Discussion of "The Predictive Ability of Commodity Currencies Volatility Risk Premium"

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Mexico City; August 18, 2016

Introduction/Motivation

Option Prices across Strike and Tenor Highly Informative: Combine Market Expectations & Risk Pricing

- Equity-Index VRP Predicts Future Equity Excess Returns
- But Empirical Evidence Weaker than Initially Asserted
- Predictability Stems from Pricing of Downside Tail Risk (Jumps)
- Evidence Consistent across U.S. and European Countries
- FX Volatility Risk Premium Less Explored
- Emphasis on Commodity Currencies Sensible

Research Question: Does Volatility Risk Pricing Matter more Broadly Interplay across Distinct Global Asset Classes of Significant Interest

Overview

Discussion

- Introduction to Framework for Variance Risk Premium (VRP)
- Measure Expected Return Variation from Options ($\mathbb{Q}$)
- Measure Expected Return Variation from HF Returns ($\mathbb{P}$)
- Implications for Paper's Approach to VRP Measurement
- Summary of Paper's Findings
- Review Recent Evidence on Equity Risk Premium
- Interpretation: Which Option Prices Predict Equity Risk Premium
- Suggestions for Research on Commodity Price Predictability

Setting and Empirical Measurement

Continuous-Time, No-Arbitrage Price Process

$$r_{t+h,t} = p_{t+h} - p_t = \int_t^{t+h} \mu_u \, du + \int_t^{t+h} \sigma_u \, dW_u + \sum_{t \leq u \leq t+h} \kappa_u$$

Prices Move Continuously, Scaled by Volatility, and via Jumps

Quadratic Return Variation

$$QV_{t,t+h} = \int_t^{t+h} \sigma_u^2 \, du + \sum_{t \leq u \leq t+h} \kappa_u^2 \approx \sum_{i=1,\ldots,n \cdot h} r^2_{t+\frac{i}{n}, t+\frac{i-1}{n}}$$

RV = Cumulative Squared High-Frequency Returns $\approx$ QV

Setting and Empirical Measurement

Variance Risk Premium

$$VRP_{t,t+h} \;=\; E_t^{\mathbb{Q}}\left[QV_{t,t+h}\right] \;-\; E_t^{\mathbb{P}}\left[QV_{t,t+h}\right]$$

$$\text{VRP} \;=\; \text{Price}\left[\text{Future Return Variation}\right] - E\left[\text{Future Return Variation}\right]$$

1st Term: Sum of Weighted Option Prices over Full Range, $(0, \infty)$

- Approximate by Finite Sum plus Interpolation and Extrapolation

2nd Term: Statistical Expectation of Return Fluctuations

- Use Model for Forecasting Volatility Exploiting Persistence

Setting and Empirical Measurement

Expected Return Variation (QV) Measure under $\mathbb{Q}$

OTM Options Richly Priced, so ATM Volatility (much) Lower than MFIV

Short-Dated ATM Volatility close to Expected Diffusive Volatility,
so Misses (most of) Jump Volatility and associated Risk Pricing

MFIV requires Intrapolation and Extrapolation – Explain Procedure

Recommendations:

- Compute Actual MFIV from Broad Option Cross-Section
- Exploit Maturity beyond One Week; Longer Forecast Horizon
- Explore Discrepancy between ATM and MFIV Measure

Setting and Empirical Measurement

Expected Return Variation (QV) Measure under $\mathbb{P}$

RV (and QV) Realizations are Strongly Right Skewed (Outliers)

Mean Return over Short Horizon ≈ 0, so don't Estimate

Expected RV Best Assessed via Reduced-Form Model, Not Realization

Recommendations:

- Exclude Mean Return from RV Computation
- Add in Overnight, Weekend, Holiday Close-Open Squared Return
- Match RV Measure to Horizon for MFIV or ATM-IV Exactly
- Forecast Future RV via Reduced-Form Time Series Model (HAR)
- **Forward** RV Measure (Realized) Inferior to **Backward** (Unit Root)

Empirical Findings

Given Measurement Ambiguities, Not Convinced Results are Robust

Nevertheless, I Find Evidence Suggestive and Intriguing!

