In[1]:=
```
cnd[z_] := (1 + Erf[z / Sqrt[2]]) / 2;
d1[V0_, K_, T_, r_, σ_] := (Log[V0/K] + (r + σ^2/2) T) / (σ Sqrt[T]);
d2[V0_, K_, T_, r_, σ_] := d1[V0, K, T, r, σ] - σ Sqrt[T];
```

In[4]:=
```
BSCall[V0_, K_, T_, r_, σ_] := V0 cnd[d1[V0, K, T, r, σ]] - K Exp[-r T] cnd[d2[V0, K, T, r, σ]]
```

In[5]:=
```
BSCall[100, 100, 1, 0.05, 0.20]
```

Out[5]= 10.4506

In[6]:=
```
Ad1[A0_, D_, T_, r_, σ_] := (Log[A0/D] + (r + σ^2/2) T) / (σ Sqrt[T]);
```

In[7]:=
```
Ad2[A0_, D_, T_, r_, σ_] := Ad1[A0, D, T, r, σ] - σ Sqrt[T];
```

In[8]:=
```
EquityMerton[A0_, D_, T_, r_, σ_] :=
 A0 cnd[Ad1[A0, D, T, r, σ]] - D Exp[-r T] cnd[Ad2[A0, D, T, r, σ]]
```

In[9]:=
```
EquityMerton[100, 70, 4, 0.05, 0.20]
```

Out[9]= 43.8038

In[10]:=
```
Ad1[100, 70, 4, 0.05, 0.20]
```

Out[10]= 1.59169

In[11]:=
```
Ad2[100, 70, 4, 0.05, 0.20]
```

Out[11]= 1.19169

In[12]:=
```
cnd[Ad1[100, 70, 4, 0.05, 0.20]]
```

Out[12]= 0.944273

In[13]:=
```
cnd[Ad2[100, 70, 4, 0.05, 0.20]]
```

Out[13]= 0.883308

In[14]:=
```
DebtMerton[A0_, D_, T_, r_, σ_] :=
 D Exp[-r T] - (D Exp[-r T] cnd[-Ad2[A0, D, T, r, σ]] - A0 cnd[-Ad1[A0, D, T, r, σ]])
```

In[15]:=
```
cnd[-Ad1[100, 70, 4, 0.05, 0.20]]
```

Out[15]= 0.0557275

In[16]:=
```
cnd[-Ad2[100, 70, 4, 0.05, 0.20]]
```

Out[16]= 0.116692

In[17]:=
```
DebtMerton[100, 70, 4, 0.05, 0.20]
```

Out[17]= 56.1962

In[18]:=
```
100 - DebtMerton[100, 70, 4, 0.05, 0.20]
```

Out[18]=
```
43.8038
```

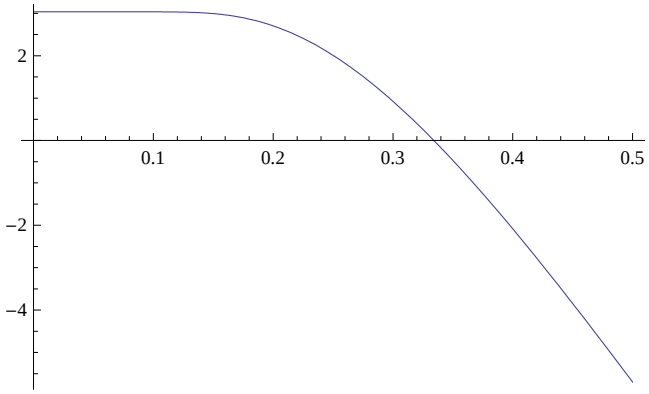
In[19]:=
```
fmin[σimp_] := 50 Exp[-0.03 * 5] - (50 Exp[-0.03 * 5] cnd[-(Log[100/50] + (0.03 + σimp^2/2) 5)/(σimp Sqrt[5]) + σimp Sqrt[5]] -
  100 cnd[-(Log[100/50] + (0.03 + σimp^2/2) 5)/(σimp Sqrt[5])]) - 40
```

In[20]:=
```
fim[1]
```

Out[20]=
```
fim[1]
```

In[21]:=
```
Plot[fmin[σimp], {σimp, 0, 0.5}]
```

Out[21]=



In[22]:=
```
Ad1[100, 30, 5, 0.03, 0.334]
```

Out[22]=
```
2.18634
```

In[23]:=
```
Ad2[100, 30, 5, 0.03, 0.334]
```

Out[23]=
```
1.4395
```

In[24]:=
```
DebtMerton[100, 30, 5, 0.03, 0.334]
```

Out[24]=
```
25.324
```

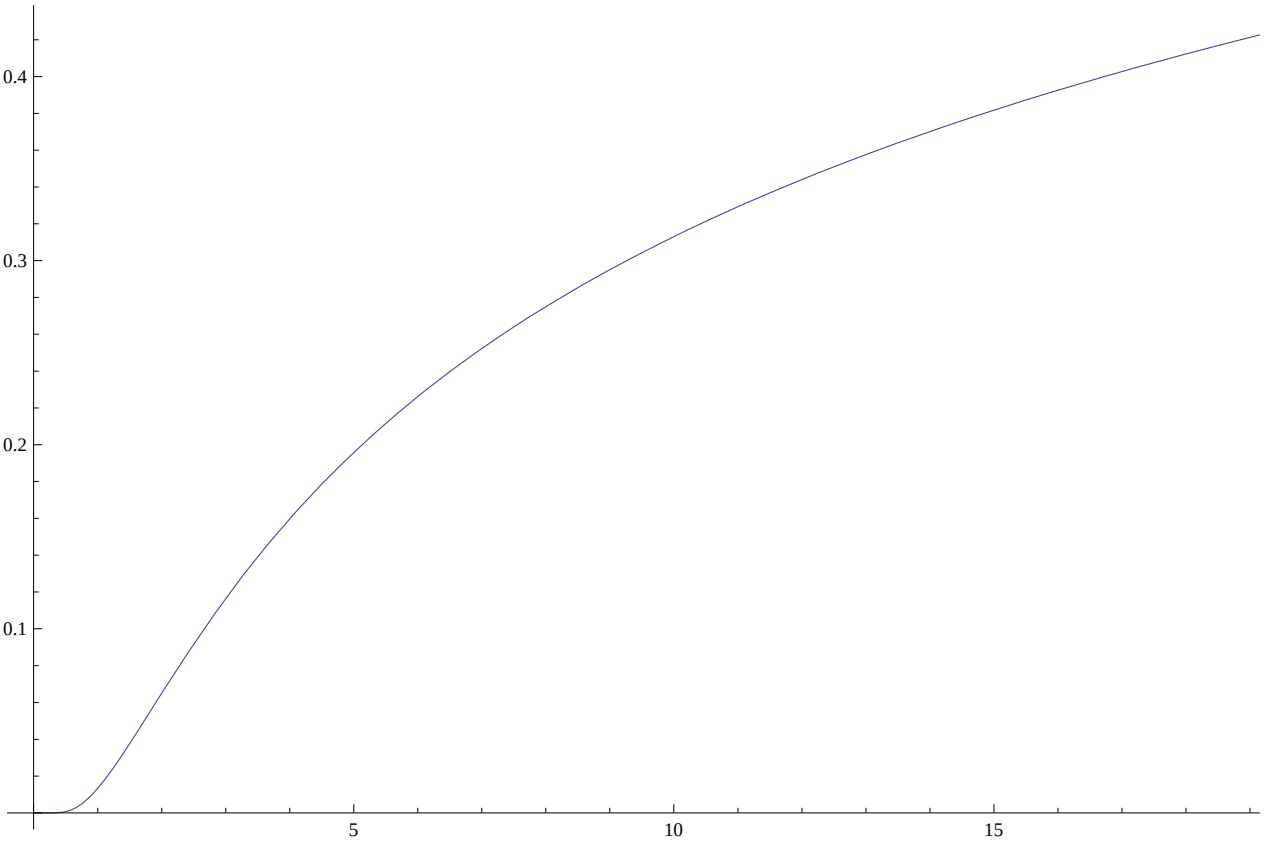
In[25]:=
```
MertonProb[A0_, D_, T_, r_, σ_] := 1 - cnd[Ad2[A0, D, T, r, σ]]
```

