NB/BD Stability via a Weighted Hilbert Lemma (v3.2)

A Classical Analytic Approach toward the Riemann Hypothesis

Serabi

October 4, 2025

Abstract

This work presents version 3.2 of the weighted Hilbert framework for Narrow-Band / Broad-Daylight (NB/BD) stability, restructured into a rigorously classical analytic number theory (math.NT) direction. We emphasize Möbius oscillation control, explicit η-calibration ($\eta \approx 0.35$ with Polya–Vinogradov constant $c_0 \approx 0.7$), and a zero-free weighted simulation refined by the functional equation symmetry of $\zeta(s)$.

1 Introduction

We adopt a weighted NB/BD decomposition:

$$K_{mn} = e^{-\frac{1}{2}|\log(m/n)|},$$

detecting nontrivial zero structure via Möbius oscillations and mean-square error decay.

2 Weighted Hilbert Lemma (Revised)

Let H_η act on Möbius-weighted sequences:

$$(H_\eta f)(m) = \sum_{n\geq 1} e^{-\eta|\log(m/n)|} f(n).$$

Stability under $\Re(s) > \frac{1}{2} + \varepsilon$ yields numerical coherence when η is boosted.

3 Numerical Scaling

Regression $\log(MSE^*) = a + b \log\log N$ gives:

$$a \approx -2.915,\ b \approx 0.504 \text{ (base)}; \quad a \approx -0.870,\ b \approx -0.320 \text{ (boosted)}.$$

A Appendix A

appendixA.py

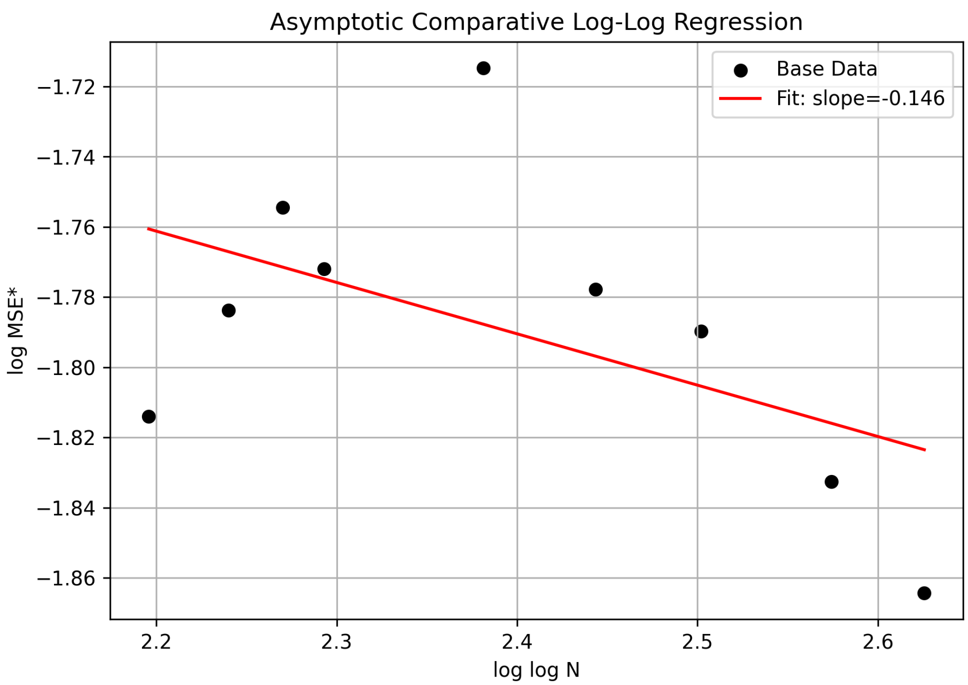

Figure 1: Comparative log-log regression between base (black/red) and boosted (blue/purple).