Oppgave 2

Aksje/ obligasjon

Valgte parametre

In[6]:=

```
μS = 0.10;
μB = 0.05;
σS = 0.20;
σB = 0.10;
ρ = 0.40;
```

Hjelpefunksjon

Utskrift med valgt antall desimaler:

In[11]:=
```
dsRound[tall_, des_] := N[Round[10^des tall] / 10^des];
```

$$\text{dsRound[tall\_, des\_]} := \text{N}\left[\frac{\text{Round}[10^{\text{des}}\ \text{tall}]}{10^{\text{des}}}\right];$$

Kumulativ fordelingsfunksjon forholdstall

In[12]:=
```
<< "Statistics`ContinuousDistributions`"
```

In[13]:=

$$\alpha = (\mu S - \mu B) + \sigma B\,(\sigma B - \rho\,\sigma S);$$

$$\beta = \sqrt{\sigma S^2 + \sigma B^2 - 2\,\sigma S\,\sigma B\,\rho};$$

In[15]:=

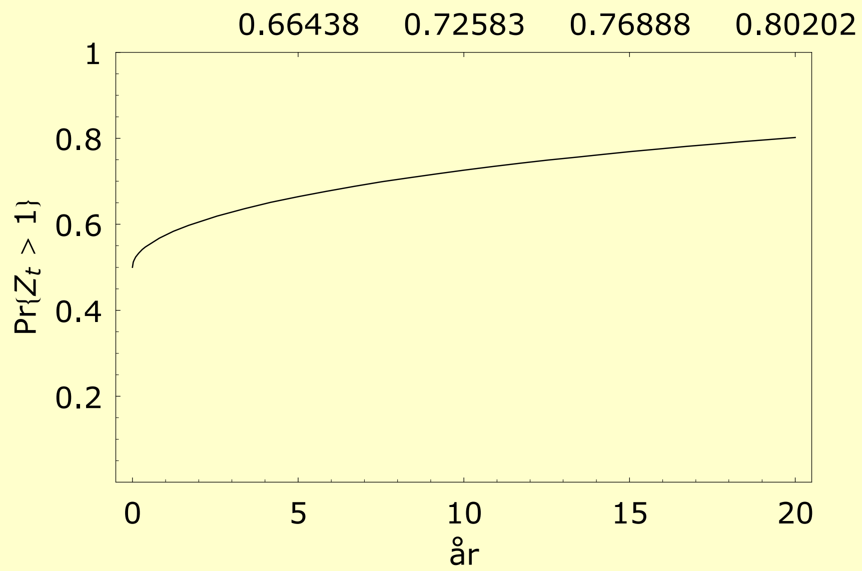
$$pr[k\_,\ t\_] := CDF\left[NormalDistribution[0, 1],\ \frac{\left(\alpha - \frac{\beta^2}{2} - \frac{Log[k]}{t}\right)\sqrt{t}}{\beta}\right];$$

Plottfunksjon

In[16]:=
```
lagPlott := Plot[pr[1, t], {t, 0, 20}, DefaultFont → {"Verdana", 11}, PlotRange → {0, 1}, Frame → True,
  FrameTicks → {Automatic, Automatic, Table[{i, ToString[dsRound[pr[1, i], 5]]}, {i, 5, 20, 5}], None},
  FrameLabel → {"år", "Pr{Z_t > 1}"}];
```

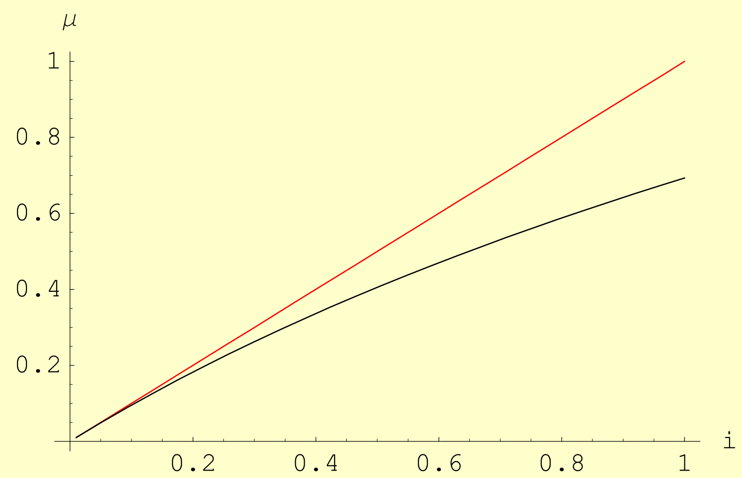
Plott

In[17]:=
```
lagPlott;
```



Fra avkastning til parameter

In[19]:=
```
Plot[{i, Log[1 + i]}, {i, .01, 1}, AxesLabel → {"i", "μ"}, PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 0]}];
```

