In [4]:

```
import math
import matplotlib.pyplot as plt
from matplotlib import style
import numpy as np
import pandas as pd
from pandas_datareader import data as pdr
import yfinance as yf
yf.pdr_override()
style.use('ggplot')
tata = pdr.get_data_yahoo('TATAMOTORS.NS', start = '2009-01-01')
```

```
[**********100%**********]  1 of 1 completed
```

In [5]:

```
tata.head()
```

Out[5]:

Date	Open	High	Low	Close	Adj Close	Volume
2009-01-02	34.430695	36.092869	33.757912	34.836346	32.157669	18566132
2009-01-05	36.607349	36.607349	34.638466	35.311253	32.596058	13382037
2009-01-06	35.608067	37.388966	34.737408	36.894272	34.057358	18622646
2009-01-07	37.398857	37.398857	33.451202	34.460377	31.810604	8271220
2009-01-09	35.617962	35.617962	31.106354	32.798206	30.276247	11836652

In [6]:

```
time_elapsed = (tata.index[-1]-tata.index[0]).days
print(time_elapsed)
```

```
4588
```

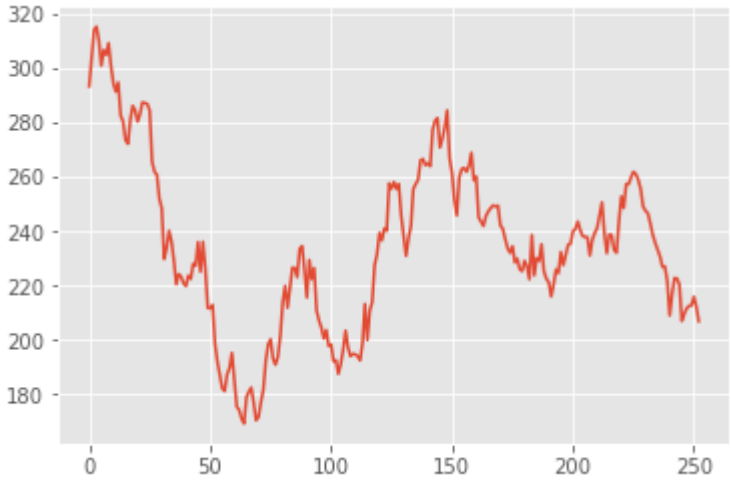
In [8]:

```
Agg_growth = (tata['Adj Close'][-1]/tata['Adj Close'][1]) #total growth
year_equi = time_elapsed / 365
CAGR = (Agg_growth**(1/year_equi))-1
std_dev = tata['Adj Close'].pct_change().std()
trd_days = 252
std_dev_scaled = std_dev * math.sqrt(trd_days)

print(f"CAGR(Mean Annual Returns): {round(CAGR,3)}")
print(f"Standard deviation: {round(std_dev_scaled,3)}")
```

```
CAGR(Mean Annual Returns): 0.191
Standard deviation: 0.457
```

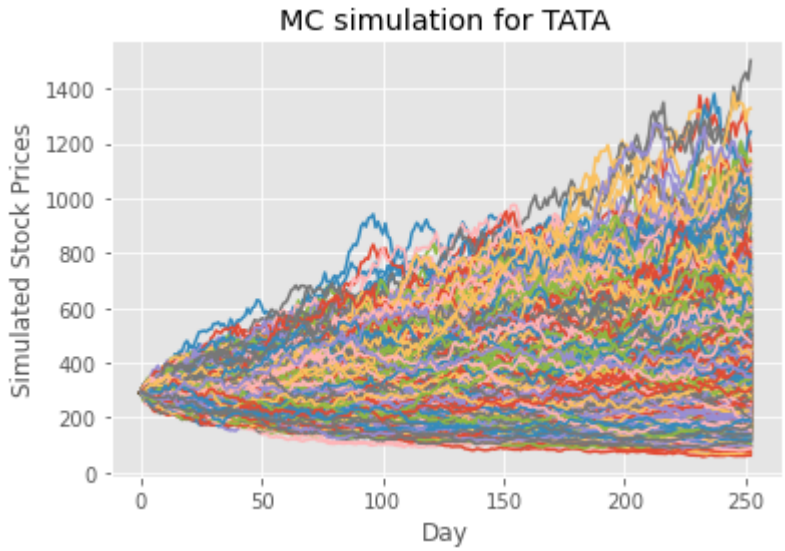
In [11]:

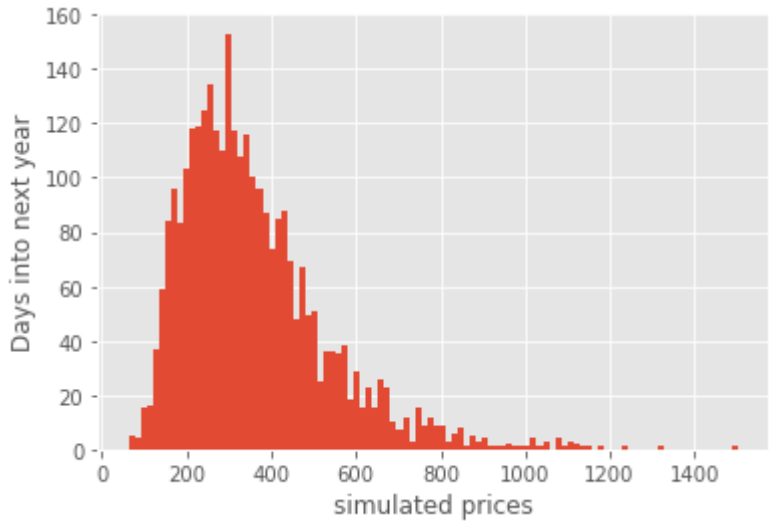
```
#set to input random value and run the MC simulation
#generating random values for 1 year and normal distribution is used to generat
daily_return_rand = np.random.normal(CAGR/trd_days,std_dev,trd_days)+1

price_series = [tata['Adj Close'][-1]]
for j in daily_return_rand:
    price_series.append(price_series[-1]*j)

plt.plot(price_series)
plt.show()
```



In [13]:

```
#above is a single random walk, generating large number of times
trials = 3000
closing_prices = []

for i in range(trials):
    daily_return_rand = np.random.normal(CAGR/trd_days,std_dev,trd_days)+1

    price_series = [tata['Adj Close'][-1]]
    for j in daily_return_rand:
        price_series.append(price_series[-1]*j)
    closing_prices.append(price_series[-1])

    plt.plot(price_series)
    plt.title('MC simulation for TATA')
    plt.xlabel("Day")
    plt.ylabel("Simulated Stock Prices")

plt.show()

#histogram
plt.hist(closing_prices, bins = 100)
plt.xlabel("simulated prices")
plt.ylabel("Days into next year")
plt.show()

```





In [14]:

```
#calculating mean closing price
mean_close_price = round(np.mean(closing_prices),3)
print(f"Expected price {mean_close_price}")
```

```
Expected price 357.811
```

In [ ]:

```

```