"Measuring Financial Investor Presence Through Term Structure Deflection"

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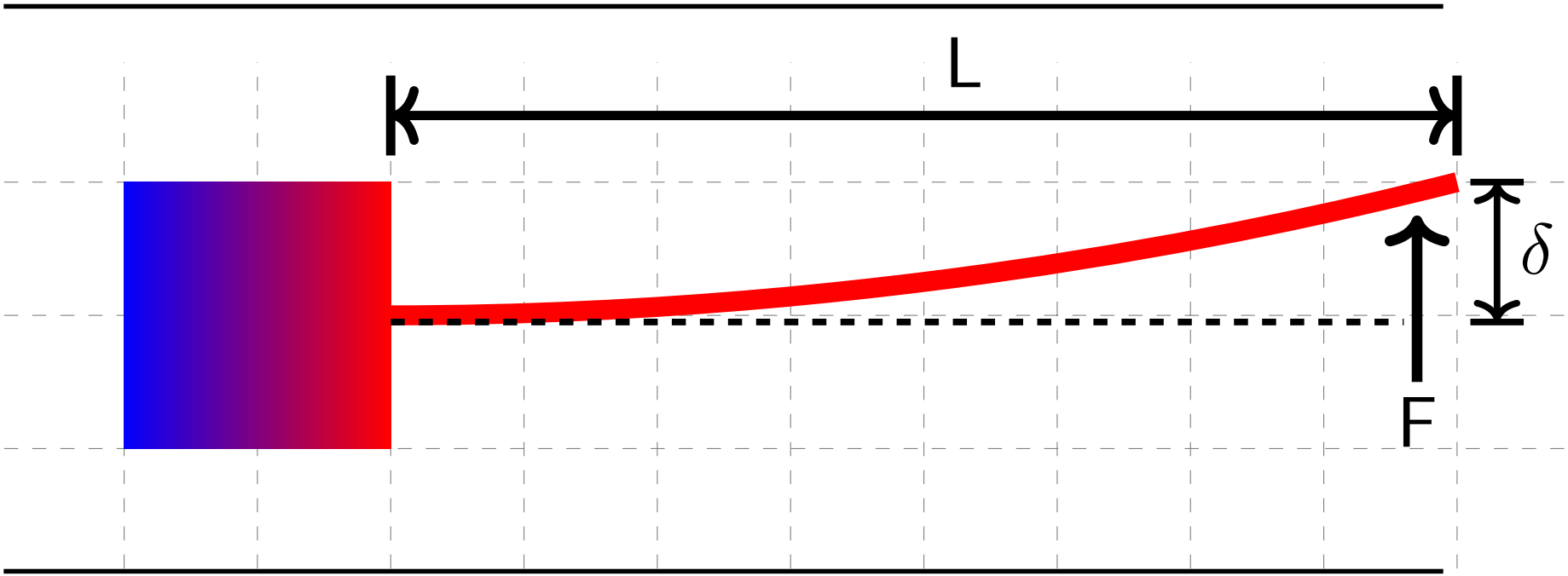
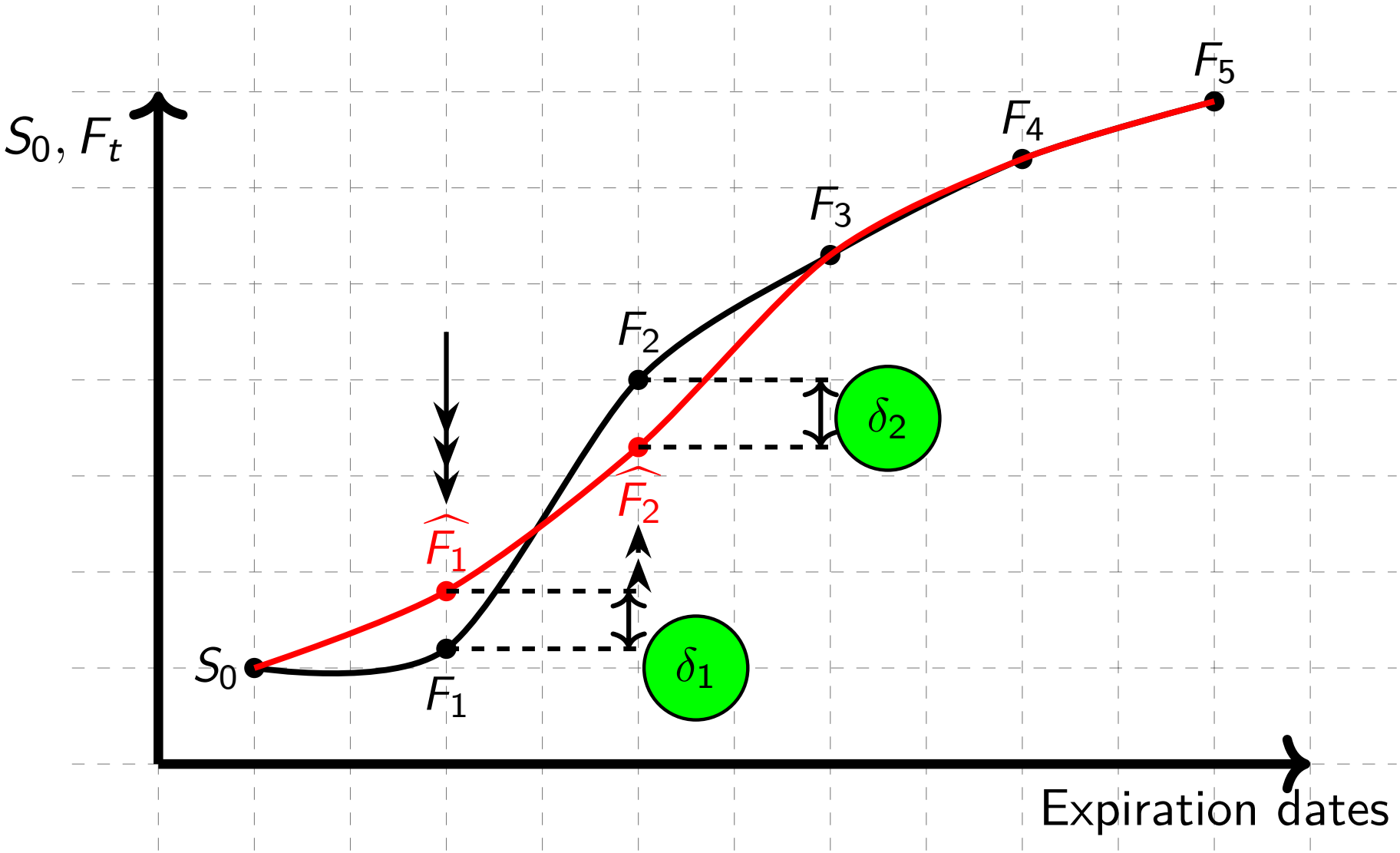
Deflection

