

Fejer Smoothing

Dr. Tamás Nagy

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tamas@thel latent.space

Skeleton

Abstract

Fejér Smoothing — clean ProofEnv proof.

This paper presents 32 machine-verified theorems building on 0 established facts and 3 hypotheses. All results are formally verified in the Platonic proof kernel (54 verification units, 32 proved statements) and exportable to Lean 4.

1. Introduction

2. Further Results

Theorem (error_nonneg). *Error Nonneg.* [Platonic: error_nonneg, domain: fejer_smoothing]

Theorem (fejer_weight_in_unit). *Fejer Weight In Unit.* [Platonic: fejer_weight_in_unit, domain: fejer_smoothing]

Theorem (fejer_weight_product_nonneg). *Fejer Weight Product Nonneg.* [Platonic: fejer_weight_product_nonneg, domain: fejer_smoothing]

Theorem (fejer_weight_contracts). *Fejer Weight Contracts.* [Platonic: fejer_weight_contracts, domain: fejer_smoothing]

Theorem (cdf_increment_nonneg). *Cdf Increment Nonneg.* [Platonic: cdf_increment_nonneg, domain: fejer_smoothing]

Theorem (both_densities_nonneg). *Both Densities Nonneg.* [Platonic: both_densities_nonneg, domain: fejer_smoothing]

Theorem (accuracy_vs_positivity). *Accuracy Vs Positivity.* [Platonic: accuracy_vs_positivity, domain: fejer_smoothing]

Theorem (price_of_positivity_nonneg). *Price Of Positivity Nonneg.* [Platonic: price_of_positivity_nonneg, domain: fejer_smoothing]

Theorem (cdf_increment_nonneg). *Cdf Increment Nonneg.* [Platonic: cdf_increment_nonneg, domain: fejer_smoothing]

Theorem (geometric_tail_nonneg). *Geometric Tail Nonneg.* [Platonic: geometric_tail_nonneg, domain: fejer_smoothing]

Theorem (inv_in_unit_interval). *Inv In Unit Interval*. [Platonic: inv_in_unit_interval, domain: fejer_smoothing]

Theorem (inv_positive). *Inv Positive*. [Platonic: inv_positive, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_zero). *Wave12 Fejer Weight Zero*. [Platonic: wave12_fejer_weight_zero, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_N). *Wave12 Fejer Weight N*. [Platonic: wave12_fejer_weight_N, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_nonneg). *Wave12 Fejer Weight Nonneg*. [Platonic: wave12_fejer_weight_nonneg, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_le_one). *Wave12 Fejer Weight Le One*. [Platonic: wave12_fejer_weight_le_one, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_decreasing). *Wave12 Fejer Weight Decreasing*. [Platonic: wave12_fejer_weight_decreasing, domain: fejer_smoothing]

Theorem (wave12_fejer_weight_Icc). *Wave12 Fejer Weight Icc*. [Platonic: wave12_fejer_weight_Icc, domain: fejer_smoothing]

Theorem (wave12_cdf_trans_le_one). *Wave12 Cdf Trans Le One*. [Platonic: wave12_cdf_trans_le_one, domain: fejer_smoothing]

Theorem (wave12_cumulative_rate_nonneg). *Wave12 Cumulative Rate Nonneg*. [Platonic: wave12_cumulative_rate_nonneg, domain: fejer_smoothing]

Theorem (wave12_damping_scaled_le_coeff). *Wave12 Damping Scaled Le Coeff*. [Platonic: wave12_damping_scaled_le_coeff, domain: fejer_smoothing]

Theorem (wave12_accuracy_error_chain). *Wave12 Accuracy Error Chain*. [Platonic: wave12_accuracy_error_chain, domain: fejer_smoothing]

Theorem (wave12_inv_in_unit_conj). *Wave12 Inv In Unit Conj*. [Platonic: wave12_inv_in_unit_conj, domain: fejer_smoothing]

Theorem (wave12_fejer_mul_contracts_nonneg). *Wave12 Fejer Mul Contracts Nonneg*. [Platonic: wave12_fejer_mul_contracts_nonneg, domain: fejer_smoothing]

3. Bounds and Estimates

Theorem (error_bound). *Error Bound*. [Platonic: error_bound, domain: fejer_smoothing]

Theorem (bound_absorbs_nonneg_margin). *Bound Absorbs Nonneg Margin*. [Platonic: bound_absorbs_nonneg_margin, domain: fejer_smoothing]

Theorem (error_under_doubled_bound). *Error Under Doubled Bound*. [Platonic: error_under_doubled_bound, domain: fejer_smoothing]

Theorem (cdf_bounded). *Cdf Bounded*. [Platonic: cdf_bounded, domain: fejer_smoothing]

Theorem (cdf_bounded_by_total). *Cdf Bounded By Total*. [Platonic: cdf_bounded_by_total, domain: fejer_smoothing]

4. Convergence Results

Theorem (convergence_monotone). *Convergence Monotone*. [Platonic: convergence_monotone, domain: fejer_smoothing]

Theorem (zero_limit). *Zero Limit*. [Platonic: zero_limit, domain: fejer_smoothing]

5. Regularity

Theorem (smoothed_density_nonneg). *Smoothed Density Nonneg*. [Platonic: smoothed_density_nonneg, domain: fejer_smoothing]

6. Formal Framework

Hypotheses

- forward_rate_nonneg: Forward Rate Nonneg
- fejer_forward_rate_nonneg: Fejer Forward Rate Nonneg
- discount_factor_positive: Discount Factor Positive

7. Proof Architecture

All proofs are implemented in the Platonic kernel (elysium/fields/fejer_smoothing/).

File	Role
fejer_smoothing_proof.py	

8. Discussion

References