Programming Literacy Test Shuwen Wang

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```python
In [20]: import pandas as pd
         import numpy as np
         import os
         import random
         import matplotlib.pyplot as plt

In [2]: os.chdir('/Users/duanyihong/Desktop')

In [3]: data=pd.read_csv('ProgrammingLiteracyTest.csv')

In [4]: data

Out[4]:           DATE  CPIAUCSL
        0    1947-01-01    21.480
        1    1947-02-01    21.620
        2    1947-03-01    22.000
        3    1947-04-01    22.000
        4    1947-05-01    21.950
        5    1947-06-01    22.080
        6    1947-07-01    22.230
        7    1947-08-01    22.400
        8    1947-09-01    22.840
        9    1947-10-01    22.910
        10   1947-11-01    23.060
        11   1947-12-01    23.410
        12   1948-01-01    23.680
        13   1948-02-01    23.670
        14   1948-03-01    23.500
        15   1948-04-01    23.820
        16   1948-05-01    24.010
        17   1948-06-01    24.150
        18   1948-07-01    24.400
        19   1948-08-01    24.430
        20   1948-09-01    24.360
        21   1948-10-01    24.310
        22   1948-11-01    24.160
        23   1948-12-01    24.050
        24   1949-01-01    24.010
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25   1949-02-01     23.910
26   1949-03-01     23.910
27   1949-04-01     23.920
28   1949-05-01     23.910
29   1949-06-01     23.920
..          ...        ...
826  2015-11-01    238.072
827  2015-12-01    237.827
828  2016-01-01    237.990
829  2016-02-01    237.532
830  2016-03-01    238.022
831  2016-04-01    238.843
832  2016-05-01    239.439
833  2016-06-01    240.074
834  2016-07-01    240.058
835  2016-08-01    240.569
836  2016-09-01    241.017
837  2016-10-01    241.667
838  2016-11-01    242.081
839  2016-12-01    242.784
840  2017-01-01    244.028
841  2017-02-01    244.102
842  2017-03-01    243.717
843  2017-04-01    244.087
844  2017-05-01    243.911
845  2017-06-01    244.032
846  2017-07-01    244.236
847  2017-08-01    245.262
848  2017-09-01    246.392
849  2017-10-01    246.583
850  2017-11-01    247.411
851  2017-12-01    247.910
852  2018-01-01    249.245
853  2018-02-01    249.619
854  2018-03-01    249.462
855  2018-04-01    250.013

[856 rows x 2 columns]

In [15]: def Randomwalk(T,sigma,x0):
             paths=np.zeros((T+1,1),np.float64)
             paths[0]=x0
             for t in range(1,T+1):
                 rand=random.random()
                 if rand>0.5:
                     ipsilon=1
                 else:
                     ipsilon=-1
```
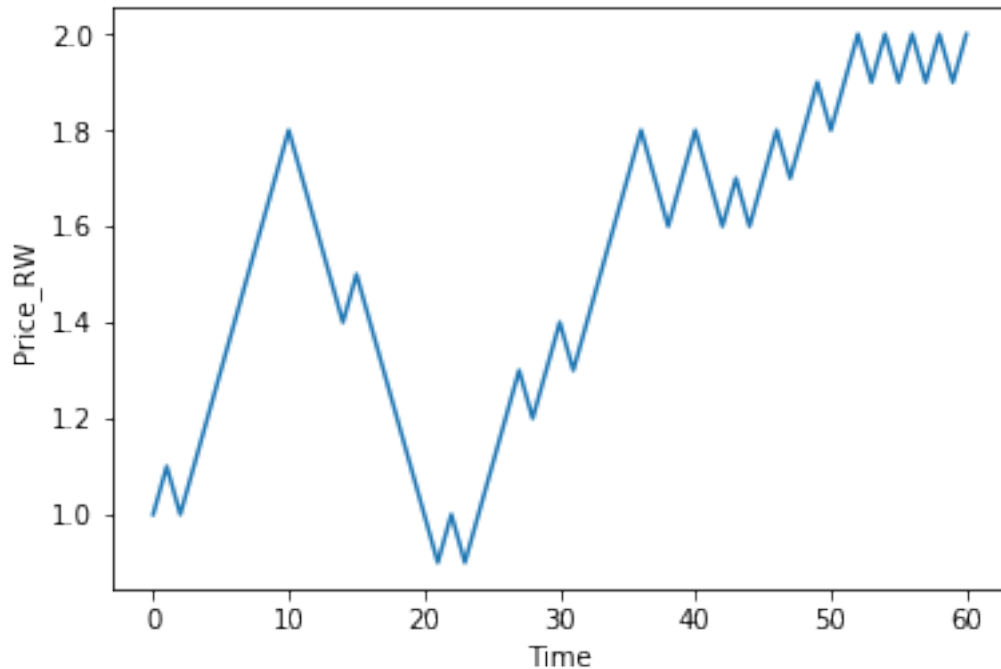
```
            paths[t]=paths[t-1]+sigma*ipsilon
        return paths

