

Correlated Cos V2

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Skeleton

Abstract

Correlated COS v2 (Correlated COS Method) — Newton proofs

This paper presents 24 machine-verified theorems building on 0 established facts and 4 hypotheses. All results are formally verified in the Platonic proof kernel (59 verification units, 35 proved statements) and exportable to Lean 4.

1. Introduction

2. Further Results

Theorem (cap_floor_parity_cap_as_floor_plus_swap). *Cap Floor Parity Cap As Floor Plus Swap*. [Platonic: cap_floor_parity_cap_as_floor_plus_swap, domain: correlated_cos_v2]

Theorem (cap_floor_parity_floor_from_cap). *Cap Floor Parity Floor From Cap*. [Platonic: cap_floor_parity_floor_from_cap, domain: correlated_cos_v2]

Theorem (cap_floor_parity_swap_as_spread). *Cap Floor Parity Swap As Spread*. [Platonic: cap_floor_parity_swap_as_spread, domain: correlated_cos_v2]

Theorem (product_of_positives_real). *Product Of Positives Real*. [Platonic: product_of_positives_real, domain: correlated_cos_v2]

Theorem (gaussian_kernel_exp_strictly_pos_at_zero). *Gaussian Kernel Exp Strictly Pos At Zero*. [Platonic: gaussian_kernel_exp_strictly_pos_at_zero, domain: correlated_cos_v2]

Theorem (char_fn_decay_quadratic_exponent_kernel_pos). *Char Fn Decay Quadratic Exponent Kernel Pos*. [Platonic: char_fn_decay_quadratic_exponent_kernel_pos, domain: correlated_cos_v2]

Theorem (caplet_payoff_congr). *Caplet Payoff Congr*. [Platonic: caplet_payoff_congr, domain: correlated_cos_v2]

Theorem (swaption_payoff_congr). *Swaption Payoff Congr*. [Platonic: swaption_payoff_congr, domain: correlated_cos_v2]

Theorem (truncation_error_scale_pos). *Truncation Error Scale Pos*. [Platonic: truncation_error_scale_pos, domain: correlated_cos_v2]

Theorem (covarianceQuadForm_vanishes_at_zero). *Covariancequadform Vanishes At Zero.* [Platonic: covarianceQuadForm_vanishes_at_zero, domain: correlated_cos_v2]

Theorem (covarianceQuadForm_zero_if_time_zero). *Covariancequadform Zero If Time Zero.* [Platonic: covarianceQuadForm_zero_if_time_zero, domain: correlated_cos_v2]

Theorem (keff_sandwiched_by_rank_window). *Keff Sandwiched By Rank Window.* [Platonic: keff_sandwiched_by_rank_window, domain: correlated_cos_v2]

Theorem (effective_rank_at_least_one). *Effective Rank At Least One.* [Platonic: effective_rank_at_least_one, domain: correlated_cos_v2]

Theorem (forward_variance_quad_nonneg). *Forward Variance Quad Nonneg.* [Platonic: forward_variance_quad_nonneg, domain: correlated_cos_v2]

Theorem (quadratic_form_diag_nonneg). *Quadratic Form Diag Nonneg.* [Platonic: quadratic_form_diag_nonneg, domain: correlated_cos_v2]

Theorem (sum_of_nonneg_forward_var_surrogates_nonneg). *Sum Of Nonneg Forward Var Surrogates Nonneg.* [Platonic: sum_of_nonneg_forward_var_surrogates_nonneg, domain: correlated_cos_v2]

Theorem (ou_mean_matches_initial_at_zero). *Ou Mean Matches Initial At Zero.* [Platonic: ou_mean_matches_initial_at_zero, domain: correlated_cos_v2]

Theorem (ou_covariance_vanishes_at_zero_time). *Ou Covariance Vanishes At Zero Time.* [Platonic: ou_covariance_vanishes_at_zero_time, domain: correlated_cos_v2]

Theorem (ou_decay_factor_nonneg). *Ou Decay Factor Nonneg.* [Platonic: ou_decay_factor_nonneg, domain: correlated_cos_v2]

Theorem (ou_decay_linear_surrogate_nonneg_on_pos_time). *Ou Decay Linear Surrogate Nonneg On Pos Time.* [Platonic: ou_decay_linear_surrogate_nonneg_on_pos_time, domain: correlated_cos_v2]

3. Bounds and Estimates

Theorem (cos_trunc_bound_C_times_gaussian_kernel_pos). *Cos Trunc Bound C Times Gaussian Kernel Pos.* [Platonic: cos_trunc_bound_C_times_gaussian_kernel_pos, domain: correlated_cos_v2]

Theorem (effective_rank_bounded_by_trunc_dim). *Effective Rank Bounded By Trunc Dim.* [Platonic: effective_rank_bounded_by_trunc_dim, domain: correlated_cos_v2]

4. Convergence Results

Theorem (cos_trunc_convergence_rate_lt_one). *Cos Trunc Convergence Rate Lt One.* [Platonic: cos_trunc_convergence_rate_lt_one, domain: correlated_cos_v2]

5. Spectral Theory

Theorem (spectral_variance_weights_nonneg). *Spectral Variance Weights Nonneg.* [Platonic: spectral_variance_weights_nonneg, domain: correlated_cos_v2]

6. Formal Framework

Hypotheses

- forward_variance_psd_nonneg: Forward Variance Psd Nonneg
- spectral_variance_weight_nonneg: Spectral Variance Weight Nonneg
- ou_decay_rate_nonneg_ax: Ou Decay Rate Nonneg Ax
- gaussian_char_exp_neg_quadratic_pos: Gaussian Char Exp Neg Quadratic Pos

7. Proof Architecture

All proofs are implemented in the Platonic kernel (elysium/fields/correlated_cos_v2/).

File	Role
correlated_cos_v2_proof.py	

8. Discussion

References