- In engineering, deflection is a distance, δ, by which a structural element, e.g., a beam of length L, is displaced due to an application of a directional force, F, relative to a situation in which there is no such force (dashed line).



- Deflection, δ, is typically proportional to the force F and a polynomial of the length L, e.g., $\delta = constant \times FL^3$ for the end load on a cantilever beam with a single fixed support.

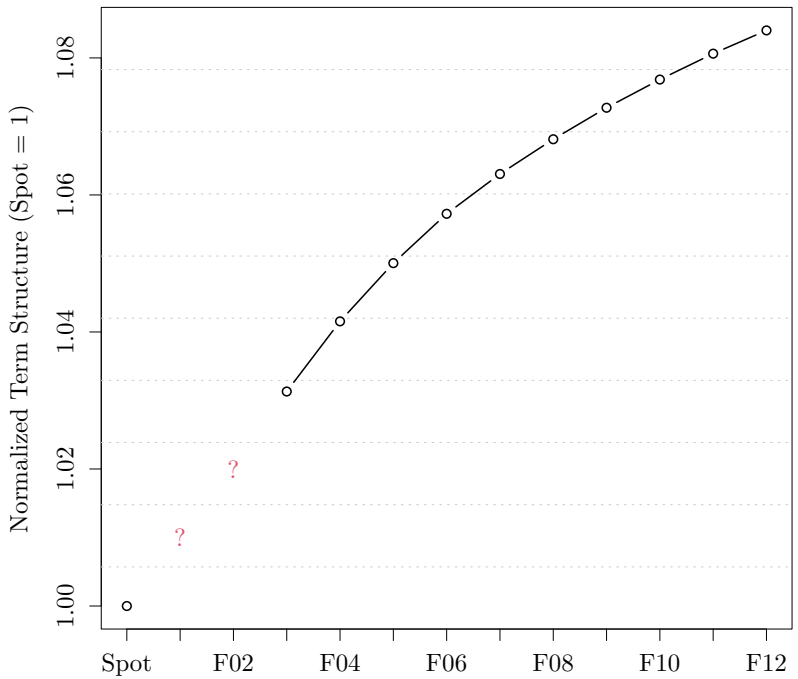
Deflection of the Term Structure of Futures Prices



