

In [12]:

```
import math
import matplotlib.pyplot as plt

T=5
sigma=0.3
r=0.05
K=105
S0=100

def auxiliary_put(pri):
    if (pri<=K):
        return (K-pri)
    elif (pri>K):
        return 0

def auxiliary_call(pri):
    if (pri>=K):
        return (-K+pri)
    elif (pri<K):
        return 0

def fact(n):
    prod=1
    while n>1:
        prod=prod*n
        n=n-1
    return prod
def Price(s,a,b,m):
    Price_c=S0
    Price_w=pow(a,s)*pow(b,m-s)
    Price_c=Price_c*Price_w
    return Price_c

def combination(n,r):
    k_1=fact(n)
    k_2=fact(n-r)*fact(r)
    k_1=k_1/k_2
    return k_1

print("M is ranging from 1 to 100")
print(" ")
print(' ')

M=[]
for s in range(101):
    M.append(s+1)
M2=[]
for s in range(21):
    M2.append(5*s+1)
call=[]
put=[]
call_1=[]
put_1=[]

def main(m,opt):
    delta=T/m
```

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delta1=math.sqrt(delta)
a=math.exp(sigma*delta1+(r-(sigma*sigma)/2)*delta)
b=math.exp(-sigma*delta1+(r-(sigma*sigma)/2)*delta)
p=((math.exp(r*delta))-b)/(a-b)
q=1-p
if (a>math.exp(r*T/m)) and (b<math.exp(r*T/m)):
    base=1/(math.exp(r*T))
    sum_1=0
    sum2=0
    for s in range(m+1):
        price_o=Price(s,a,b,m)
        price=auxiliary_call(price_o)
        price=price*combination(m,s)
        price=price*pow(p,s)*pow(q,m-s)
        sum_1=sum_1+price
        price_o=Price(s,a,b,m)
        price=auxiliary_put(price_o)
        price=price*combination(m,s)
        price=price*pow(p,s)*pow(q,m-s)
        sum2=sum2+price
    sum_1=sum_1*base
    sum2=sum2*base
    if opt==1 :
        call.append(sum_1)
        put.append(sum2)
    if opt==2 :
        call_1.append(sum_1)
        put_1.append(sum2)

    else :
        print('The no arbitrage condition is violated; calculation terminated for M
        =',m)

for k in M:
    main(k,1)

plt.plot(M,call,label='Call')
plt.plot(M,put,label='Put')
plt.xlabel('M is increased by +1')
plt.ylabel('Price->')

plt.show()

print(' ')

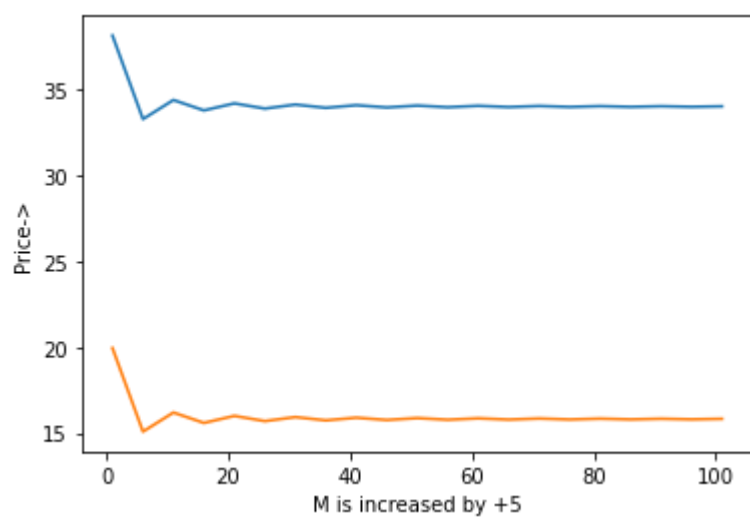
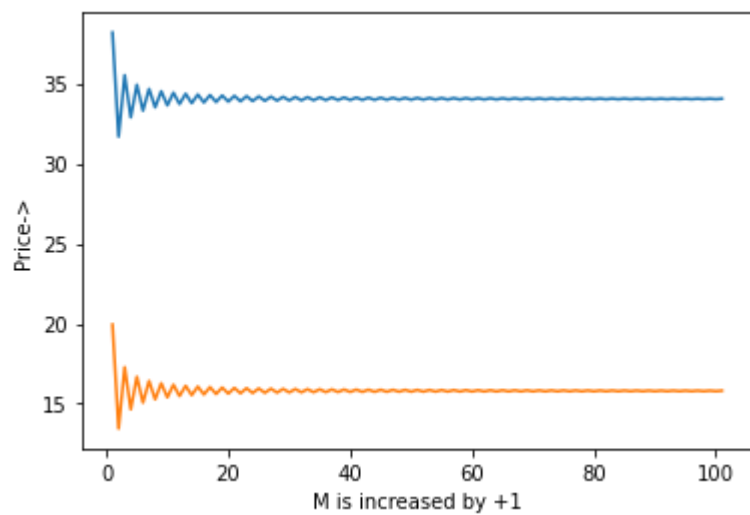
for k in M2:
    main(k,2)

plt.plot(M2,call_1,label='Call')
plt.plot(M2,put_1,label='Put')
plt.xlabel('M is increased by +5')
plt.ylabel('Price->')

plt.show()

```

M is ranging from 1 to 100



In []: