Oppgave 5

Årlig avkastning

Pakker

In[1]:=
```
<< Statistics`ContinuousDistributions`
<< Graphics`Graphics`
<< Statistics`DataManipulation`
```

Valgte parametre og simuleringer

In[4]:=
```
nHandleDager = 250;
nSimuleringer = 10000;
Timing[simN01 = Partition[RandomArray[NormalDistribution[0, 1], nHandleDager nSimuleringer], nHandleDager];]
```

Out[6]=
```
{1.172 Second, Null}
```

Kompilerte funksjoner for raske beregninger

In[7]:=
```
folder = Compile[{{k, _Real}, {θ0, _Real}, {θ1, _Real}, {θ2, _Real}, {matrise, _Real, 1}},
    FoldList[√(θ0 + θ1 (#1 #2)^2 + θ2 #1^2) &, k √(θ0/(1 - (θ1 + θ2))), matrise]];
```

In[8]:=
```
summer = Compile[{{matrise, _Real, 2}}, matrise[[1]].matrise[[2]]];
```

GARCH rekursjonsformel

In[9]:=

```
lagGARCH[nSim_, {θ0_, θ1_, θ2_}, k_] := Module[{},
   res = Table[0, {nSim}];
   Do[
    z = simN01[[j]];
    σ = folder[k, θ0, θ1, θ2, Delete[z, -1]];
    res[[j]] = e^summer[{z,σ}];
    , {j, nSim}];
   res];
```

Simuleringer av GARCH

In[10]:=
```
garchParms = {0.000002, 0.09, 0.89};
Timing[simGARCH = lagGARCH[nSimuleringer, garchParms, 1];]
```

Out[11]=
```
{2.063 Second, Null}
```

In[12]:=
```
σGARCH = √250 √(garchParms[[1]] / (1 - (garchParms[[2]] + garchParms[[3]])));
```

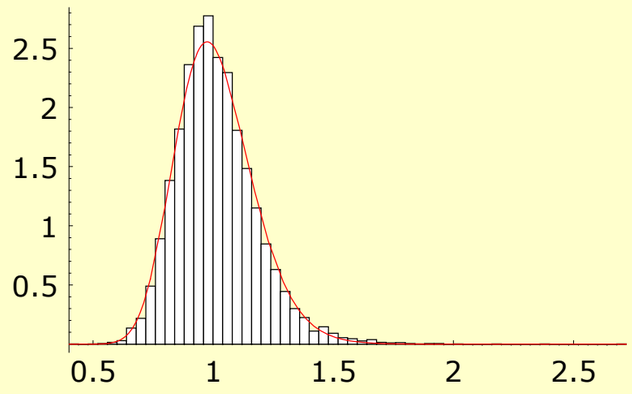
Grafikkfunksjoner GARCH

In[13]:=
```
hist = Histogram[simGARCH, DisplayFunction → Identity, HistogramScale → 1,
   BarStyle → RGBColor[1, 1, 1], HistogramCategories → Table[i / 25, {i, 0, 300}]];
```

In[14]:=
```
lagGARCHpdf[{θ0_, θ1_, θ2_}] := Plot[PDF[LogNormalDistribution[0, √250 √(θ0 / (1 - (θ1 + θ2)))], x],
   {x, 0, 3}, PlotRange → All, PlotStyle → RGBColor[1, 0, 0], DisplayFunction → Identity];
```

Simulerte GARCH data og lognormal tetthet

In[15]:=
```
Show[hist, lagGARCHpdf[garchParms], DisplayFunction → $DisplayFunction, DefaultFont → {"Verdana", 13}];
```



Statistiske egenskaper

In[16]:=
```
#1[simGARCH] & /@ {Mean, StandardDeviation, Skewness, Kurtosis}
#1[LogNormalDistribution[0, σGARCH]] & /@ {Mean, StandardDeviation, Skewness, Kurtosis}
```

Out[16]=
```
{1.01423, 0.166923, 0.960109, 6.1661}
```

Out[17]=
```
{1.01258, 0.161109, 0.48135, 3.41475}
```

In[18]:=
```
forholdstallKvantiler =
  Table[Quantile[simGARCH, p] / Quantile[LogNormalDistribution[0, σGARCH], p], {p, 0.9000, .9999, .0001}];
```

Kvantiler (ubetydlig forskjell?)

In[19]:=
```
ListPlot[forholdstallKvantiler, PlotJoined → True];
```