In[26]:=
```
MertonProb[100, 30, 5, 0.03, 0.334]
```

Out[26]=
```
0.075005
```

In[27]:=
```
Plot[MertonProb[100, 40, T, 0.05, 0.40], {T, 0, 20}]
```

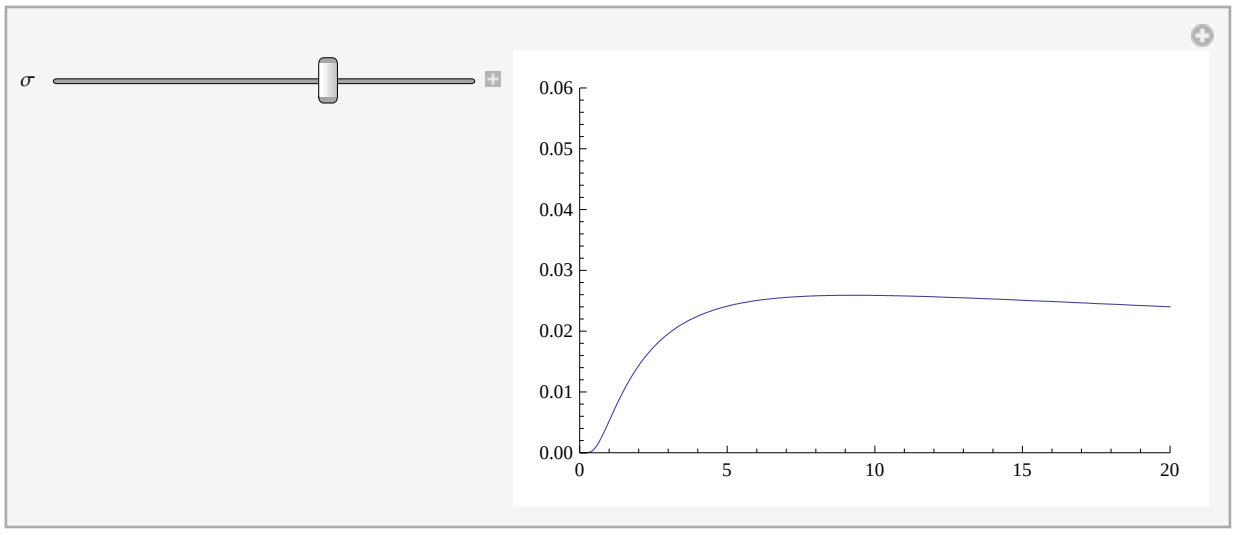
Out[27]=



In[28]:=
```
MertonSpread[A0_, D_, T_, r_, σ_] := -1/T Log[DebtMerton[A0, D, T, r, σ]/D] - r
```

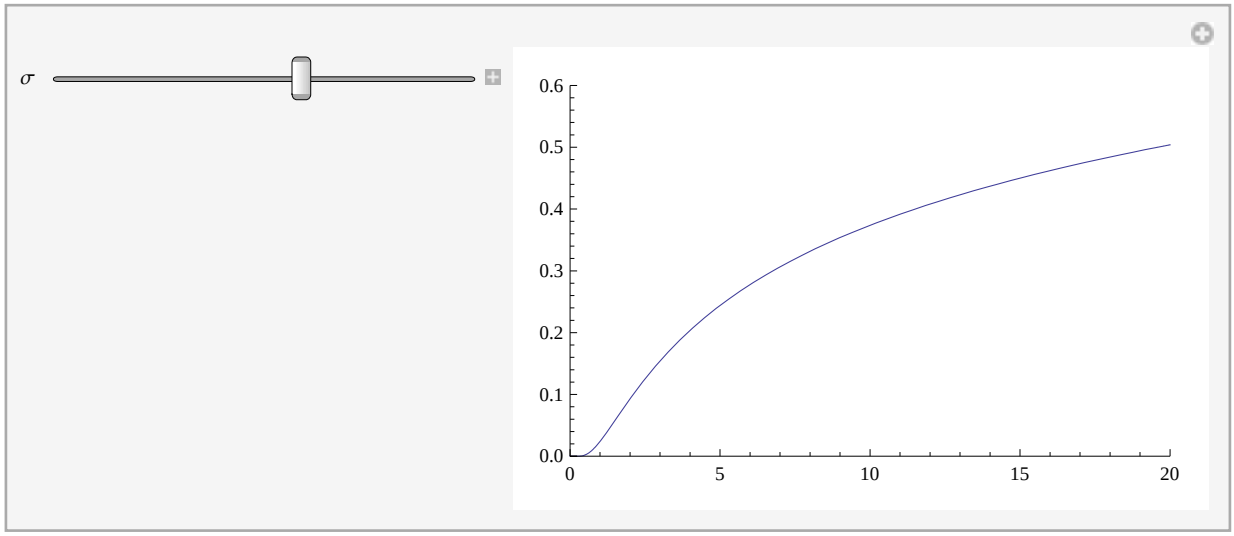
In[29]:=
```
Manipulate[Plot[MertonSpread[100, 40, T, 0.05, σ],
  {T, 0, 20}, PlotRange → {{0, 20}, {0, 0.06}}], {σ, 0.2, 0.6}]
```

Out[29]=



In[30]:=
```
Manipulate[Plot[MertonProb[100, 40, T, 0.05, σ],
  {T, 0, 20}, PlotRange → {{0, 20}, {0, 0.6}}], {σ, 0.2, 0.6}]
```

Out[30]=



In[31]:=
```
Plot3D[MertonSpread[100, 40, T, 0.05, σ], {T, 0, 20}, {σ, 0, 0.30}]
```

Out[31]=