In [24]: RW=Randomwalk(60,0.1,1)
        plt.plot(RW)
        plt.xlabel('Time')
        plt.ylabel('Price_RW')
        plt.show()
```



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In [29]: data['M_inflation']=(data['CPIAUCSL']-data['CPIAUCSL'].shift(1))/data['CPIAUCSL'].shi:
        df=np.split(data,2)

In [30]: df[0]

Out[30]:          DATE  CPIAUCSL  M_inflation
        0   1947-01-01     21.48          NaN
        1   1947-02-01     21.62     0.006518
        2   1947-03-01     22.00     0.017576
        3   1947-04-01     22.00     0.000000
        4   1947-05-01     21.95    -0.002273
        5   1947-06-01     22.08     0.005923
        6   1947-07-01     22.23     0.006793
        7   1947-08-01     22.40     0.007647
        8   1947-09-01     22.84     0.019643
        9   1947-10-01     22.91     0.003065
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10   1947-11-01   23.06    0.006547
11   1947-12-01   23.41    0.015178
12   1948-01-01   23.68    0.011534
13   1948-02-01   23.67   -0.000422
14   1948-03-01   23.50   -0.007182
15   1948-04-01   23.82    0.013617
16   1948-05-01   24.01    0.007976
17   1948-06-01   24.15    0.005831
18   1948-07-01   24.40    0.010352
19   1948-08-01   24.43    0.001230
20   1948-09-01   24.36   -0.002865
21   1948-10-01   24.31   -0.002053
22   1948-11-01   24.16   -0.006170
23   1948-12-01   24.05   -0.004553
24   1949-01-01   24.01   -0.001663
25   1949-02-01   23.91   -0.004165
26   1949-03-01   23.91    0.000000
27   1949-04-01   23.92    0.000418
28   1949-05-01   23.91   -0.000418
29   1949-06-01   23.92    0.000418
..        ...      ...         ...
398  1980-03-01   80.10    0.013924
399  1980-04-01   80.90    0.009988
400  1980-05-01   81.70    0.009889
401  1980-06-01   82.50    0.009792
402  1980-07-01   82.60    0.001212
403  1980-08-01   83.20    0.007264
404  1980-09-01   83.90    0.008413
405  1980-10-01   84.70    0.009535
406  1980-11-01   85.60    0.010626
407  1980-12-01   86.40    0.009346
408  1981-01-01   87.20    0.009259
409  1981-02-01   88.00    0.009174
410  1981-03-01   88.60    0.006818
411  1981-04-01   89.10    0.005643
412  1981-05-01   89.70    0.006734
413  1981-06-01   90.50    0.008919
414  1981-07-01   91.50    0.011050
415  1981-08-01   92.20    0.007650
416  1981-09-01   93.10    0.009761
417  1981-10-01   93.40    0.003222
418  1981-11-01   93.80    0.004283
419  1981-12-01   94.10    0.003198
420  1982-01-01   94.40    0.003188
421  1982-02-01   94.70    0.003178
422  1982-03-01   94.70    0.000000
423  1982-04-01   95.00    0.003168
424  1982-05-01   95.90    0.009474
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425   1982-06-01     97.00         0.011470
426   1982-07-01     97.50         0.005155
427   1982-08-01     97.70         0.002051

[428 rows x 3 columns]
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In [31]: df[1]

Out[31]:   DATE   CPIAUCSL   M_inflation
```
428   1982-09-01    97.700       0.000000
429   1982-10-01    98.100       0.004094
