Assignment

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1 Probability

2 Assignment-4

(**Answer-1**)

Let $M(t)$ denote the amount of money at time $t \in [0, T]$ after continuously compounding at the rate of $r(t)$. Then it will follow the following differential equation:

$$\frac{dM(t)}{dt} = r(t)M(t).$$

Solving this we get

$$\begin{aligned}
\frac{dM(t)}{M(t)} &= r(t)dt \\
\int_{M}^{M(T)} \frac{dM(t)}{M(t)} &= \int_{0}^{T} r(t)dt \\
\ln\left(\frac{M(T)}{M}\right) &= \int_{0}^{T} r(t)dt \\
M(T) &= Me^{\int_{0}^{T} r(t)dt}.
\end{aligned}$$