

PGSS: Math Finance HW 2

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1.

$$\begin{aligned}
 F &= \$5000 \\
 T_{mat} &= 5 \text{ years} \\
 \text{When } t = 0, B_0 &= \$4300 \\
 5000 &= 4300\left(1 + \frac{r}{12}\right)^{12 \cdot 5} \\
 \sqrt[60]{\frac{5000}{4300}} &= 1 + \frac{r}{12} \\
 r &= 12\left(\sqrt[60]{\frac{5000}{4300}} - 1\right) \\
 r &\approx 0.0302 = 3.02\%
 \end{aligned}$$

2.

$$\begin{aligned}
 M &= \$1000 \\
 T &= 2 \text{ years} \\
 \text{When } t = 0, M_{\text{present}} &= \$925 \\
 925 &= \frac{500}{\left(1 + \frac{r}{12}\right)^{12}} + \frac{500}{\left(1 + \frac{r}{12}\right)^{24}} \\
 \frac{925}{500} &= \frac{1}{\left(1 + \frac{r}{12}\right)^{12}} + \frac{1}{\left(1 + \frac{r}{12}\right)^{24}} \\
 \text{Let } x &= \left(1 + \frac{r}{12}\right)^{12} \\
 \frac{925}{500} &= \frac{1}{x} + \frac{1}{x^2} \\
 \frac{925}{500}x^2 &= x + 1 \\
 0 &= \frac{925}{500}x^2 - x - 1 \\
 x &= \frac{-(-1) \pm \sqrt{(-1)^2 - 4\left(\frac{925}{500}\right)(-1)}}{2\left(\frac{925}{500}\right)} \\
 x &= \frac{250 \pm 250\sqrt{8.4}}{925} \\
 x &\approx 1.05359 \\
 \left(1 + \frac{r}{12}\right)^{12} &= 1.05359 \\
 r &= 12\left(\sqrt[12]{1.05359} - 1\right) \\
 r &\approx 0.05232 = 5.23\%
 \end{aligned}$$