# Advanced Derivatives Research Fall, 2008

Professor San-Lin Chung

Room #707

02-33661084

Issues on derivative securities, such as market trading, pricing, hedging, and applications, are one of the most important and mainstream research topics in finance area for the past decades. It is also the main component in the area of financial engineering. Due to rigorous innovations in financial markets, it provides abundant research topics as well as potentials for finance researchers.

This course will explore recent advanced research on derivatives markets. I will cover the following topics: (1) option pricing with jumps and stochastic volatility; (2) GARCH option pricing models; (3) empirical derivatives research; (4) option pricing with liquidity risk; and (5) credit risk models and empirical research.

#### **Topic: Option Pricing with Jumps and Stochastic Volatility**

- Das, S. R., and R. K. Sundaram, 1999, "Of smiles and smirks: A term structure Perspective", Journal of Financial and Quantitative Analysis 34, 211-239.
- Hull, J. and A. White "The pricing of options on assets with stochastic volatilities," Journal of Finance, volume 42 (June 1987), pages 281–300.
- Heston, S, 1993, "A closed form solution with options with Stochastic volatility, With applications to bond and currency markets", Review of Financial Studies, 6, 327-343
- Duffie, D., K. Singleton, and J. Pan, 2000, "Transform analysis and asset pricing for affine jump-diffusions", Econometrica 68, 1343-1376.
- Eraker, B., M. Johannes, and N. Polson, 2003, "The impact of jumps in volatility and returns", Journal of Finance 58, 1269-1300.
- Bakshi, Gurdip, Charles Cao, and Zhiwu Chen, 1997, "Empirical Performance of Alternative Option Pricing Models," Journal of Finance 52, No. 5, 2003-2049.
- Bates, D. S., 1991, "The crash of '87: Was it expected? The evidence from options markets", Journal of Finance 46, 1009-1044.
- Bates, D. S., 1996a, "Jumps and stochastic volatility: exchange rate processes implicit in PHLX deutsche mark options", Review of Financial Studies 9, 69-107.
- Bates, D. S., 1996b, "Testing option pricing models", in G. S. Maddala, C. R. Rao, eds., Statistical Methods in Finance, Amsterdam, Elsevier, 567-611.
- Bates, D. S., 2000, "Post-'87 crash fears in the S&P 500 futures option market", Journal of Econometrics 94, 181-238.

- Pan, J., 2002, "The jump-risk premia implicit in options: Evidence from an integrated time-series study", Journal of Financial Economics 63, 3-50.
- Bakshi, Gurdip, Nikunj Kapadia and Dilip Madan, 2003, "Pricing Stock Return Characteristics, Skew Laws, and Differential Pricing of Individual Equity Options", Review of Financial Studies 101-143.
- Bakshi, Gurdip and Nikunj Kapadia, 2003, "Delta Hedged Gains and the Negative Volatility Risk Premium", Review of Financial Studies 16 (Summer 2003), 527-566.
- Bakshi, Gurdip, Peter Carr and Liuren Wu, 2004, "Stochastic Risk Premiums, Stochastic Skewness in Currency Options, and Stochastic Discount Factors in International Economies", Journal of Financial Economics.
- Bakshi, Gurdip and Dilip Madan, 2000, "Spanning and Derivative-Security Valuation", Journal of Financial Economics 55, 205-238.
- Bakshi, Gurdip, Peter Carr and Liuren Wu, 2007, "Stochastic Skew for Currency Options" <u>Journal of Financial Economics</u>,
- Bakshi, Gurdip, Peter Carr and Liuren Wu, 2004, "Time-Changed Levy Processes and Option Pricing", <u>Journal of Financial Economics</u>, Vol. 71 No. 1, pp. 113-141
- Bakshi, Gurdip, Peter Carr and Liuren Wu, 2003, "The Finite Moment Log Stable Process and Option Pricing", <u>Journal of Finance</u>,,Vol. 58 No. 2, pp. 753-778
- Bakshi, Gurdip, Peter Carr and Liuren Wu, 2003, "What Type of Process Underlies Options? A Simple Robust Test", <u>Journal of Finance</u>, December, 2003
- Peter Carr, Dilip Madan, and Eric Chang, 1998, "The Variance Gamma Process and Option Pricing" <u>European Finance Review</u>, Vol. 2 No. 1
- J.C. Duan and A. Fulop, 2007, "Estimating the Structural Credit Risk Model When Equity Prices Are Contaminated by Trading Noises" (to appear in Journal of Econometrics).
- Mark Broadie, Mike Chernov and Michael Johannes, 2007, "Model Specification and Risk Premia: Evidence from S&P 500 futures options", *Journal of Finance*
- Michael Johannes, Nicholas Polson and Jon Stroud, 2008, "Learning about Jumps and Stochastic Volatility: Filtering Stochastic Differential Equations with Jumps", forthcoming Review of Financial Studies

