

# Infant Mortality and Economic Growth: Modeling by Increasing Returns and Least Squares

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## Abstract

Infant mortality rate (IMR) is the number of deaths per 1,000 live births of children under one year of age. High levels of poverty and low health and sanitation standards contribute to these deaths. The per capita Gross Domestic Product (GDPpc), among some other factors, as a proxy for income significantly affects infant mortality rate. GDP measures the monetary value of final goods and services produced in a country in a year, while the ratio of GDP to the total population of a country is the GDPpc.

Annual cross-country data from the World Bank database during the years 1998 and 2014 demonstrate wide variation in infant mortality rates and gross domestic product per capita. All the datasets show that there is a range of high infant mortality at low GDPpc levels and there is a range of high GDPpc levels with low infant mortality. Unfortunately, the data are so noisy that there cannot be stated any simple relationship between IMR and GDPpc. However, using least squares estimates of infant mortality rates and assuming that GDPpc is subject to non-decreasing returns offers a meaningful method that is quite appropriate for modeling these datasets. Indeed, we understand at once the increasing slope of the IMR curve and we provide a quantitative explanation to what economists have observed: that at highest GDPpc levels, IMR increases after bottoming out. The advantage of our method is that it gives a clear quantitative model for confirmation of assumptions which so far had only qualitative support.

This presentation consists of two parts. The first part provides empirical evidence and demonstrates the suitability of our assumption on the increasing slopes of the IMR curve. These results are typically intended for use as a guide to policy makers. The second part explains the optimization method for calculating the solution to the problem stated. The description of the method is very instructive to our analysis.

**keywords** convexity, gross domestic product, increasing returns, infant mortality rates, least squares, quadratic programming, splines.