Issue: Large Vol Shock induces **Negative VRP** for that Week
But really Large Vol Innovation – Followed by Large VRP next Week

"Common Sense" Checks

- Plot VRP Measures (Backward, Forward, Model-Based)
- Check Serial Correlation of Empirical VRP
- Compute Correlation w/ Time t and $t+1$ Bid-Ask & Default Spread
- Correlate w/ FX, Commodity, Equity Returns – R^2 Excessive?

Empirical Findings

If Focus is Commodity Returns, Why Not Use Commodity VRP?

Long-Term Impact Important, Use Longer VRP Maturity?

Issue: VRP Innovation Interpretation – Focus on Long-Term Impact

Economic Rationale: Shock induces immediate Discount on Risk Assets Future Returns Up, as Shock Dissipates , or "Risk Appetite" Recovers

Findings: Effect of Positive CC-VRP Shock on Returns

- Commodities Up – Lasts 1-2 Month
- USD Up, EM-FX Down w/ Longer Impact (or I misinterpret Sign);
- All Equities Up – Long-Lasting Impact!
- Bonds Up (Yields Down) – but only One Week!
- Default Spreads Drop – Long Lasting Impact!

Empirical Findings

How Do We Interpret the Empirical Findings?

Longer-Term Impact on Global Equities (up), Credit Spreads (down)

Shock Less Lasting Effect on Commodities, some on FX EM Rates

Shock No Impact on Bonds (beyond One Week)

Rationale: CC-VRP Shocks Correlated w/ Global Bus Cycle Innovations?

Explore Asymmetric Risk Pricing in CC-FX Options (Up/Down Vol)

Explore Interaction b/w VRP Shocks across Global Asset Classes

E.g., How are Commodity- and Equity-VRP related to CC-VRP?

Andersen, Fusari, Todorov (AFT) on Tails versus Volatility

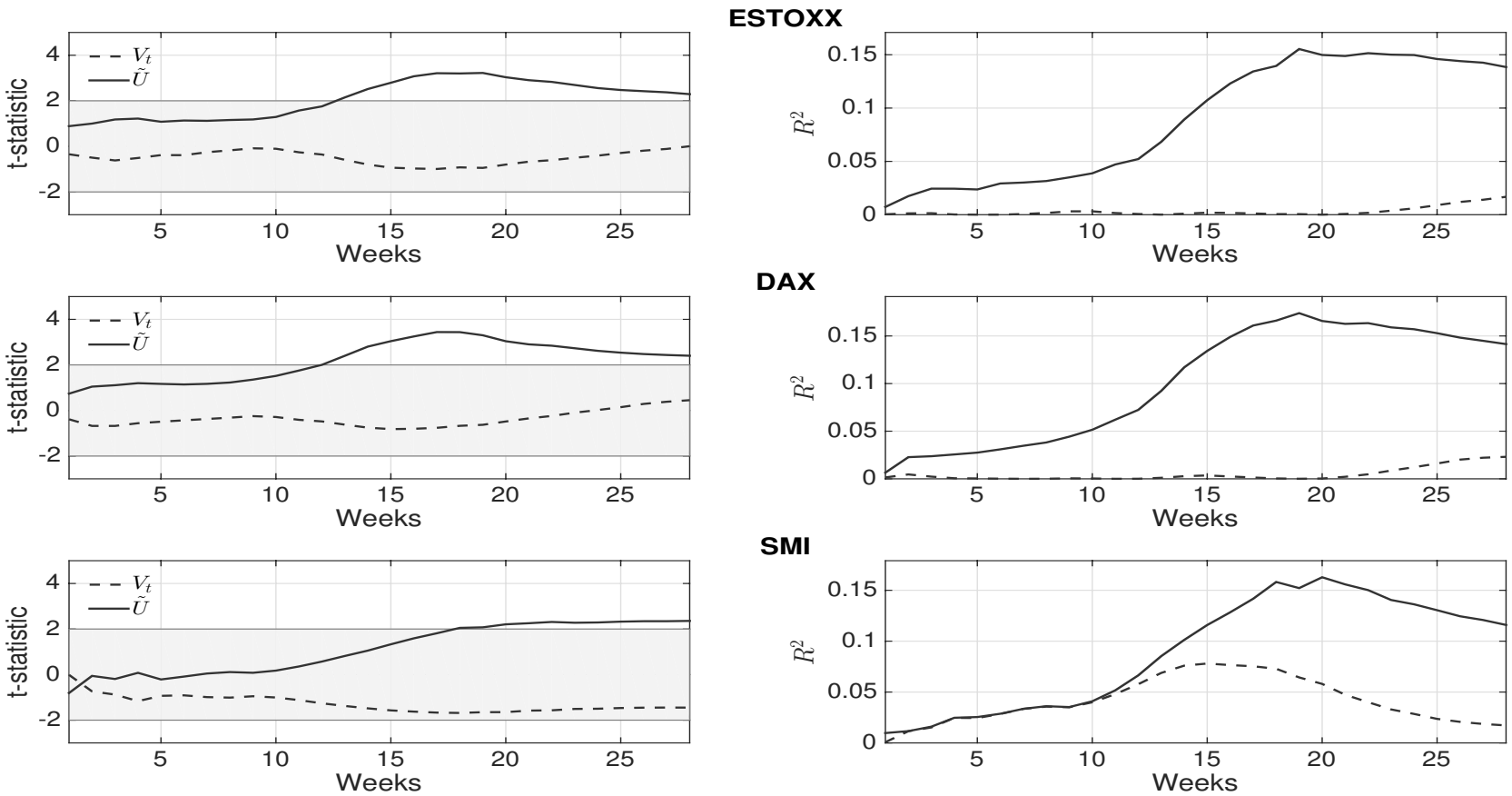
In (Affine) Parametric Model, Option Prices Tractable