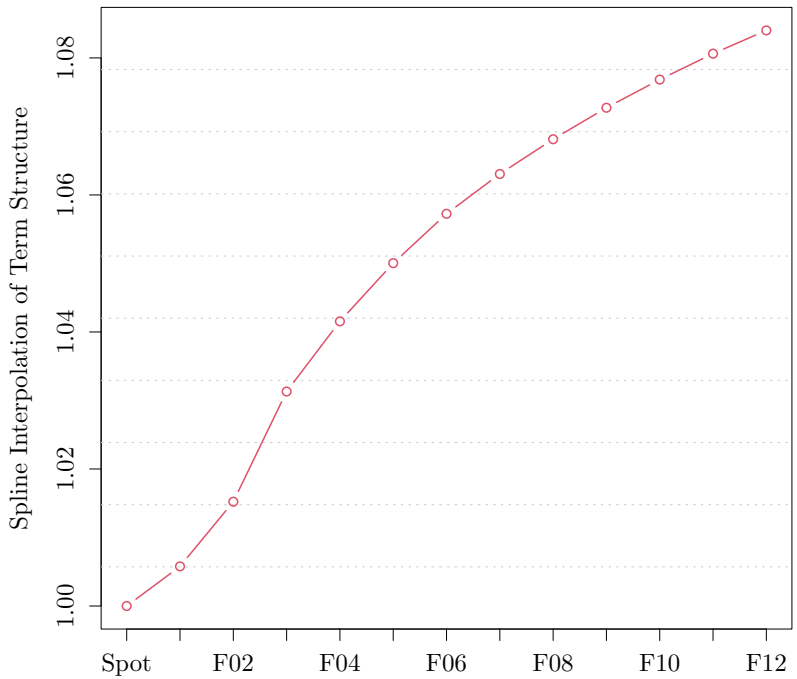
The Deflection Measure

- Our deflection measure is constructed from futures prices ONLY. We calculate it for five roll days for each month and then aggregate it.
- It is intuitive - calculated in CENTS per barrel, i.e., a "rolling-out" deflection of 28 cents for contract F1 and a "rolling-in" deflection of 16 cents for contract F2 make a combined monthly net deflection of 44 cents per barrel.
- It does NOT require CFTC COT data (and, hence, does not rely on the commercial vs. non-commercial split).
- It does NOT require CFTC CIT data (ends in 2015).
- It does NOT require parametric or nonparametric estimation (needed for the estimation of risk premium/premia).
- It does NOT depend on the overall slope of the term structure (backwardation or contango).

The Deflection Measure: Mechanics



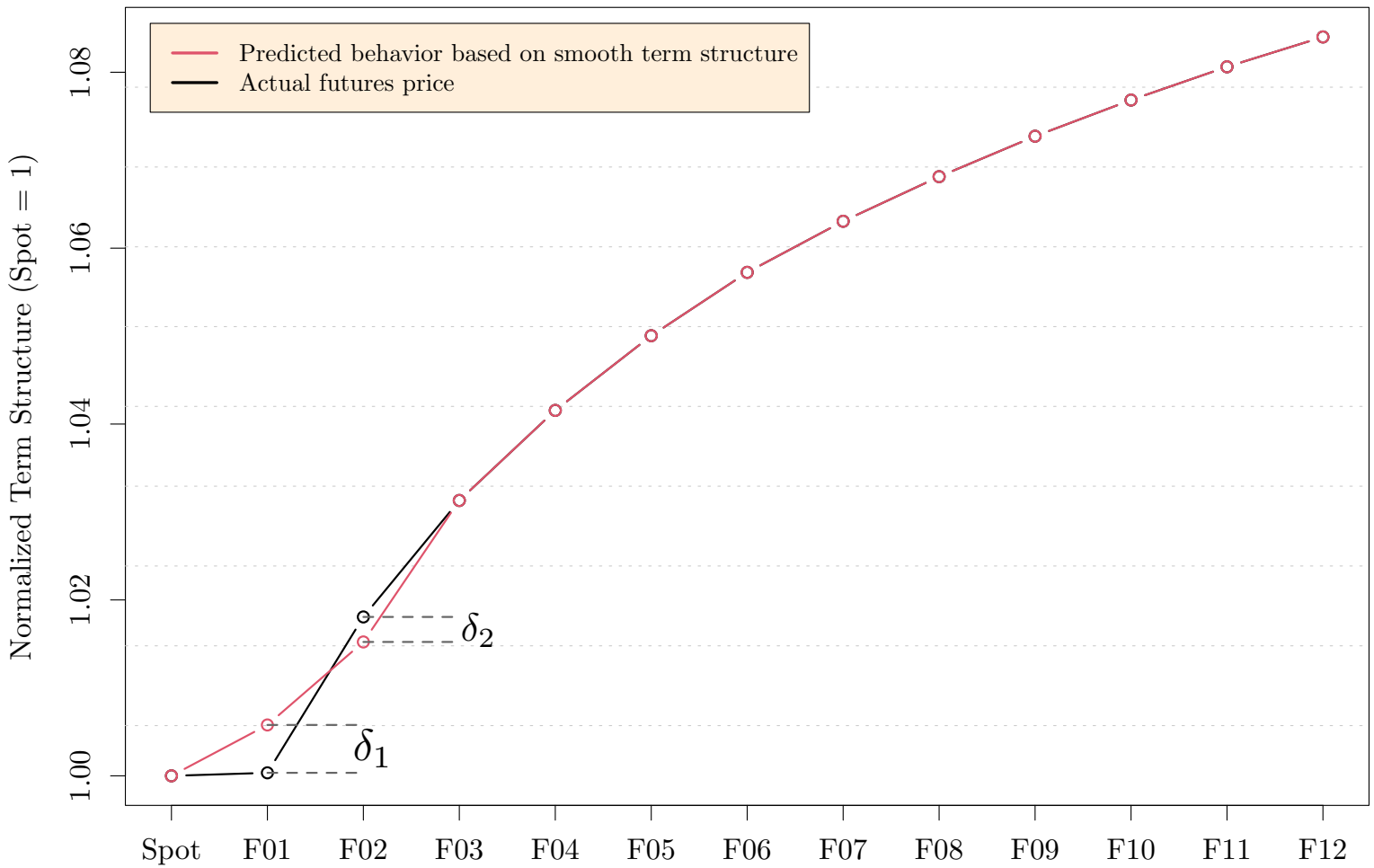
(a) Remove F1 and F2 from term structure



