**VOLATILITY B40.3105**  
**Professor Robert Engle**

**Course Content**
The most fascinating aspect of financial market prices is how they change. Students will learn how to measure and forecast financial volatility. They will become proficient with ARCH/GARCH models, exponential smoothing and historical volatilities. These tools will be used to measure risk and analyze alternative approaches to calculating Value at Risk. Implied volatilities from options will be introduced and compared statistically and economically. Then the course will turn to the multi-asset problem and discuss traditional and new approaches to measuring and forecasting correlations. These tools will be applied to the problem of dynamic portfolio selection and risk control.

The course will be run on Blackboard 8; all assignments and course materials will be posted there. The course will have four homework problems. These will be submitted electronically. There will be a final exam and in-class QuickQuizzes. These QQs will take about 5 minutes at the beginning of every class and cover the previous lecture. There are no make-ups.

Prerequisites: Foundations of Finance and a familiarity with simple probability and statistics including least squares regression. There will be substantial use of the EViws econometric software which is available in the computer labs and on the Stern server.

**Topics – One per class**  
1. Financial Volatility - Causes, Consequences, and Global Patterns  
2. ARCH/GARCH Models and their extensions  
3. Value at Risk Estimation, Downside Risk and Credit Risk  
4. Options Implied Volatility and its properties. And now Variance Swaps  
5. Correlation Models – Applications to Portfolio Choice  
6. High Frequency Volatility and Trading  

**Class Schedule**
This course will meet in KMEC 2-60 at the following times:  
- Tues. 3/31/2009 6:00pm – 9:00pm  
- Tues. 4/7/2009 6:00pm – 9:00pm  
- Tues. 4/14/2009 6:00pm – 9:00pm  
- Tues. 4/21/2009 6:00pm – 9:00pm  
- Tues. 4/28/2009 6:00pm – 9:00pm  
- Tues. 5/5/2009 6:00pm – 9:00pm  

**Computer Labs**
- Tuesdays will be in KMC 2-60  
- Saturdays will be in KMC 3-50  
- Tues 3/31/2009 9:00pm – 10:00pm (KMC 2-60)  
- Sat 4/4/2009 10:00am – 12:00am (KMC 3-50)  
- Tues. 4/7/2009 9:00pm – 10:00pm (KMC 2-60)
Sat 4/11/2009 10:00am – 12:00pm (KMC 3-50)
Tues, 4/14/2009 9:00pm-10:00pm (KMC 2-60)
Sat 4/18/2009 10:00am – 12:00pm (KMC 3-50)
Tues 4/21/2009 9:00pm – 10:00pm (KMC 2-60)
Sat 4/25/2009 10:00am – 12:00pm (KMC 3-50)

Grading
Final 48%
Homework 40%
QuickQuizzes 12%

Readings

   Financial Analysts Journal, November, pp20-26
   with Stock Market Volatility: Evidence from the UK”, Journal of Asset Management, pp
   101-111
   1989”, Management Science, 1586-1609
   Campbell, John, Andrew Lo and Craig MacKinlay, (1997) The Econometrics of

   Estimates of the Variance of UK. Inflation”, Econometrica
   Practice”, AER, also posted on nobel.se
   Engle, Robert, and Andrew Patton,(2001) “What good is a volatility model?”
   Quantitative Finance
   Brooks, Chris, Introductory Econometrics for Finance, Cambridge University
   Press, pp441-468

3. Hull, John and Alan White (Fall 1998)“Incorporating Volatility Updating into the
   Kaplanski and Kroll,(Spring 2002), “VaR Risk Measures vs Traditional Risk
   Measures: An Analysis and Survey” Journal of Risk
   Engle, Nobel Lecture op.cit.

   Chapters 8 and 15
   “VIX White Paper”(2003), CBOE


6. REVIEW