

`ExpectedValue[Abs[Exp[#1 - 1 / 2 t] - 1] &, NormalDistribution[0, Sqrt[t]]]`

$$2 \operatorname{Erf}\left[\frac{\sqrt{t}}{2 \sqrt{2}}\right]$$

`p[t_] := 4 (th[Sqrt[t] / 2] - 1 / 2)`

`th[x_] := 1 / 2 (1 + Erf[x / Sqrt[2]])`

```

pl[t1_, t2_] := Show[

  Plot[p[x], {x, 0, 0.9}, AxesLabel → {t, E[Abs[St - S0]]},
    PlotStyle → Directive[Darker[Darker[Blue]]], Ticks → {{{t1, "t1"}, {t2, "t2"}}, {}},
    Epilog → {Text[Style["long-side arbitrage", FontSize → 12],
      {(Max[t2, t1] + 0.9) / 2, 0.5 Min[p[t2], p[t1]]}],
      Text[Style["short-side arbitrage", FontSize → 12],
      {(t2 + t1) / 2, 0.5 (p[0.9] + Max[p[t2], p[t1]])}]}],

  RegionPlot[{y < p[t1], y > p[t2]}, {x, 0, 0.9},
    {y, 0, p[0.9] * 1.2}, BoundaryStyle → Directive[Opacity[0]],
    PlotStyle → {Directive[Opacity[0.3], Blue], Directive[Purple, Opacity[0.3]]}],

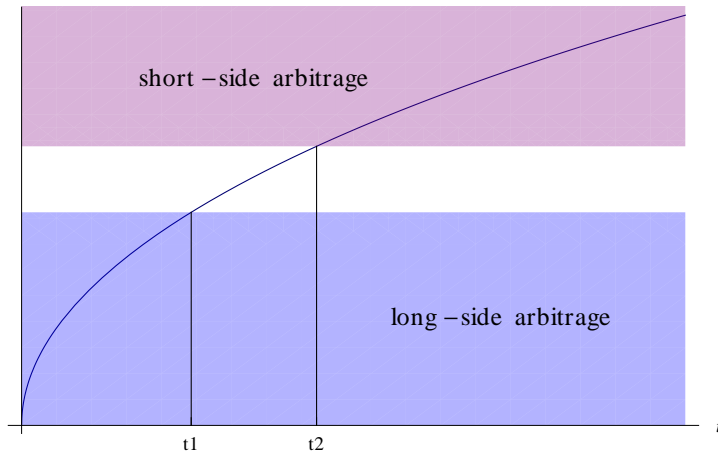
  Graphics[Line[{
    {{t1, 0}, {t1, p[t1]}},
    {{t2, 0}, {t2, p[t2]}}
  }]]
];
Manipulate[pl[t1, t2], {{t1, 0.23}, 0, 0.9}, {{t2, 0.4}, 0, 0.9}]

```



pl[0.23, t2 = 0.4]

$E(|S_t - S_0|)$



Export["c:\\arbband.jpg", pl[0.23, t2 = 0.4]]

c:\\arbband.jpg

ExpectedValue[Max[Exp[# - 1/2 t] - k, 0] &, NormalDistribution[0, Sqrt[t]]]

$$\begin{cases} 1 - k & k \leq 0 \mid t \leq 0 \\ \frac{1}{2} \left(1 + \operatorname{Erf} \left[\frac{t - 2 \operatorname{Log}[k]}{2 \sqrt{2} \sqrt{t}} \right] - k \operatorname{Erfc} \left[\frac{t + 2 \operatorname{Log}[k]}{2 \sqrt{2} \sqrt{t}} \right] \right) & \text{True} \end{cases}$$

$$\text{BS}[S_-, K_-, t_-] := S_- \frac{1}{2} \left(1 + \operatorname{Erf} \left[\frac{t_- - 2 \operatorname{Log}[k]}{2 \sqrt{2} \sqrt{t_-}} \right] - k \operatorname{Erfc} \left[\frac{t_- + 2 \operatorname{Log}[k]}{2 \sqrt{2} \sqrt{t_-}} \right] \right) /. k \rightarrow K_- / S_-$$

P[S_-, K_-] := Max[S - K, 0];

Plot[{P[S, 70], BS[S, 70, 0.1]}, {S, 30, 100}, PlotRange -> {0, 30}]