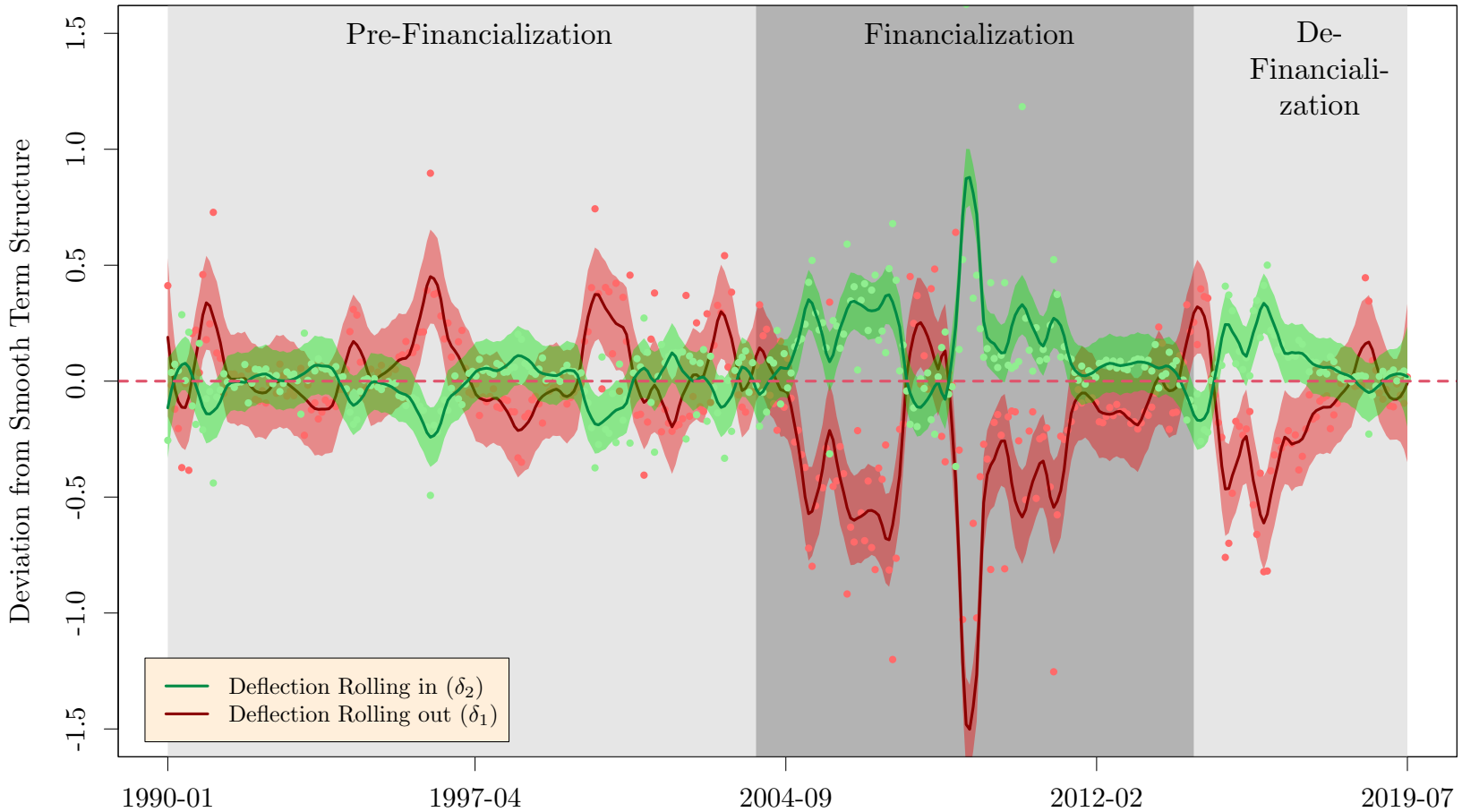
(b) Fit missing observations with spline