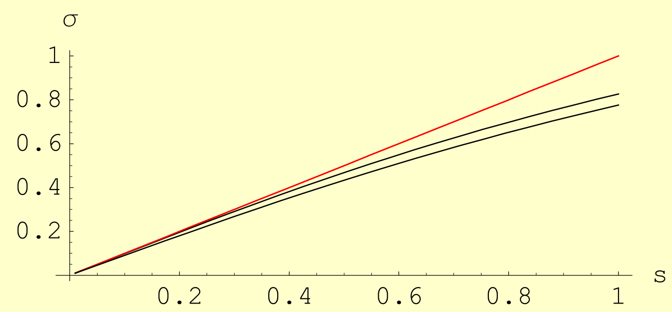


Fra standardavvik til parameter

In[20]:=

```
Plot[Evaluate[Table[{s, Sqrt[Log[1 + (s/(1 + i))^2]]}, {i, .01, .1, .09}]], {s, .01, 1},
  AxesLabel → {"s", "σ"}, AspectRatio → .4, PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 0]}];
```

$$\text{Plot}\left[\text{Evaluate}\left[\text{Table}\left[\left\{s, \sqrt{\text{Log}\left[1+\left(\frac{s}{1+i}\right)^2\right]}\right\}, \{i, .01, .1, .09\}\right]\right], \{s, .01, 1\}, \right.$$
$$\left.\text{AxesLabel} \to \{\text{"s"}, \text{"}\sigma\text{"}\}, \text{AspectRatio} \to .4, \text{PlotStyle} \to \{\text{RGBColor}[1, 0, 0], \text{RGBColor}[0, 0, 0]\}\right];$$



Klargjør parametre for symbolsk matematikk

In[21]:=

```
Clear[μS, μB, σS, σB, ρ];
```

In[22]:=

```
MatrixForm[Σ = {{1, ρ}, {ρ, 1}}]
```

Out[22]//MatrixForm=

$$\begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}$$

Fra parameter ρ til kovarians

In[23]:=

```
FullSimplify[e^((μS - σS^2/2) + (μB - σB^2/2))
    Integrate[e^(σS x + σB y - 1/2 {x,y}.Inverse[Σ].{x,y}) / Sqrt[(2 π)^2 Det[Σ]], {x, -∞, ∞}, {y, -∞, ∞}, Assumptions → {ρ^2 < 1, σS > 0, σB > 0}] - e^(μS+μB)];
StyleForm[TraditionalForm[%], FontFamily → "Times", FontSize → 18]
```

Out[24]//StyleForm=

$$e^{\mu B+\mu S}\,(-1+e^{\rho\,\sigma B\,\sigma S})$$

Setter parametere på nytt

In[79]:=
```
<<Statistics`ContinuousDistributions`
```

Nevner for å regne om fra kovarians til korrelasjon:

In[80]:=
```
nevner = StandardDeviation[LogNormalDistribution[μS, σS]] StandardDeviation[LogNormalDistribution[μB, σB]];
```

In[81]:=
```
μS = 0.10;
μB = 0.05;
σS = 0.20;
σB = 0.10;
```

Plottfunksjon

Lager funksjon for å sjekke grafisk forholdet mellom parameter ρ og faktisk korrelasjon

In[85]:=

```
lagKorrelasjonsPlott := Plot[{ρ, (e^(μB+μS) (e^(ρ σB σS) - 1))/nevner}, {ρ, -1, 1},
  AxesLabel → {"ρ", "Corr{(S_(t+1) - S_t)/S_t, (B_(t+1) - B_t)/B_t}"}, PlotStyle → {RGBColor[1, 0, 0], RGBColor[0, 0, 0]}];
```

$$\texttt{lagKorrelasjonsPlott} := \texttt{Plot}\left[\left\{\rho, \frac{e^{\mu B+\mu S}\left(e^{\rho\,\sigma B\,\sigma S}-1\right)}{\texttt{nevner}}\right\}, \{\rho, -1, 1\}, \texttt{AxesLabel} \to \left\{"\rho", "\texttt{Corr}\{\frac{S_{t+1}-S_t}{S_t}, \frac{B_{t+1}-B_t}{B_t}\}"\right\}, \texttt{PlotStyle} \to \{\texttt{RGBColor}[1,0,0], \texttt{RGBColor}[0,0,0]\}\right];$$

Plott

In[86]:=
```
lagKorrelasjonsPlott;
```