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

- **GARCH and Volatility Swaps**, *A. Javaheri, E. Haug, P. Wilmott, Quantitative Finance*, 2004, vol. 4, issue 5

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

- **The Market Price of Interest-rate Risk: Measuring and Modeling Fear and Greed in the Fixed-income Markets** *R. Ahmad, P. Wilmott,* WILMOTT magazine, Jan 2007

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?