Given Parameters, Option Prices Nonlinear Function of (Strike, Tenor) plus Common (Volatility, Jump) Factors

Use Option Surface to Extract Volatility and Tail Factor

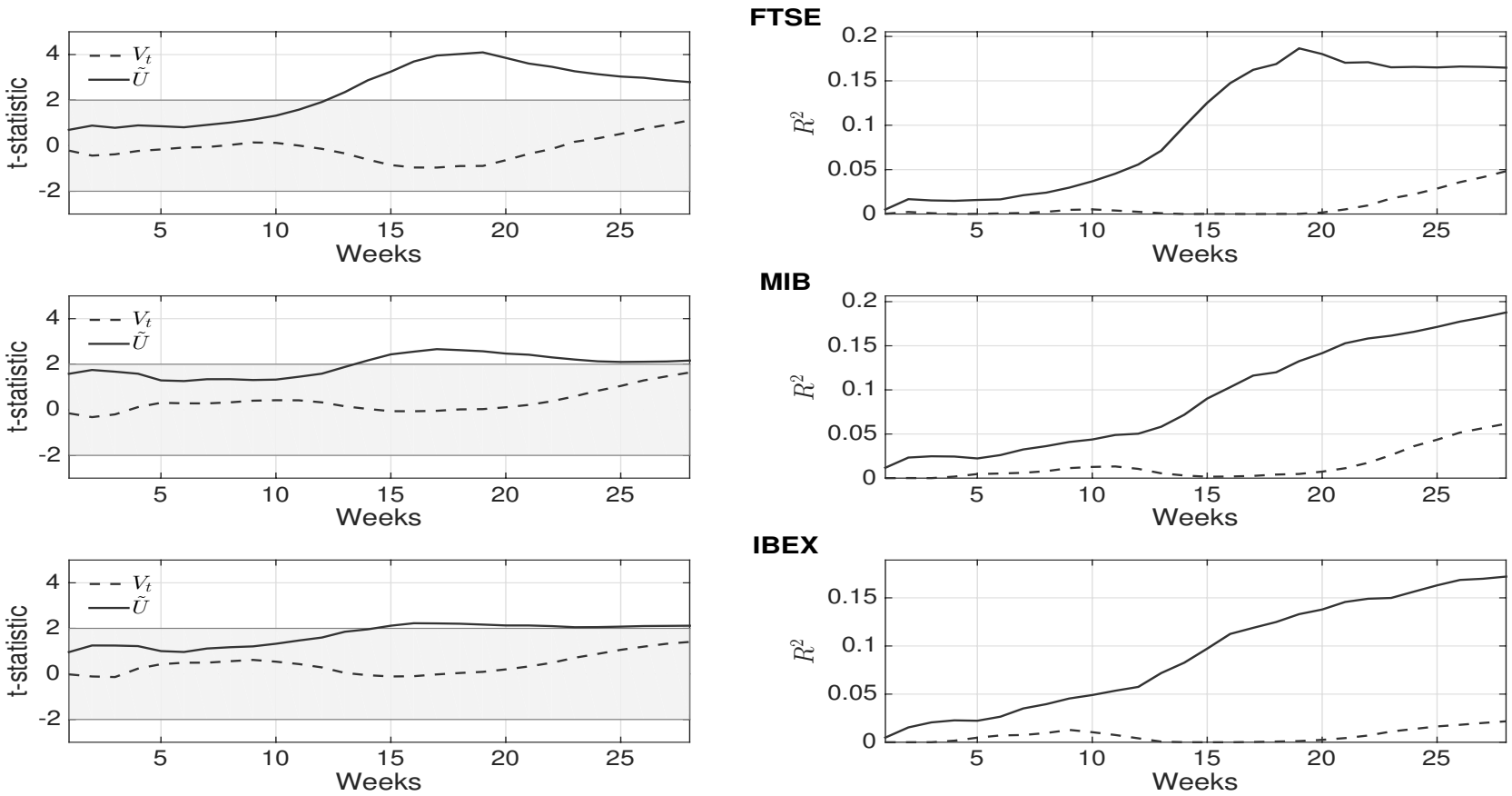
- In Suitable Affine Model, "Invert" System into Factors
- Estimated System Generates Factor Realizations Day-by-Day
- Each End-of-Trading-Day: $\left(V_t, \widetilde{U}_t\right)$, $V_t \perp \widetilde{U}_t$, $t = 1, \ldots, T$
- Factors Convey ALL Time-Varying Information about System
- Factors Should Embody the Predictive Power for Future Returns

