monte-carlo-dynamic-volatility

September 29, 2021

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from tqdm import tqdm
sns.set()
```

[2]:
```
df = pd.read_csv('../dataset/TSLA.csv')
df.head()
```

[2]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	2018-03-23	311.250000	311.250000	300.450012	301.540009	301.540009	6654900
1	2018-03-26	307.339996	307.589996	291.359985	304.179993	304.179993	8375200
2	2018-03-27	304.000000	304.269989	277.179993	279.179993	279.179993	13872000
3	2018-03-28	264.579987	268.679993	252.100006	257.779999	257.779999	21001400
4	2018-03-29	256.489990	270.959991	248.210007	266.130005	266.130005	15170700

[3]:
```
def pct_change(x,period=1):
    x = np.array(x)
    return ((x[period:] - x[:-period]) / x[:-period])
```

[4]:
```
number_simulation = 100
predict_day = 30

results = pd.DataFrame()

for i in tqdm(range(number_simulation)):
    prices = df.Close.values[-predict_day:].tolist()
    volatility = pct_change(prices[-predict_day:]).std()
    for d in range(predict_day):
```

```
        prices.append(prices[-1] * (1 + np.random.normal(0, volatility)))
        volatility = pct_change(prices[-predict_day:]).std()
    results[i] = pd.Series(prices[-predict_day:]).values
```

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100%|      | 100/100 [00:00<00:00, 689.32it/s]
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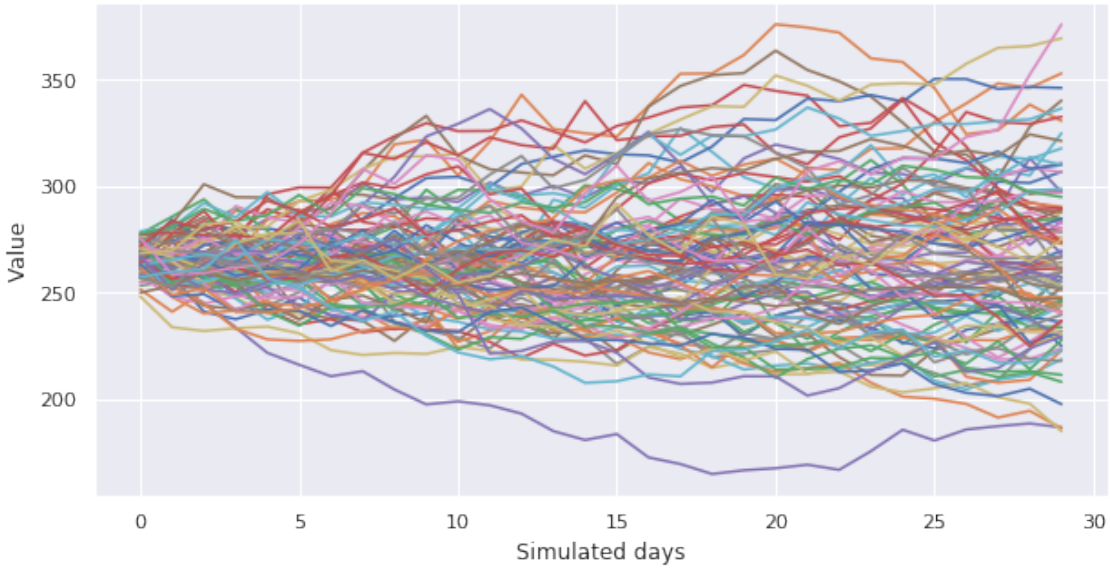
[5]:
```
plt.figure(figsize=(10,5))
plt.plot(results)
plt.ylabel('Value')
plt.xlabel('Simulated days')
plt.show()
```



[6]:
```
raveled = results.values.ravel()
raveled.sort()
cp_raveled = raveled.copy()

plt.figure(figsize=(17,5))
plt.subplot(1,3,1)
plt.plot(results)
plt.ylabel('Value')
plt.xlabel('Simulated days')
plt.subplot(1,3,2)
sns.distplot(df.Close,norm_hist=True)
plt.title('$\mu$ = %.2f, $\sigma$ = %.2f'%(df.Close.mean(),df.Close.std()))
plt.subplot(1,3,3)
sns.distplot(raveled,norm_hist=True,label='monte carlo samples')
sns.distplot(df.Close,norm_hist=True,label='real samples')
```

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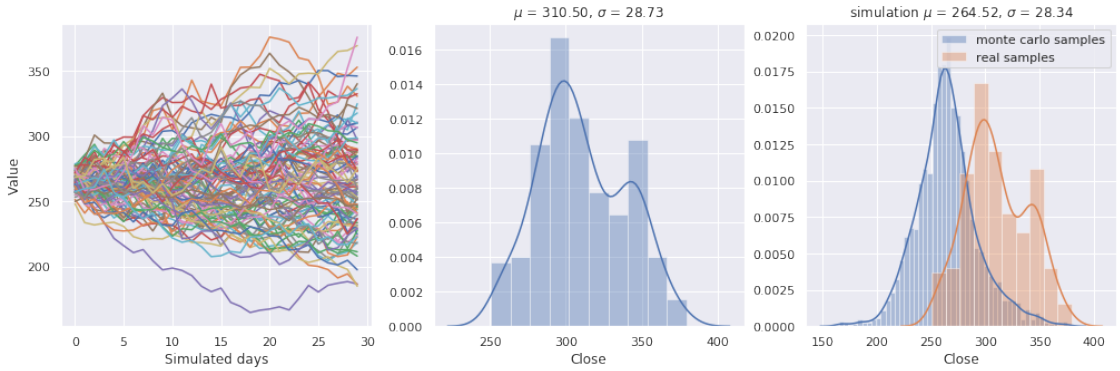
plt.title('simulation $\mu$ = %.2f, $\sigma$ = %.2f'%(raveled.mean(),raveled.
 ↪std()))
plt.legend()
plt.show()
```



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