- Mark Broadie, Mike Chernov and Michael Johannes, 2007, "Understanding Index Option Returns", working paper.
- Michael Johanne and Andrew Dubinsky, 2006, "Earnings Announcements and Equity Options" working paper.
- Eraker, B. 2004, "<u>Do Stock Prices and Volatility Jump? Reconciling Evidence</u> from Spot and Option Prices ", Journal of Finance, 59, p. 1367-1403
- Jones, C., 2006, "Nonlinear Factor Analysis of S&P 500 Index Option Returns", Journal of Finance 41: 2325-2363 (2006)
- Jones, C., 2003, "The Dynamics of Stochastic Volatility: Evidence from Underlying and Options Markets", Journal of Econometrics, 116: 181-224
- Buraschi, Andrea, Jiltsov, Alexei, 2006, "Model uncertainty and option markets with heterogeneous beliefs", Journal of finance, p. 2841-2897
- Du Du, 2007, "Option Pricing under Habit Formation and Event Risks", job market paper, Department of Economics, University of Chicago
- Maenhout, P. and Joost Driessen, 2006, "The World Price of Jump and Volatility Risk," working paper, Insead.
- Pedro Santa-Clara and Alessio Saretto, 2007, "Option Strategies: Good Deals and Margin Calls" working paper, UCLA.
- Bondarenko O, 2003, "Why are Put Options So Expensive", working paper.
- Peter Christoffersen, Kris Jacobs and Steve Heston ,2007, "The Shape and Term Structure of the Index Option Smirk: Why Multifactor Stochastic Volatility Models Work so Well "working paper, University of McGill.
- Peter Christoffersen, Kris Jacobs and Karim Mimoun, 2007, "An Empirical Comparison of Affine and Non-Affine Models for Equity Index Options" working paper, University of McGill.

## **Topic: GARCH Option Pricing Models**

- JC Duan, "The GARCH Option Pricing Model", Mathematical Finance, 5(1), 1995, pp. 13-32
- JC Duan, P. Ritchken and Z. Sun, "Approximating GARCH-Jump Models, Jump-Diffusion Processes, and Option Pricing", Forthcoming, Mathematical Finance, 2005

- J.C. Duan, P. Ritchken and Z. Sun, 2007, "Jump Starting GARCH: Pricing and Hedging Options with Jumps in Returns and Volatilities", working paper, University of Toronto.
- Ritchken, P and R Trevor "Option Pricing Under GARCH and Stochastic Volatility", Journal of Finance, 1999, Vol. 54, No. 1, pp. 377-402.
- Heston, S and S Nandi, "A closed-form GARCH option valuation model", Review of Financial Studies", 2000; 13, 585-625
- Christoffersen. P and K, Jacobs (2004), "Which Volatility Model for Option Valuation?", Management Science.
- Christoffersen, P., S. Heston and K. Jacobs, 2005, "Option Valuation with Conditional Skewness", Journal Of Econometrics, forthcoming
- Christoffersen. P and K. Jacobs, "The Importance of the Loss Function in Option Valuation". Journal of Financial Economics, 2004, Volume 72, 291-318.
- Dennis Patrick and S.Mayhew, "Risk Neutral Skewness: Evidence from Stock Options", Journal of Financial and Quantitative Analysis 37, 3, 471-493.
- Kalimipalli, M and R. Sivakumar, "Does Skewness Matter? Evidence from Index Options Market". Working paper.