430   1982-11-01    98.000      -0.001019
431   1982-12-01    97.700      -0.003061
432   1983-01-01    97.900       0.002047
433   1983-02-01    98.000       0.001021
434   1983-03-01    98.100       0.001020
435   1983-04-01    98.800       0.007136
436   1983-05-01    99.200       0.004049
437   1983-06-01    99.400       0.002016
438   1983-07-01    99.800       0.004024
439   1983-08-01   100.100       0.003006
440   1983-09-01   100.400       0.002997
441   1983-10-01   100.800       0.003984
442   1983-11-01   101.100       0.002976
443   1983-12-01   101.400       0.002967
444   1984-01-01   102.100       0.006903
445   1984-02-01   102.600       0.004897
446   1984-03-01   102.900       0.002924
447   1984-04-01   103.300       0.003887
448   1984-05-01   103.500       0.001936
449   1984-06-01   103.700       0.001932
450   1984-07-01   104.100       0.003857
451   1984-08-01   104.400       0.002882
452   1984-09-01   104.700       0.002874
453   1984-10-01   105.100       0.003820
454   1984-11-01   105.300       0.001903
455   1984-12-01   105.500       0.001899
456   1985-01-01   105.700       0.001896
457   1985-02-01   106.300       0.005676
..           ...       ...           ...
826   2015-11-01   238.072       0.001295
827   2015-12-01   237.827      -0.001029
828   2016-01-01   237.990       0.000685
829   2016-02-01   237.532      -0.001924
830   2016-03-01   238.022       0.002063
831   2016-04-01   238.843       0.003449
832   2016-05-01   239.439       0.002495
833   2016-06-01   240.074       0.002652
```

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834   2016-07-01   240.058   -0.000067
835   2016-08-01   240.569    0.002129
836   2016-09-01   241.017    0.001862
837   2016-10-01   241.667    0.002697
838   2016-11-01   242.081    0.001713
839   2016-12-01   242.784    0.002904
840   2017-01-01   244.028    0.005124
841   2017-02-01   244.102    0.000303
842   2017-03-01   243.717   -0.001577
843   2017-04-01   244.087    0.001518
844   2017-05-01   243.911   -0.000721
845   2017-06-01   244.032    0.000496
846   2017-07-01   244.236    0.000836
847   2017-08-01   245.262    0.004201
848   2017-09-01   246.392    0.004607
849   2017-10-01   246.583    0.000775
850   2017-11-01   247.411    0.003358
851   2017-12-01   247.910    0.002017
852   2018-01-01   249.245    0.005385
853   2018-02-01   249.619    0.001501
854   2018-03-01   249.462   -0.000629
855   2018-04-01   250.013    0.002209

[428 rows x 3 columns]
```

```python
In [38]: df[0].describe()
         mean1=df[0]['M_inflation'].mean()
         mean1
```

Out[38]: 0.0035620145668405837

```python
In [36]: df[1].describe()
         mean2=df[1]['M_inflation'].mean()
         mean2
```

Out[36]: 0.0022009939770092917

```python
In [42]: plt.plot(data['DATE'],data['M_inflation'])
         plt.xlabel('Time')
         plt.ylabel('M_inflation')
         plt.axhline(mean1,color='red',linestyle='--')
         plt.axhline(mean2,color='green',linestyle='--')
         plt.show()
```