

# Financial Markets

R E S E A R C H C E N T E R

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AT VANDERBILT

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## From the Director

The Financial Markets Research Center, founded seven years ago, continues its mission to support research in financial markets and to provide a mechanism for the interaction of industry practitioners, regulators, and academics. Center funds are used to maintain data bases, provide computer programming assistance, fund summer faculty research, and sponsor workshops and conferences. Faculty research makes possible a deeper understanding of the rapid developments in trading markets and the new financial instruments introduced in the past few years.

The Center's annual conferences bring together academics, practitioners, and regulators to discuss recent research and its implications for practice and regulatory policy. Titles of the conferences held in the past six years indicate some of the interests of the Center and its faculty:

- 1988 - The Stock Market Crash of 1987: What Have We Learned?
- 1989 - Dewey Daane Conference on International Financial Policy
- 1990 - Volatility and Market Structure
- 1991 - Securities Markets Transaction Costs
- 1992 - World Trading Markets
- 1993 - Risk Management

This year's conference on Risk Management, supported by special grants from Bankers Trust and the New York Stock Exchange, is described in greater detail elsewhere in this newsletter.

Faculty associated with the Center now number 13. New to the finance faculty is Tarun Chordia, who has just received his Ph.D. degree from UCLA. Chordia is working on a number of topics in financial markets, including mutual fund charges, brokerage commission schedules, and off-floor trading. Recent research by Center faculty covers topics such as: stochastic volatility, the intraday evolution of spreads in dealer markets, stock returns and dividend yields, corporate financing choices, business cycles and common stock offerings, trading market structure, earnings announcement and stock prices, and other subjects.

Faculty research efforts are supported by research associates Ziyong Cai and Hao Zhang, who maintain data bases and provide programming support. Pat Scott, administrative assistant for the Center, continues to see that things run smoothly.



## FUNDING

The Center is funded by its members and by outside research grants. Funds are used to maintain financial markets data bases and to support the Center's research projects. Members sit on the advisory board, participate in all activities of the Center, receive research reports, and give advice on the activities and research direction of the Center. Research grants for specific projects are sought from various research sponsors including foundations, government agencies, trade organizations, and corporations.

Current Center members are:

Bankers Trust Company  
 J. C. Bradford & Company  
 The Chicago Board Options Exchange  
 The Chicago Mercantile Exchange  
 Hull Trading Company  
 The National Association of Securities Dealers  
 The New York Stock Exchange  
 Refco Group, Ltd.  
 Timber Hill Incorporated  
 Tudor Investment Corporation

## GOALS OF THE CENTER

The Financial Markets Research Center at Vanderbilt University fosters scholarly research in financial markets, financial instruments, and financial institutions. Research of the Center may focus on participants in financial markets, such as brokers, exchanges, and financial intermediaries, on businesses needing financing, and on appropriate regulatory policy. The Center

1. Provides a mechanism for interaction between representatives of the financial community, researchers in financial markets, and the faculty at Vanderbilt.
2. Identifies critical research issues in financial markets and provides a focus for such research.
3. Supports research by faculty members and Ph.D. students at Vanderbilt by maintaining data bases and funding research projects.
4. Guides and disseminates research about financial markets.

## Conference on Risk Management

Banks are typically perceived as providers of financing, but increasingly banks and other financial institutions are entering the risk management business. Corporations may continue to seek bank financing, but they may also seek help in reducing or modifying their risks, such as currency risk, interest rate risk, oil price risk, equity market risk, among others. Risks can be managed as part of financing, but increasingly risks are managed separately from financing by using futures and options. Corporations and pension funds can trade futures and options directly in organized markets, or they can enter into OTC swap and option contracts with banks and securities firms. Certain short-term currency risks and short-term agricultural commodity price risks have been effectively handled by currency futures markets and commodity futures markets. However, the new risk management business, handled OTC, is intended to deal with a much broader and more complex range of risks.

Financial institutions that manage customer risks, in turn, assume their own risks. Sophisticated banks with an adequate internal risk management system control the risks arising from their derivative contracts. But less sophisticated banks, through oversight, error, or failure to monitor employees properly, may assume unknowingly large risks. Sudden large price changes can impose losses even on positions that appear adequately hedged. Regulators are concerned that the reporting of outstanding contractual obligations is not complete and that they are unable to assess the risks assumed by financial institutions they regulate.