The Deflection Measure: Empirical

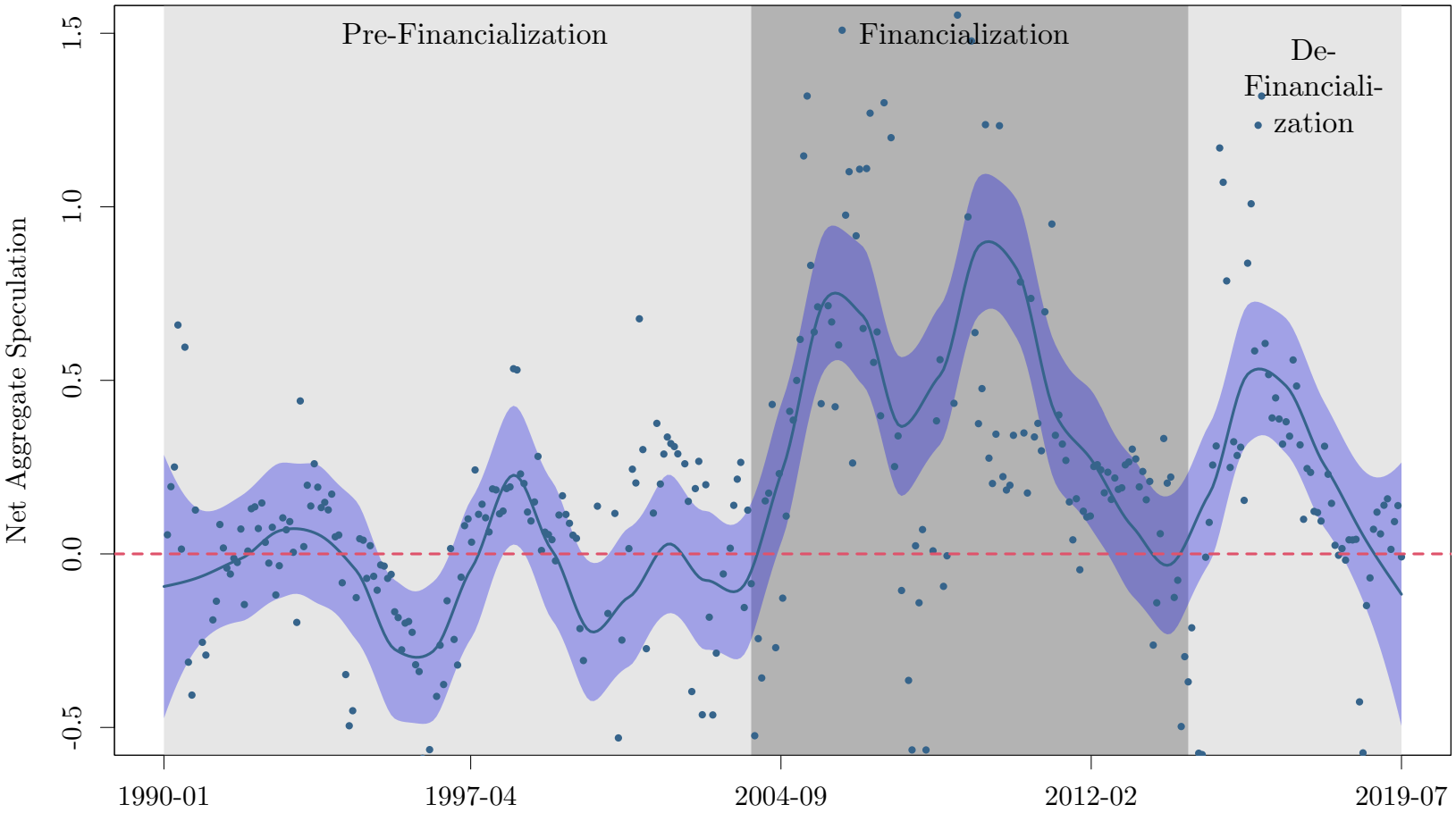
Empirical Deflection of Term Structure



The Deflection Measure: Time Series of Components



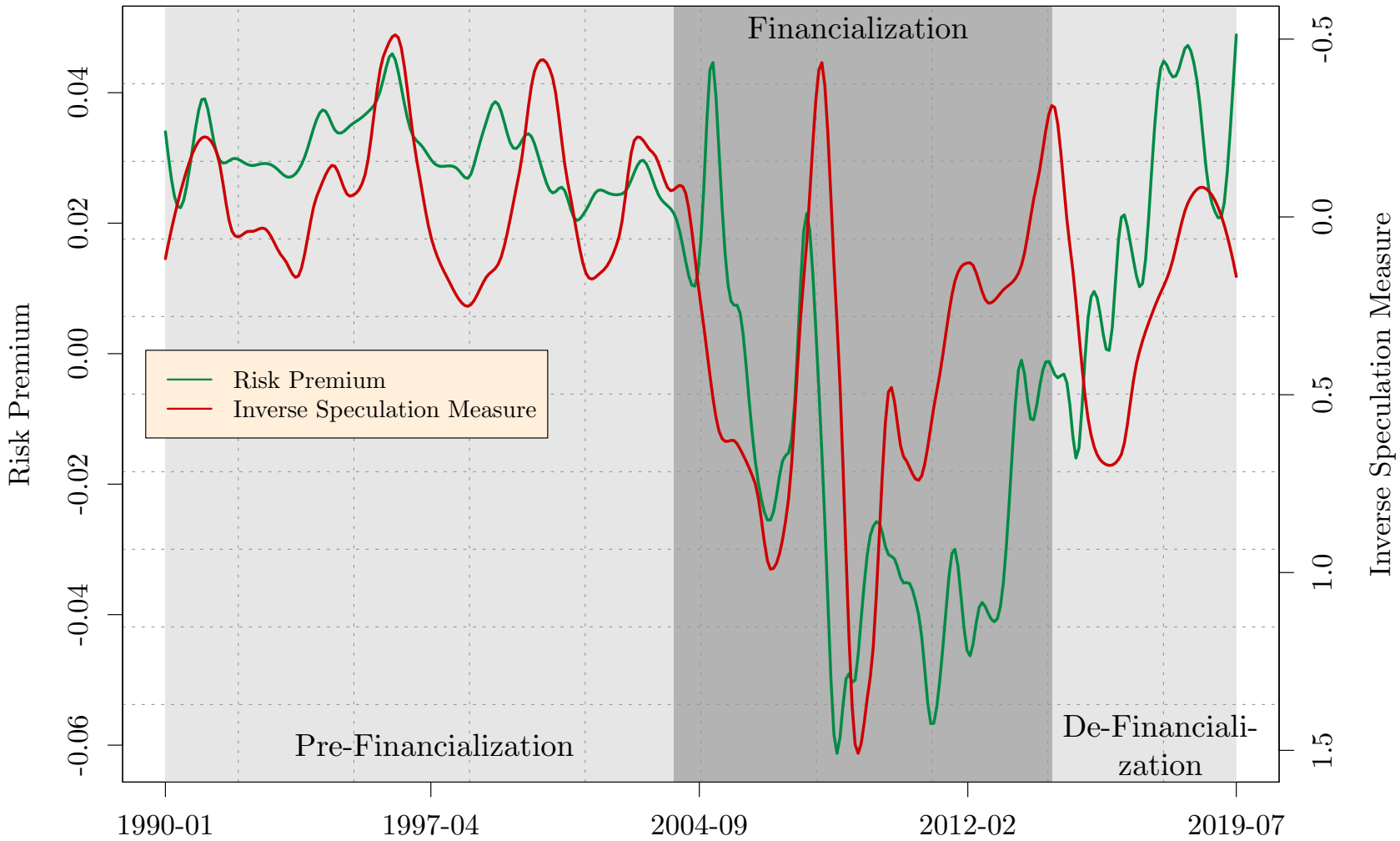
The Deflection Measure: Time Series



The Deflection Measure and Other Measures

- $RP_t = E_t[S_T] - F_{t,T}$ (Hamilton and Wu, 2014)
- $HP_t = \frac{CS_t - CL_t}{OI_t}$ (CFTC Data)
- $Q_t = \frac{CNS_t - CNS_{t-1}}{OI_{t-1}}$ (CFTC Data)
- $LTST_t = R_{LT,t} - R_{ST,t}$ (Kang, Rouwenhorst and Tang, 2020)

