

[Github](#)

我將詳細的內容以及 code 放在以上 Github

```
In [2]: class StochasticProcess():

    def __init__(self,x0=0):
        assert (type(x0)==float or type(x0)==int or x0 is None)
        self.x0 = float(x0)

    def gen_random_walk(self,n_step=100):

        w = np.ones(n_step)*self.x0

        for i in range(1,n_step):
            yi = np.random.choice([1,-1])
            w[i] = w[i-1]+(yi/np.sqrt(n_step))

        return w

    def gen_normal(self,n_step=100):
        w = np.ones(n_step)*self.x0

        for i in range(1,n_step):
            yi = np.random.normal()
            w[i] = w[i-1]+(yi/np.sqrt(n_step))

        return w
```

首先先寫一個 Class, StochasticProcess()

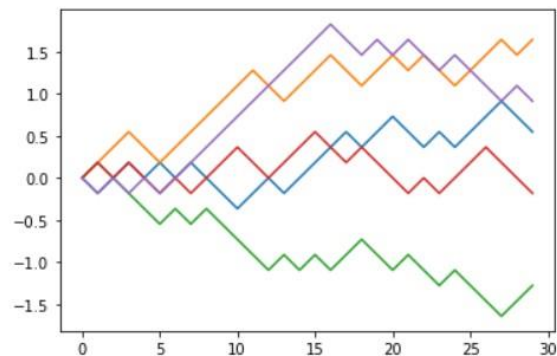
物件內容分別代表

gen_random_walk(): 產生隨機漫步

gen_normal(): 產生常態分配 wiener process

```
In [3]: sp = StochasticProcess()
```

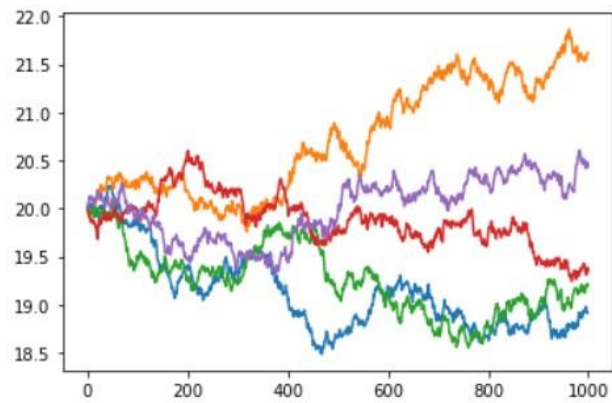
```
In [4]: for i in range(5):
        plt.plot(sp.gen_random_walk(30))
        plt.show()
```



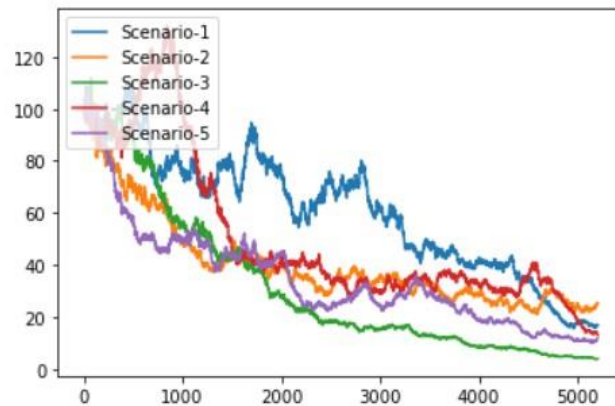
模擬 5 條 $M = 30$ 之隨機漫步

```
In [5]: sp = StochasticProcess(20)
```

```
In [7]: for i in range(5):  
        plt.plot(sp.gen_normal(1000))  
        plt.show()
```



```
In [8]: for i in range(5):  
        plt.plot(sp.stock_price(mu=0.2,  
                                sigma=0.7,  
                                dt=0.01))  
plt.legend(['Scenario-'+str(i) for i in range(1,6)],  
           loc='upper left')  
plt.hlines(y=100,xmin=0,xmax=520,  
           linestyle='--',color='k')  
plt.show()
```



$$(dw)^2 = dt$$

可以看出當給股票一點時間，股價會巨幅震盪