PGSS: Math Finance HW 6

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1.

$$P_0^A = \frac{1000}{\left(1 + \frac{0.035}{12}\right)^{12}}$$
$$P_0^A = \$965.65$$

$$P_0^{A+B} = 1000 \cdot \frac{\left(1 + \frac{f(1,5)}{12}\right)^{48}}{\left(1 + \frac{0.05}{12}\right)^{60}}$$

$$0 = P_0^A - P_0^{A+B}$$

$$f(s,T) = 12\left(\left[\frac{(1 + \frac{r(0,T)}{12})^T}{(1 + \frac{r(0,s)}{12})^s}\right]^{\frac{1}{T-s}} - 1\right)$$
$$f(1,5) = 12\left(\left[\frac{(1 + \frac{r(0,5)}{12})^5}{(1 + \frac{r(0,1)}{12})^1}\right]^{\frac{1}{5-1}} - 1\right)$$
$$f(1,5) = 0.05375 \text{ or } 5.375\%$$

2. (a) At $t = 0$ take a loan of P_0^F where $F = \$10000$ and make a deposit of the same amount over the interval $\left[0, \frac{11}{12}\right]$. An interest rate $r(0,1)$ is applied to the lean and a rate $r(0, \frac{11}{12})$ is applied to the deposit. Finally, at $t = \frac{11}{12}$ deposit the the amount P_0^F over $\left[\frac{11}{12}, 12\right]$ to grow a loan to \$10,000 over a year and a deposit to the same amount plus V_1.

(b)

$$V_0 = \frac{10000}{\left(1 + \frac{0.04}{12}\right)^{12}} - \frac{10000}{\left(1 + \frac{0.039}{12}\right)^{11}}$$
$$V_0 = -\$40.84$$