New financial derivative instruments enable corporations and money managers to more accurately and more tightly control their risks. Yet, paradoxically, the possibility of error from mismanaged positions is also greater. Bank regulators, in particular, emerging from the disastrous sequence of S&L failures in the 1980's, are skittish that off-balance sheet futures and options contracts raise the risk of banks and threaten the deposit insurance fund.

On April 15-16, 1993, the Financial Markets Research Center held a conference on Risk Management attended by academics, regulators, and representatives of the financial services industry. The conference was funded by special grants from Bankers Trust and the New York Stock Exchange, two of the

members of the Financial Markets Research Center. The conference focused on three main issues: (1) new exchange traded and OTC derivative products, (2) risk management by banks and securities firms and the regulation of risk management, and (3) recent developments in the pricing and analysis of derivative products.

The first session on new products was chaired by **Robert Davis** of Davis Financial Associates and a former commissioner of the Commodity Futures Trading

Commission. **Todd Petzel**, chief economist of the Chicago Mercantile

Exchange, provided an overview of the growth and development in derivative products. Among other things, he noted that more than 15 new exchanges have begun trading globally since 1986. He proposed two theses: first, that exchange markets

develop when exchange futures and options trading is significantly less costly than trading in the cash market, and, second, that exchange-traded derivatives and OTC-traded derivatives are complementary rather than competitive. OTC instruments satisfy sophisticated retail customers, whereas exchange-traded instruments serve a wholesale market function. He also discussed regulatory issues raised by the new and wider range of derivative products. **Joe Levin**, director of new product development at the Chicago Board Options Exchange, reviewed some of the new products recently developed by the CBOE and focused on the FLEX options introduced on February 26, 1993 in response to OTC options. FLEX options are options on the S&P 100 Index customized with respect to expiration (up to five years), with respect to strike price, with respect to exercise procedure (American or European), and with respect to the settlement basis at expiration (open, high, low, or other standards). FLEX options are guaranteed by the Options Clearing Corporation, which has recently received a triple A rating. **Barry**



*Jim Lodas chairs a session on new products.*

**Schachter**, financial economist at the Commodity Futures Trading Commission, closed out the first session by discussing CFTC regulatory policy toward exchange and off-exchange derivatives. He described the exemptive authority given to the CFTC under the 1992 Futures Trading Act.

Instruments that have many of the features of futures contracts, such as swaps, may be exempted from CFTC oversight if they meet certain conditions, such as the lack of a clearing house, the existence of credit risk, lack of standardization, and participation only by sophisticated or wealthy investors. He also explained that hybrid instruments, which are debt, preferred equity, or depository instruments that have a cash-flow component tied to the value of a commodity, would be exempt from CFTC regulation if the commodity exposure of the instrument is not the major source of volatility in the hybrid instrument.

The second Thursday morning session maintained an emphasis on new products and was chaired by **Jim**

**Lodas**, partner of Hull Trading Company. **David Langer** of Bankers Trust Company described recent developments in OTC derivatives. **Robert Whaley**, professor of finance at Duke University and head of Duke's Futures and Options Research Center, spoke on "Derivatives on Market Volatility: Tools Long Overdue."

Whaley described the new volatility index which he helped construct for the Chicago Board Options Exchange. The index is based on the implied volatilities from the OEX options. Whaley described the usefulness of (yet to be introduced) derivatives on the volatility index. **Robert Litzenberger**, the Edward Hopkinson, Jr., Professor of Investment Banking at the Wharton School, spoke on tax related derivatives. He provided two examples of how derivatives can be used to enhance the yield when different investors have different marginal tax rates. One dealt with the municipi-



*Governor Susan Phillips speaks on regulatory policy toward derivatives.*

pal bond market. The other example dealt with German and U.S. investors in the DAX equity index. German investors receive a credit for taxes paid on dividends, whereas American investors do not. This



*Brandon Becker discusses SEC oversight of securities firms' risk management procedures.*

tax treatment lowers the DAX index futures price and creates an incentive to buy German equity by swapping into the futures index rather than buying the equity directly.

After lunch, **Dewey Daane**, former Governor of the Federal Reserve System and senior adviser of the Financial Markets Research Center, introduced **Susan Phillips**, a Governor of the

Federal Reserve System and chairman of the Federal Reserve Board's Committee on Derivatives. In the time remaining after Professor Daane's introduction, Governor Phillips spoke on "Derivative Instruments and Regulatory Policy." She commented on the growing importance of derivatives, particularly OTC derivatives, and the challenges this growth poses for regulatory policy. In particular, the Board is concerned about systemic risk and the possibility that the failure of a bank could have broader reverberations throughout the economy. As a result, the Federal Reserve Board and other regulators have taken actions to ensure that risks are appropriately managed. To supplement the capital requirements specified under the 1988 Basle Accord that apply primarily to credit risk, the Federal Reserve has posed new standards for interest rate risk. She reported progress in allowing institutions to net long and short positions vis-a-vis contra parties. She described the need for financial institutions to maintain an appropriate internal information system with appropriate accounting standards that would adequately measure an institution's risk.