The Deflection Measure vs. the Risk Premium Measure



The Deflection Measure and Volatility

$$\hat{\sigma}_t = (log(P_{t,max}) - log(P_{t,min})) \cdot \sqrt{4}$$

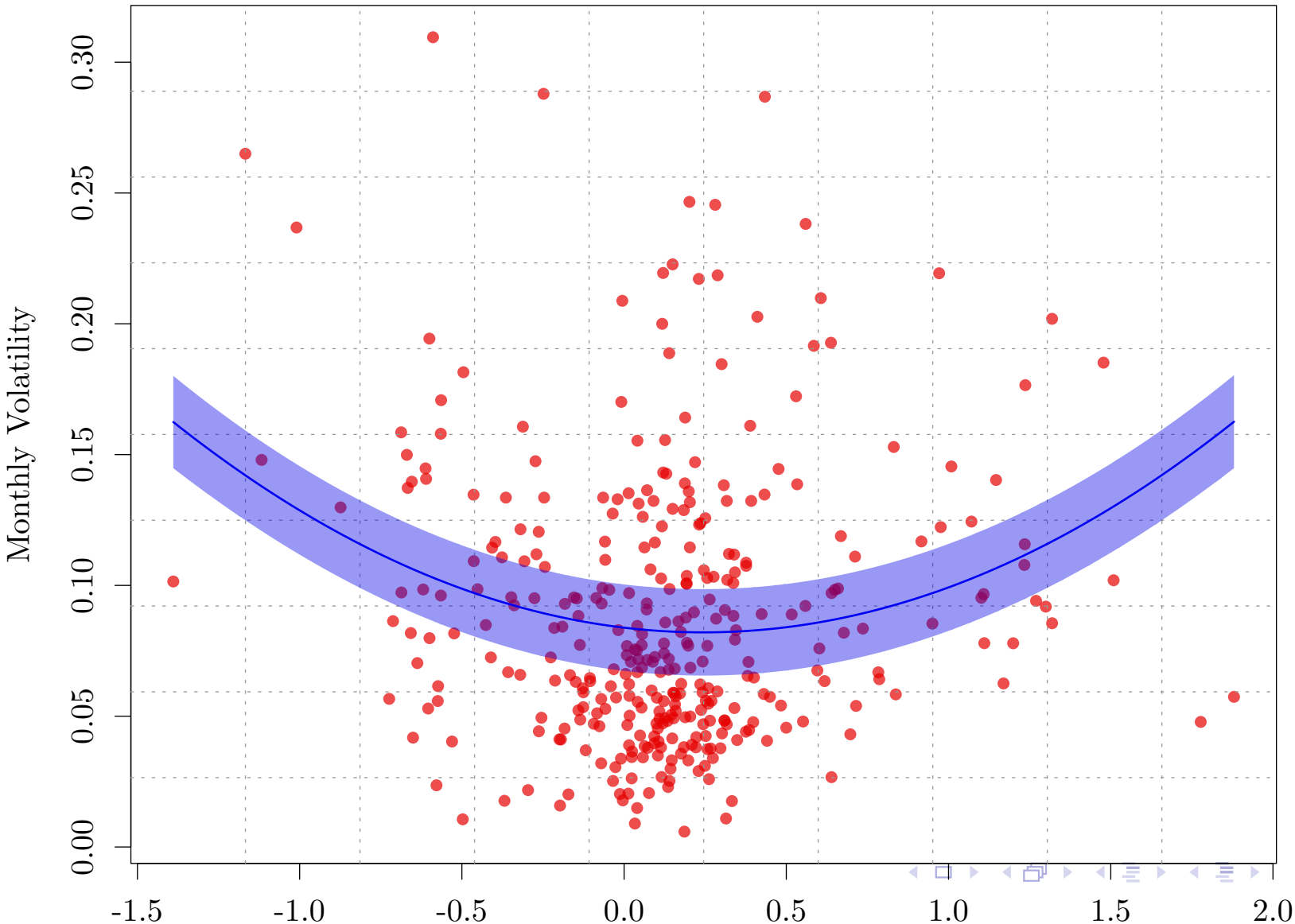
$$\hat{\sigma}_t = \beta_0 + \beta_1 \cdot RiskPremium_t + \beta_2 \cdot Deflection_t + \quad (1)$$
$$\beta_3 \cdot HP_t + \beta_4 \cdot Q_t + \beta_5 \cdot LTST_t + \quad (2)$$
$$\beta_6 \cdot Kilian_t + \beta_7 \cdot Inventory_t + \beta_8 \cdot TBill_t + \quad (3)$$
$$\beta_9 \cdot S\&P500_t + \beta_{10} \cdot VIX_t + \varepsilon_t \quad (4)$$

- $\hat{\beta}_2 < 0$: Financial investors "absorb" next week's volatility.
- $\hat{\beta}_2 > 0$: Financial investors "amplify" next week's volatility.

