The capital asset pricing model has solutions with positive α and negative β_A

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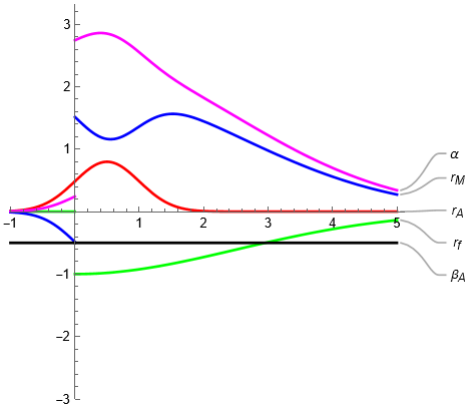
Abstract

In this paper, I describe two solutions to the capital asset pricing model with positive α and negative β_A.
The paper ends with "The End"

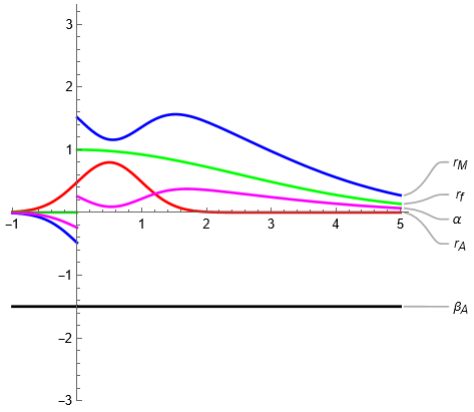
Introduction

Unknown to most individuals, the capital asset pricing model has solutions with positive α and negative β_A.
Such solutions seem surprising, but upon closer examination are valid solutions nonetheless.
In this paper, I describe two solutions to the capital asset pricing model with positive α and negative β_A.

Two solutions to the capital asset pricing model with positive α and negative β_A



The first solution



The second solution

Differentiating between the two solutions

Note that both solutions have the same **return on the asset** r_A and **return on the market portfolio** r_M, but different **risk-free rate** r_f, **alpha** α and **beta of the asset** β_A.

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

$$r_M(\mu,\sigma,\theta,t) = 2\left(\{ \begin{array}{cc} 2\theta e^{-\frac{t^2\theta^2}{\pi}} & t>0 \\ 0 & t\le 0 \end{array} \right) - \frac{e^{-\frac{(t-\mu)^2}{2\sigma^2}}}{\sqrt{2\pi}\sigma}$$

The first solution

$$r_f(\theta,t) = -\ \{ \begin{array}{cc} 0 & t\le 0 \\ 2\theta e^{-\frac{\theta^2 t^2}{\pi}} & t>0 \end{array}$$

$$\beta_A(t) = -\frac{1}{2}$$

$$\alpha(\mu,\sigma,\theta,t) = \frac{5}{2}\left(\{ \begin{array}{cc} 2e^{-\frac{t^2\theta^2}{\pi}}\theta & t>0 \\ 0 & t\le 0 \end{array} \right) + \frac{e^{-\frac{(t-\mu)^2}{2\sigma^2}}}{2\sqrt{2\pi}\sigma}$$

The second solution

$$r_f(\theta,t) = \ \{ \begin{array}{cc} 0 & t\le 0 \\ 2\theta e^{-\frac{\theta^2 t^2}{\pi}} & t>0 \end{array}$$

$$\beta_A(t) = -\frac{3}{2}$$

$$\alpha(\mu,\sigma,\theta,t) = \frac{1}{2}\left(\{ \begin{array}{cc} 2e^{-\frac{t^2\theta^2}{\pi}}\theta & t>0 \\ 0 & t\le 0 \end{array} \right) - \frac{e^{-\frac{(t-\mu)^2}{2\sigma^2}}}{2\sqrt{2\pi}\sigma}$$

Use of the two solutions

The first solution is useful to build a **high-risk high-reward hedge fund**.
The second solution is useful to build a **medium-risk medium-reward wealth fund**.

Code for the solutions

Mathematica code for the solutions is available here.

The End