#### **Empirical derivatives research**

- Dumas, B., J. Fleming, and R. E. Whaley, 1997, "Implied volatility functions: Empirical Tests", Journal of Finance 53, 2059-2106.
- Suo, W and J. Hull, "A Methodology for Assessing Model Risk and its Application to the Implied Volatility Function Model", Journal of Financial and Quantitative Analysis, Vol. 37, No. 2, June 2002, pp.297-318
- Blair, B. J., S. Poon, and S. J. Taylor, 2001, "Forecasting S&P100 volatility: The Incremental information content of implied volatilities and high-frequency index returns", Journal of Econometrics 105, 5-26.
- Christensen, B.J. and N.R. Prabhala, 1998, "The relation between implied and realized Volatility", Journal of Financial Economics 50, 125-150.
- Pong, S., M. B. Shackleton, S. J. Taylor and X. Xu, 2002, "Forecasting sterling/dollar volatility: A comparison of implied volatilities and AR(FI)MA models", Working paper, FEN
- Poteshman, A. M., 2000, "Forecasting future volatility from option prices", Working paper, FEN
- Jiang, G.J. and Y.S. Tian, 2005, "Model free implied volatility and it information content", Review of Financial Studies.
- Harvey, C. R. and R. E..Whaley, 1992, "Market volatility prediction and the efficiency of the S&P 100 index option market", Journal of Financial Economics 30, 43-73.

- Coval, J. D., and T. Shumway, 2001, "Expected option returns", Journal of Finance 56, 983-1009.
- Neely, C. J., 2004, "Forecasting foreign exchange volatility: Why is implied volatility biased and inefficient? And does it matter?", Federal Reserve Bank of St.Louis Working paper.
- Koopman, S. J., B. Jungbacker, and E. Hol, 2005, "Forecasting daily variability of the S&P 100 stock index using historical, realized and implied volatility measures", Journal of Empirical Finance.
- Chan, W, M. Kalimipalli, R.Sivakumar, "The Economic Value of Realized Volatility: Evidence from Index Options Market", Working Paper.
- Bakshi, Gurdip, Charles Cao, and Zhiwu Chen, 1997, "Pricing and Hedging Long-Term Options" Journal of Econometrics 94, 2000, 277-318.
- Taylor, S, 2000, "Consequences for Option Pricing of a Long Memory in Volatility", Working paper, Lancaster University.
- Carr, Peter and Dilip Madan, 2006, "A Theory of Volatility Spreads", Management Science 2006, No. 52, Issue 12, 1945-1956.
- Peter Carr and Liuren Wu, 2005, "A Tale of Two Indices", <u>Journal of Derivatives</u>, Spring 2006
- J.C. Duan and C. Yeh, 2007, "Jump and Volatility Risk Premiums Implied by VIX", working paper, University of Toronto.
- J.C. Duan and J. Wei, 2007, "Systematic Risk and the Price Structure of Individual Equity Options", Review of Financial Studies, forthcoming.

### option pricing with liquidity risk

Brenner M., Eldor R. and S, Hauser, 2001, The Price of Options Illiquidity, *Journal of Finance*, 2, 789-805.

Cao, M., and J. Wei, 2007, Commonality in Liquidity: Evidence from the Option Market, *NBER working paper*.

Cetin, U., R.Jarrow and P. Protter, 2004, Liquidity Risk and Arbitrage Pricing Theory, *Finance and Stochastics*, 8, 311-341.

Cetin, U., R.Jarrow, P. Protter and M. Warachka, 2006, Options in an Extended Black-Scholes Economy with Illiquidity: Theory and Empirical Evidence, *Review of Financial Studies*, 19(2), 493-529.

Chordia, T., R. Roll and A. Subrahamnyam, 2000, Commonality in Liquidity, *Journal of Financial Economics*, 56(2), 501-530.

Duan, J. C., and J. Wei, 2007, Systematic Risk and the Pric Structure of Individual Equity Options, *Review of financial Studies fourth coming*.

- Frey, Rudiger, 2000, Market illiquidity as a source of model risk in dynamic hedging, *Model Risk*.
- Frey, R., and P. Patie, 2002, Risk management for derivative in illiquid markets: A simulation study, *Risk Publications*.
- Jarrow R. and P. Protter, 2005, Liquidity Risk and Option Pricing Theory, *Handbook of Financial Engineering*, Ed. J. Bridge and V. Linetsky, Elservier Publishers (forthcoming).

