We let a = x_, B = $\overline{x}$

This is saving upper bound

```
SU[p_, β_, a_, B_, R_, δ_] :=
 (Log[(1 + R) δ] + Log[p + (1 - p) / (B - a) ∫_a^B e^(β (x)) dx]) / β / (2 + R)
```

This is borrowing lower bound

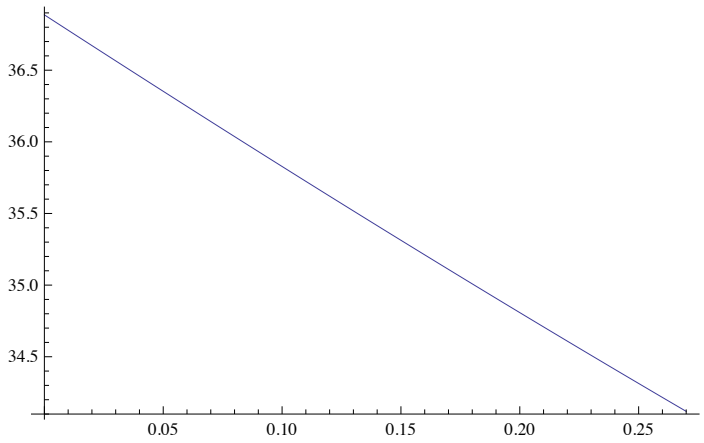
```
BU[p_, β_, a_, B_, R_, δ_] :=
 (β a - Log[(1 + R) δ] - Log[p + (1 - p) / (B - a) ∫_a^B e^(β (x)) dx]) / β / (2 + R)
```

```
g[p_, β_, a_, B_, r_] := (1 - p)^2 + p (1 - p) / (B - a) ∫_a^B e^(β x (1 + r) / (2 + r)) dx
```

```
SU[0.63, 0.065, 91, 95, 0, 1 / 1.3]
```

36.8863

```
Plot[SU[0.63, 0.065, 91, 95, r, 1 / 1.3], {r, 0, 0.27}]
```




```
SU[0.63, 0.065, 91, 95, 0.27, 1 / 1.3]
```