After Governor Phillips' talk, **Jimmy Bradford**, senior partner of J.C. Bradford & Company, chaired a session on "Risk Management and Regulation in

Securities Firms." **Emanuel Derman**, head of the Quantitative Strategies Group in the Equities Division at Goldman, Sachs & Company, reviewed risk management procedures at Goldman Sachs. He discussed the analytical models for pricing complex derivative instruments, the risk management systems necessary to track the firm's overall position, and the future trends and needs in risk management.

**Brandon Becker**, acting director of the Division of Market Regulation at the Securities and Exchange Commission, discussed regulatory oversight of risk management procedures in securities firms. He noted that the SEC's current capital requirement regulations are not always appropriate for derivatives. In particular, they fail to take full account of the risk reducing effects of off-setting positions. He emphasized the SEC's desire that securities firms have appropriate risk management procedures and noted



*Dan Mudge describes Bankers Trust's risk management system.*

that the SEC has authority to require information on risk management procedures and off balance sheet items of securities firms.

The afternoon's last session on "Risk Management and Regulation in Banks" was chaired by **Rick Kilcollin**, chief operating officer of the Chicago Mercantile Exchange. **Daniel Mudge**, managing

director at Bankers Trust in charge of global risk management, spoke on Bankers Trust risk management system - RAROC (risk adjusted return on capital). RAROC is a comprehensive, world-wide risk management system that is intended to cover all risks and to assess the incremental risk of a new position based on its volatility and its correlation with the bank's existing positions. The amount of capital charged to a position depends on the degree to which it hedges existing positions. **Chris Cumming** of the Federal Reserve Bank of New York described the bank examination process and the adjustments to the new world of derivatives. **Stuart Greenbaum**, Norman Strunk Distinguished Professor of Financial

Institutions and director of the Banking Research Center at Northwestern, described alternative approaches to regulating bank risk taking. Greenbaum noted that U.S. regulators have followed two approaches to the regulation of banks. The first has been direct regulation — to specify quite clearly and usually quite narrowly the powers of a bank with respect to assets and liabilities. Recently the United States has increased the powers of banks and moved from direct regulation to indirect regulation primarily in the form of risk-based capital requirements. The problem with indirect regulation, according to Greenbaum, is that regulators may not have sufficient information to impose appropriate regulations and, more importantly, may be unable to fine tune the incentives created by such regulations. Greenbaum advocates a return to direct regulation for that part of a bank which would receive deposit insurance. Some have called this the “narrow” bank concept. The narrow bank would be restricted in the assets in which it could invest but in return would receive deposit insurance. The remainder of the bank would be free to enter into any business, including derivatives, but would not receive insurance on the liabilities it uses to finance its operations. In Greenbaum’s view, this modification of regulation would obviate the need for regulators to assess in detail the risk management system of banks.

The Friday morning sessions turned to theoretical and empirical research in the pricing of derivatives. The first session, “Theoretical Developments in Pricing Derivatives,” was chaired by **Ron Masulis**, The Frank K. Houston Professor of Finance at the Owen School. **Tom Ho**, president of Global Advanced Technology Corporation, spoke on “Primitive Securities: Portfolio Building Blocks.” Ho used his procedure to analyze the cash flow characteristics of path dependent securities including complex collateralized mortgage obligations. The approach makes possible a more detailed specification of the risk exposure of a security than other valuation procedures. **Cliff Ball**, associate professor of management at the Owen School, presented a paper, “A Review of Stochastic Volatility Models with Application to Option Pricing.” The paper begins with a brief overview of option pricing models and alternative nonstochastic models of volatility. Stochastic volatility complicates option pricing and invalidates the much used Black-Scholes model. Stochastic volatility also makes more difficult the management of derivative positions and exposes such

positions to risks that are not considered under the traditional option pricing models. Therefore, it is important to understand how stochastic volatility may be modeled and the degree to which it is changing. Ball’s paper provides an overview of stochastic volatility processes, their implication for option pricing, and evidence on the nature of stochastic volatility.