#### **Credit Risk Models and Empirical Research**

- Anderson, R. and S. Sundaresan, 1996, "Design and Valuation of Debt Contract," *Review of Financial Studies* 9, 37-68.
- Anderson, R. and S. Sundaresan, 2000, "A Comparative Study of Structural Models of Corporate Bond Yields: An Exploratory Investigation," *Journal of Banking and Finance* 24, 255-269.
- Bharath, S. T., and T. Shumway, 2004, "Forecasting Default with the KMV-Merton Model," Working Paper, University of Michigan.
- Black, F. and J. C. Cox, 1976, "Valuing Corporate Securities: Some Effects of Bond Indenture Provisions," *Journal of Finance* 31, 351-367.
- Briys, E. and F. de Varenne, 1997, "Valuing Risky Fixed Rate Debt: An Extension," *Journal of Financial and Quantitative Analysis* 32, 239-248.
- Brockman, P. and H. J. Turtle, 2003, "A Barrier Option Framework for Corporate Security Valuation," *Journal of Financial Economics* 67, 511-529.
- Chen R., F. J. Fabozzi, G. Pan, R. Sverdlove, 2007, "Sources of Credit Risk: Evidence from Credit Default Swaps," *Journal of Fixed Income*, forthcoming.
- Chen, R., S. Hu., and G. Pan, 2006, "Default Prediction of Various Structural Models," Working Paper, Rutgers University, National Taiwan University, and National Ping-Tung University of Sciences and Technologies.
- Collin-Dufresne, P. and R. S. Goldstein, 2001, "Do Credit Spreads Reflect Stationary Leverage Ratios?" *Journal of Finance* 56, 1929-1957.
- Duffee, G., 1999, "Estimating the Price of Default Risks," *Review of Financial Studies* 12, 197-226.

- Duffie D. and D. Lando, 2001, "Term Structure of Credit Spreads with Imcomplete Accounting Information," Econometrica, 69, 633-664.
- Eom, Y. H., J. Helwege, and J. Huang, 2004, "Structural Models of Corporate Bond Pricing: An Empirical Anslysis," *Review of Financial Studies* 17, 499-544.
- Ericsson, J. and J. Reneby, 2004, "An Empirical Study of Structural Credit Risk Models Using Stock and Bond Prices," *Journal of Fixed Income* 13, 38-49.
- Ericsson, J. and J. Reneby, 2005, "Estimating Structural Bond Pricing Models," *Journal of Business* 78, 707-735.
- Ericsson, J., J. Reneby, and H. Wang, 2006, "Can Structural Models Price Default Risk? Evidence from Bond and Credit Derivative Markets," Working Paper, McGill University and Stockholm School of Economic.
- Geske, R., 1977, "The Valuation of Corporate Liabilities as Compound Options," *Journal of Financial and Quantitative Analysis* 12, 541-552.
- Geske, R. and H. E. Johnson, 1984, "The Valuation of Corporate Liabilities as Compound Options: A Correction," *Journal of Financial and Quantitative Analysis* 19, 231-232.
- Hilberink, B. and L. C. G. Rogers, 2002, "Optimal Capital Structure and Endogenous Default," *Financial and Stochastics* 6, 237-263.
- Huang, J. and M. Huang, 2003, "How Much the Corporate-Treasury Yield Spread is Due to Credit Risk?" Working Paper, Penn State University and Stanford University.
- Jones, E., S. Mason, and E. Rosenfeld, 1984, "Contingent Claims Analysis of Corporate Capital Structures: An Empirical Investigation," *Journal of Finance* 39, 611-627.
- Ju, N. and H. Ou-Yang, 2006, "Capital Structure, Debt Maturity, and Stochastic Interest Rates," *Journal of Business* 79, 2469-2502.
- Leland, H. E., 1994, Corporate debt value, bond covenants, and optimal capital structure, *Journal of Finance* 49, 1213-1252.
- Leland, H. E., 1998, "Agency Cost, Risk Management, and Capital Structure," *Journal of Finance* 53, 1213-1243.
- Leland, H. E., 2004, "Prediction of Default Probabilities in Structural Models of Debt," *Journal of Investment Management* 2, No. 2.

- Leland, H. E. and K. B. Toft, 1996, "Optimal Capital Structure, Endogenous Bankruptcy, and the Term Structure of Credit Spreads," *Journal of Finance* 51, 987-1019.
- Longstaff, F., and E. Schwartz, 1995, "A Simple Approach to Valuing Risky Fixed and Floating Rate Debt and Determining Swaps Spread," *Journal of Finance* 50, 789-819.
- Merton, R. C., 1974, "On the Pricing of Corporate Debt: the Risk Structure of Interest Rates," *Journal of Finance* 28, 449-470.
- Vassalou, M. and Y. Xing, 2004, "Default Risk in Equity Returns," *Journal of Finance* 59, 831-868.
- Zhou, C., 2001, "The Term Structure of Credit Spreads with Jump Risk," *Journal of Banking and Finance* 25, 2015-2040.