# The inflation risk premium can be zero at all points in time

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In this paper, I describe how the inflation risk premium can be zero at all points in time. The paper ends with "The End"

## Introduction

The inflation risk premium is defined as the premium needed to hold an asset above the risk-free rate plus the expected inflation. Mathematically, we have

$$r_A(t) = r_f(t) + \mathrm{E}[i(t)] + p_i(t)$$

where
$r_A(t)$ is the return on the asset as a function of time
$r_f(t)$ is the risk-free rate as a function of time
$\mathrm{E}[i(t)]$ is the expected inflation as a function of time
$p_i(t)$ is the inflaton risk premium as a function of time

## The inflation risk premium can be zero at all points in time

The inflation risk premium can be zero at all points in time, if the return on the asset, the risk-free rate and the expected inflation have specific functional forms described below:

$$r_A(t) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(t-\mu)^2}{2\sigma^2}}$$

$$r_f(t) = \begin{cases} 0 & t \leq 0 \\ \frac{2\theta e^{-\frac{\theta^2 t^2}{\pi}}}{\pi} & t > 0 \end{cases}$$

$$E[i(t)] = e^{-Ft} \begin{cases} Ft - e^{Ft}(e^{-Ft}Ft - \frac{e^{-\frac{(t-\mu)^2}{2\sigma^2}}}{\sqrt{2\pi}\sigma}) & t \leq 0 \\ Ft - e^{Ft}(e^{-Ft}Ft + \frac{2e^{-\frac{t^2\theta^2}{\pi}}\theta}{\pi} - \frac{e^{-\frac{(t-\mu)^2}{2\sigma^2}}}{\sqrt{2\pi}\sigma}) & t > 0 \end{cases}$$

where $\mu$, $\sigma$, $\theta$ and $F$ are real constants and $t$ is time.
Then we have

$$p_i(t) = r_A(t) - r_f(t) - \mathrm{E}[i(t)] = 0$$

## The End