull.keys() ])
```

[8]:
```
0.9999999999999999
```

[9]:
```
pmat = np.array([ [get_next_week_probs(a,w)[nw] for w in states] for nw in␣
 ↪states ])
pmat
```

[9]:
```
array([[0.80637813, 0.13833992, 0.14893617],
       [0.16400911, 0.80434783, 0.29787234],
       [0.02961276, 0.05731225, 0.55319149]])
```

[ ]:
```

```