The R-r-ρ Identity for Rectangles

Soumadeep Ghosh

Kolkata, India

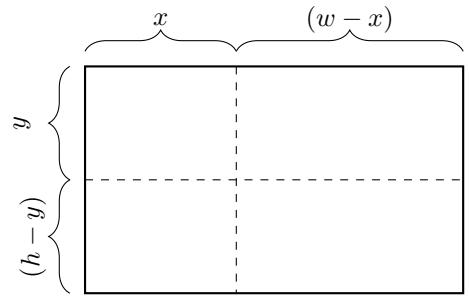
Abstract

In this paper, I describe the R-r-ρ identity for rectangles, its applications and the implications when it doesn't hold.
The paper ends with "The End"

Introduction

The R-r-ρ identity for rectangles is simple to describe, has varied applications, and implications when the identity doesn't hold.
In this paper, I describe the R-r-ρ identity for rectangles.

The R-r-ρ Identity for Rectangles



The rectangle was width $w > 0$ and height $h > 0$.
There exists a point at horizontal distance $0 < x < w$ from the top-left.
There exists a point at vertical distance $0 < y < h$ from the top-left.
Then

$$wh = xy + x(h-y) + y(w-x) + (w-x)(h-y) \tag{1}$$

Define

$$R = \frac{x}{w-x} \tag{2}$$

Define

$$r = \frac{y}{h-y} \tag{3}$$

Define

$$\rho = \frac{xy}{wh-xy} \tag{4}$$

Eliminating w and h from 1 2, 3 and 4, yields the R-r-ρ identity

$$(1+R)\rho = r(R-\rho) \tag{5}$$

Applications of the Identity

This identity serves as a check in

1. The measurement of areas in economics
2. The measurement of global stock market capitalization
3. The measurement of weightage in a portfolio

Implications when the Identity Doesn't Hold

Whenever this identity **doesn't hold**, there are **profound** implications for the real world.

The End