Volatility: Derivatives vs. Reality

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• Background

• Real world vs. Risk Neutral measure
• Girsanov theorem and extensions
• Central Limit Theorem in absence of a perfect hedge

Uses Mean Variance pricing instead of risk-neutral / hedging framework
Need a risk aversion parameter (Utility)
Uses diversification, CLT
• Do Options Markets Correctly Price the Probabilities of Movement of the Underlying Asset? Y. Ait-Sahalia, Y. Wang, F. Yared, Journal of Econometrics, 2001

Uses non-parametric methods for cross-sectional and historic implied distributions
Suggests there are trading opportunities
• Inside Volatility Arbitrage, A. Javaheri, WILEY, 2005

Compares historic and cross-sectional based on parametric models and filtering techniques

Looks for trading opportunities where there are discrepancies
• Volatility Estimation via Chaos Expansions, A. Javaheri, WILMOTT magazine, March 2005

Similar idea, uses Wiener Chaos Expansion for real world estimation

More “exact” than approximate filtering techniques for the nonlinear case

*Implied* market price of risk from historic moves and compares to current cross-sectional for trade opportunities
• The Recovery Theorem, *S. Ross*, NBER, 2011

Derives the real-world probability from risk-neutral based on assumptions on Utility.

Peter Carr uses assumptions on numeraire portfolio instead.
• Future Research

• Compare current vs. historic and risk neutral vs. real world probabilities

• Which is more “correct”? 

• How to derive trading signals? How reliable?