34.1188

```
BU[0.63, 0.065, 91, 95, 0.27, 1 / 1.3]
```

5.96929

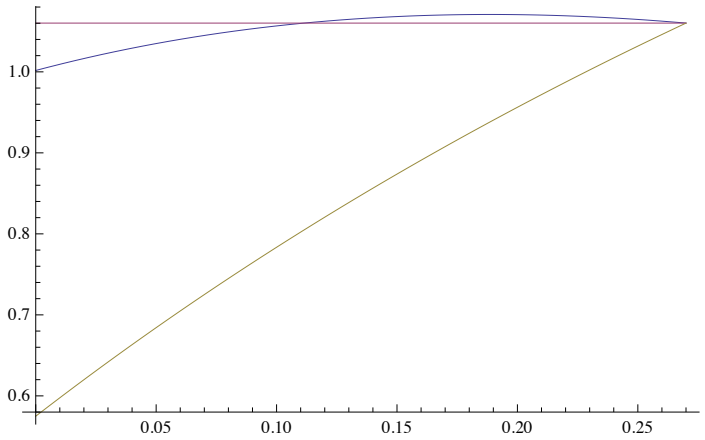
```
g[0.63, 0.065, 91, 95, 0.27]
```

7.00301

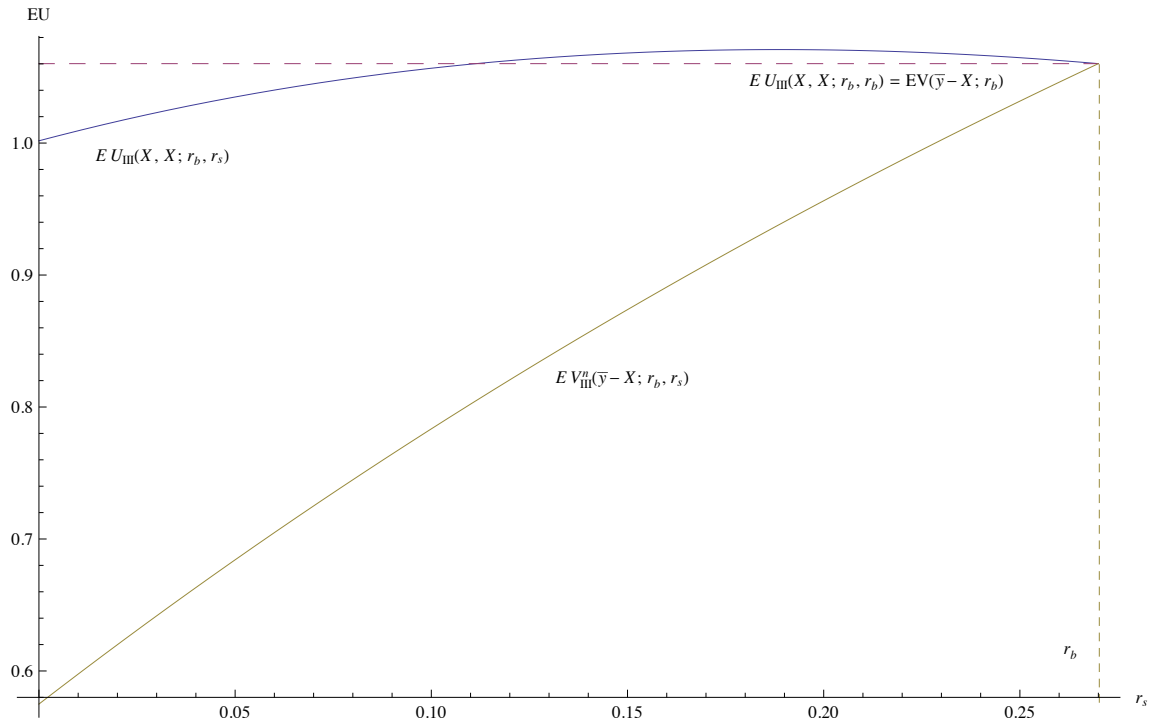
```
ω[m_, β_, r_, R_] := 1 - e^(-2 β m (R - r) / (2 + R))
```

```
γ[r_, β_, p_, δ_, B_, a_] :=
 (2 + r) / (1 + r) ((1 + r) δ (p + (1 - p) / (B - a) ∫_a^B e^(β (x)) dx))^(1 / (2 + r))
```

```
EU3[p_, r_, R_, β_, m_, δ_, B_, a_, Y_] :=
 (1 + δ) / β - e^(-β Y) p^2 / β  γ[r, β, p, δ, B, a] (1 + 1 / p e^(- β m (R - r) / (2 + r))
      ∫_p^1 (1 - ω[m, β, r, R]  p^2 / z^2)^(-2 (2 + R) / 2 / (2 + r)) dz) -
  (1 - p) / β e^(-β Y) γ[R, β, p, δ, B, a] (√(1 - ω[m, β, r, R] p^2))
   1 / (B - a) ∫_a^B e^(β x (1 + R) / (2 + R)) dx

PW[p_, r_, R_, β_, m_, δ_, B_, a_, Y_] :=
 (1 + δ) / β - p e^(-β Y) / β γ[R, β, p, δ, B, a] -
  (1 - p) e^(-β Y) / β γ[R, β, p, δ, B, a] / (B - a) ∫_a^B (e^(β x (1 + R) / (2 + R))) dx

EV3[p_, r_, R_, β_, m_, δ_, B_, a_, Y_] :=
 (1 + δ) / β - p e^(-β Y) / β γ[r, β, p, δ, B, a] -
  (1 - p) e^(-β Y) / β γ[R, β, p, δ, B, a] / (B - a) ∫_a^B (e^(β x (1 + R) / (2 + R))) dx

f1 = Plot[{EU3[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5],
   PW[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5],
   EV3[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5]}, {r, 0, 0.27}]
```




```
Show[f1, AxesLabel → {r_s, EU}]
```



normalize utility under perfect market as 1

```
f2 = Plot[{EU3[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5] /
     PW[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5],
   1, EV3[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5] /
     PW[0.63, r, 0.27, 0.065, 5.96, 1 / 1.3, 95, 91, 72.5]}, {r, 0, 0.27}]
```