AFT Evidence on European Equity-Indices



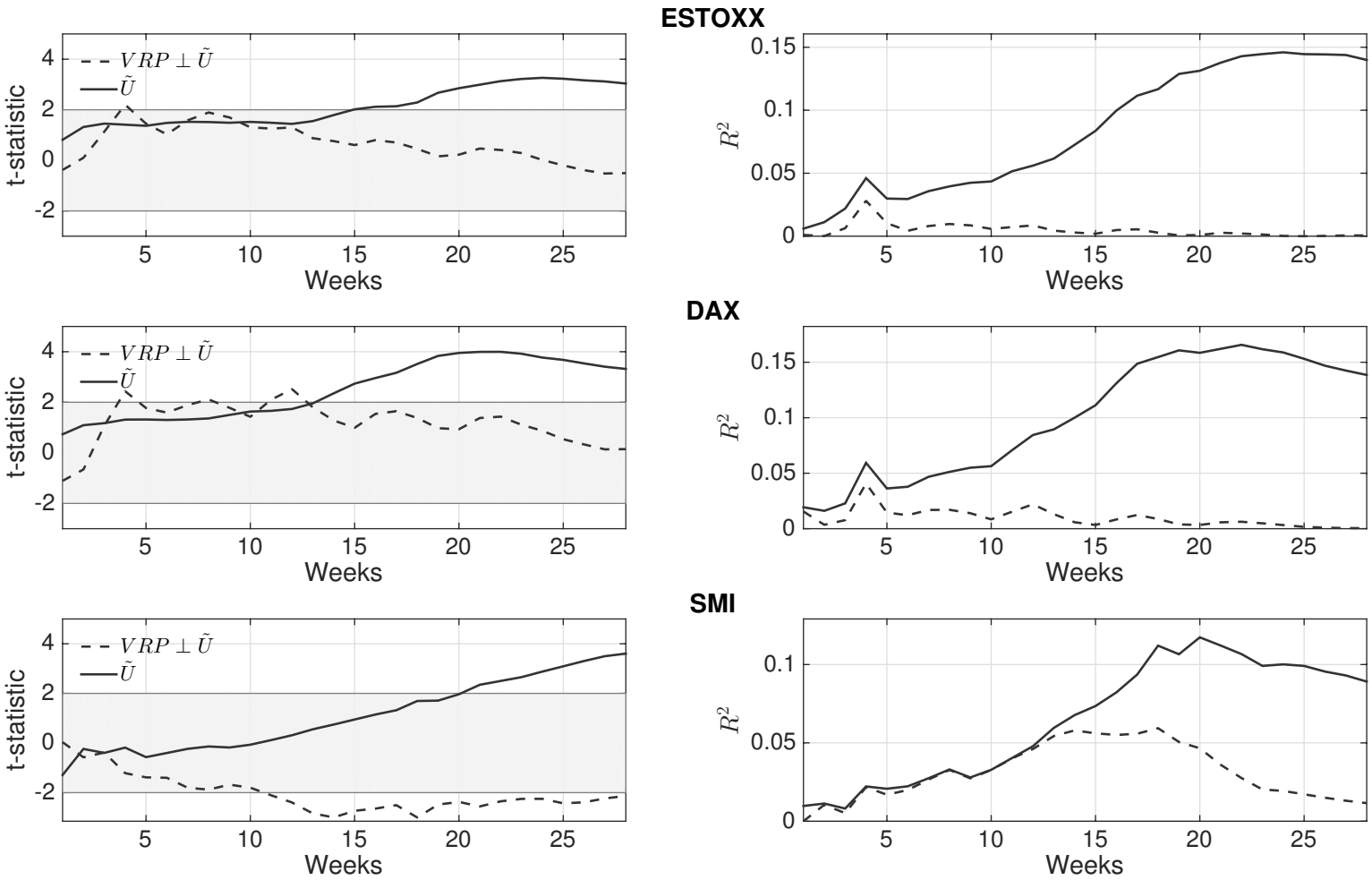
Negative Jump Tail Captures Equity Return Predictability

AFT Evidence on European Equity-Indices



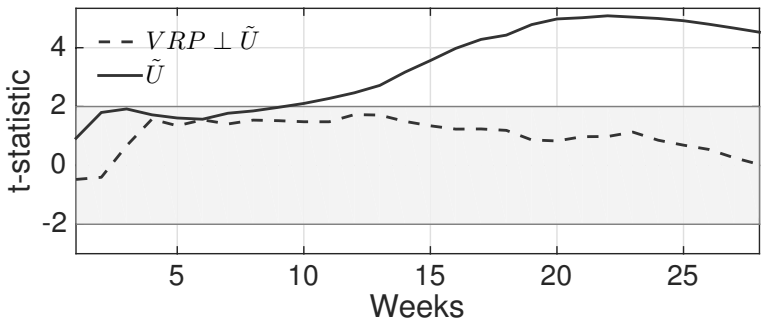
Negative Jump Tail Captures Equity Return Predictability

AFT Evidence for VRP on European Equity-Indices



Predictive Regressions of Excess Returns using VRP

AFT Evidence for VRP on European Equity-Indices



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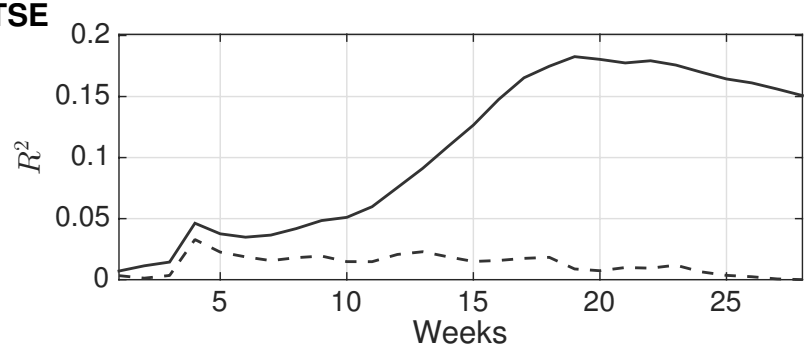