The Deflection Measure and Volatility

	Dependent Variable: Oil Futures Volatility								
	Pre-Financialization			Financialization			De-Financialization		
Risk Premium	2.77		3.98	−0.54		−0.42*	−0.45		−0.04
Deflection		−5.10**	−3.30**		2.94**	1.30**		4.54***	0.84
Hedging Pressure			−16.55			−22.04*			−24.26
Net Trading Q			4.93			17.51			2.32
LTST			0.09*			−0.22**			0.08
Kilian Index			0.01			−0.01			−0.05**
ΔOil Inventory			−0.23			0.04			−0.54
3-Month T-Bill			0.35			0.58			−0.43
ΔS&P 500			0.16			−0.01			0.07
VIX			0.49**			0.42***			0.38
Obs.	167	167	167	125	125	125	62	62	62
Adj. R-squared	0.02	0.03	0.09	0.04	0.12	0.53	0.01	0.12	0.32

The Deflection Measure and Volatility Smile



Robustness: Different Financialization Dates

	Dependent Variable: Oil Futures Volatility								
	Pre-Financialization			Financialization			De-Financialization		
Risk Premium	0.28	0.12		−2.00	−0.46*		−0.45	−0.04	
Deflection		−2.39**	−1.58		3.87***	1.81***		4.54***	0.84
Hedging Pressure			−4.54			−9.63			−24.26
Net Trading Q			0.11			10.64			2.32
LTST			0.05			−0.42			0.08
Kilian Index			0.00			−0.03**			−0.05**
ΔOil Inventory			−0.06			−0.75			−0.54
3-Month T-Bill			0.49			16.37***			−0.43
ΔS&P 500			0.18			0.03			0.07
VIX			0.34**			0.46***			0.38
Obs.	223	223	223	69	69	69	62	62	62
Adj. R-squared	0.00	0.01	0.03	0.13	0.19	0.69	0.01	0.12	0.32

Robustness: Controlling for Extreme Events

	Dependent Variable: Oil Futures Volatility								
	Pre-Financialization			Financialization			De-Financialization		
Risk Premium	2.77		4.52	−0.54		−0.40*	−0.45		0.02
Deflection		−2.58**	−1.75		3.91***	1.36*		4.98***	1.37
Hedging Pressure			−17.36			−21.96*			−23.38
Net Trading Q			4.81			16.97			2.37
LTST			0.09*			−0.21**			0.07
Kilian Index			0.01			−0.01			−0.04**
ΔOil Inventory			−0.29			−0.01			−0.51
3-Month T-Bill			0.38			0.51			−0.56
ΔS&P 500			0.15			0.01			0.07
VIX			0.51**			0.41***			0.38
Obs.	167	167	167	125	125	125	62	62	62
Adj. R-squared	0.02	0.01	0.08	0.04	0.19	0.53	0.01	0.13	0.32

Robustness: Controlling for 10-day front-runners

	Dependent Variable: Oil Futures Volatility								
	Pre-Financialization			Financialization			De-Financialization		
Risk Premium	2.77		5.21*	−0.54		−0.45**	−0.45		−0.09
Deflection		0.65	2.49		3.07*	1.54*		5.22*	−1.16
Hedging Pressure			−18.27			−25.60**			−28.69
Net Trading Q			4.69			17.98			5.29
LTST			0.09			−0.20**			0.09
Kilian Index			0.01			−0.01*			−0.05**
ΔOil Inventory			−0.25			0.19			−0.55
3-Month T-Bill			0.38			0.71			−0.15
ΔS&P 500			0.15			0.02			0.11
VIX			0.52**			0.43***			0.40
Obs.	167	167	167	125	125	125	62	62	62
Adj. R-squared	0.02	0.01	0.08	0.04	0.04	0.52	0.01	0.01	0.32

Concluding Remarks

1. We propose a new measure of financial investor presence in commodity futures markets - deflection of the term structure.
2. We show that, during the 10-year financialization period, observed first and second nearby futures prices get **deflected** by an average by 44 cents per barrel.
3. Our measure contains **sufficient own variation** to motivate its use and captures investor presence to an extent that the risk premium cannot.
4. The measure is **easy** to replicate, it can serve as a real-time measure of financial investor presence to guide commercial hedgers and policy makers in commodity futures markets.