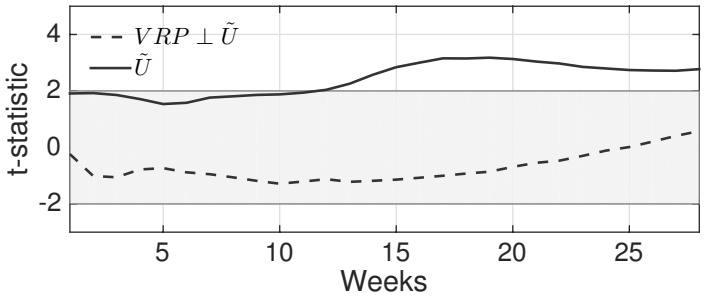

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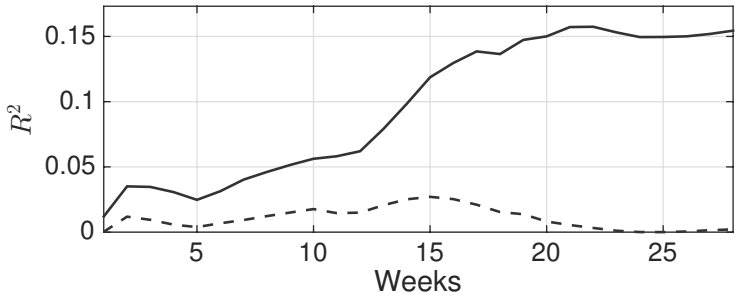

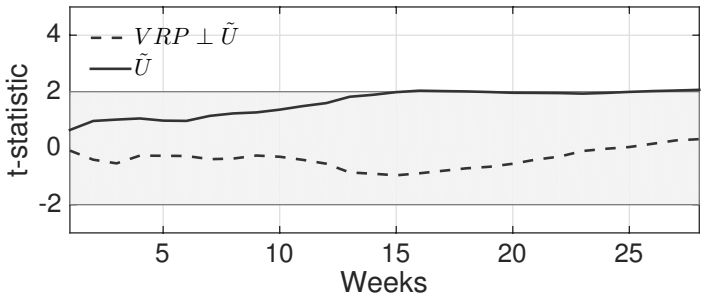

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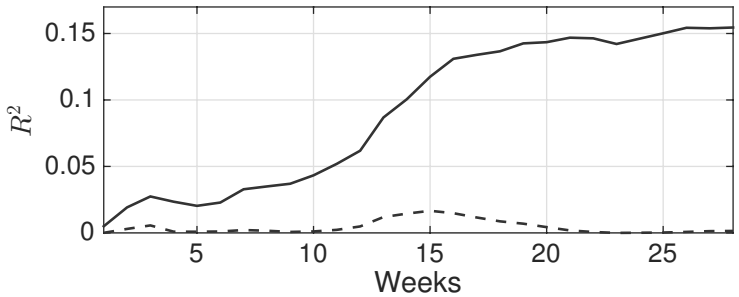

Predictive Regressions of Excess Returns using VRP

AFT Evidence on European Equity-Indices

VRP Evidence NOT Robust

Risk Pricing of Left Tail Drives Equity-Risk Premium

Evidence for (Commodity) Currencies of Great Interest

For Currencies, Both Tails Relevant

Relative Tail Pricing likely to Shift

Does Relative Tail Pricing Predict Direction of FX Appreciation?

Separate (Corridor) Up-Variance and Down-Variance

Andersen, Bondarenko & Gonzalez-Perez (2015, RFS) provide Details

Concluding Remarks

Interesting Suggestive Findings

- CC-VRP Seems Related to Future Global Asset Returns
- Equity and Default Spread Effects quite Long-Lasting
- Perhaps Best Viewed as partial Effects
- Hints at Connections in Risk (Option) Pricing across Assets
- Should Inspire much New Work on these Interactions

Possible Extensions

- Improved Measurement Procedures
- Exploit Commodity VRP Directly
- Separate Jump Risk Pricing from Volatility
- Explore Asymmetries in Option-Implied Risk Pricing
- Explore Correlations in Risk Pricing across Asset Classes