The conference’s last session, chaired by **James Cochrane**, senior vice president of the New York Stock Exchange, was comprised of two papers on empirical analyses of volatility. The first paper by **Stephen Figlewski**, professor of finance at New York University, examined issues in the forecasting of volatility. Figlewski discussed alternative procedures for estimating and projecting changes in volatility. The morning session ended with a paper by **Craig Lewis**, associate professor of finance at the Owen School, on “Initial Margin Policy and Volatility in the Crude Oil Futures Market.” In the paper (written with Ted Day), Lewis constructs a term structure of volatilities and shows how forward volatilities are affected by changes in margin regulations in the crude oil futures market.

## 2nd Annual Dewey Daane Invitational Tennis Tournament A Success

Competition for the contents of the Daane Cup intensified this year as 16 participants in the Financial Markets Research Center Conference on Risk Management stayed for a Friday afternoon round-robin doubles tennis tournament, hosted by Dewey Daane. The contents of the Daane Cup went to Jim Lodas, who displayed considerable athletic ability, and to Bob Whaley, who succeeded in finding good partners.



*Bob Whaley, tournament runner-up, with Dewey Daane.*

## FINANCE STUDENT ACTIVITIES

### Owen School Finance Association

The goal of the Finance Association is to enhance Owen students' knowledge of current topics in finance as well as provide a link to the financial community. These goals were furthered during the 1992-93 academic year in a variety of ways. The Association sponsored trips to New York and Chicago to give interested students a chance to learn directly from business persons at several major financial institutions and exchanges. Also, during the year the Association hosted several speakers on finance topics. As has become customary, the year was capped off with the presentation of the Owen Finance Association Executive of the Year Award. This year Charles S. Sanford, Jr., chairman of the board of Bankers Trust Company, was selected as the award recipient.

### Max Adler Student Investment Fund

The primary purpose of the Max Adler Student Investment Club is the active management of the fund created by the generous gift of Mrs. Mimi Adler in memory of her late husband, the founder of Spencer Gifts. Students gain practical experience in selecting investments and in actively managing a portfolio. This practical experience is supplemented by club sponsored investment contests and speakers from the investment community who discuss current topics and trends in the industry.



*Charlie Sanford, chairman of the board of Bankers Trust, receiving the Owen Finance Association's executive of the year award from Andy Johnson, president of the Association.*

## GUEST SPEAKERS

An important aspect of the education of MBA students and the faculty at the Owen School is the opportunity to listen to and question senior executives from financial industries. Outside speakers are sponsored directly by the Financial Markets Research Center, the Owen Lecture Series, or the Finance Association, or are invited as an integral part of courses such as Monetary and Fiscal Policy and Financial Institutions. Guest speakers during the 1992-93 academic year were:

**James K. Baker**, chairman and chief executive officer, Arvin Industries

**Gert Becker**, chief executive officer, DeGussa

**Roger E. Brinner**, group vice-president and executive research director, DRI/McGraw Hill

**J. Alfred Broadbuss, Jr.**, president, Federal Reserve Bank of Richmond

**Alan R. Buckwalter, III**, president, Texas Commerce Bank-Houston

**Barber B. Conable, Jr.**, member of Congress, 30th New York District 1965-1985 and president, World Bank, 1986-1992

**Richard Erb**, deputy managing director, International Monetary Fund

**Jane Evans**, vice president and general Manager, US West

**Gail Fosler**, vice president and chief economist, The Conference Board, Inc.

**John G. Heimann**, chairman of global financial institutions, Merrill Lynch and Company

**Robert Heller**, chief executive officer, VISA International

**Thomas M. Hoenig**, president, Federal Reserve Bank of Kansas City

**Sidney L. Jones**, Assistant Secretary of the Treasury for Economic Affairs and professor, Dartmouth College

**Silas Keehn**, president, Federal Reserve Bank of Chicago

**Edward W. Kelley, Jr.**, member, Board of Governors of the Federal Reserve System

**Eugene A. Leonard**, president, Corporation for Financial Risk Management, St. Louis

**Robert D. McTeer, Jr.**, president, Federal Reserve Bank of Dallas

**Richard M. Miller**, chairman and chief executive officer, Willis Corroon

**Rudolph G. Penner**, director of economic studies, KPMG Peat Marwick

**Michael D. Rose**, chairman and chief executive officer, Promus Corporation

**Charles S. Sanford, Jr.**, chairman of the board, Bankers Trust Company

**Henry B. Schacht**, chairman and chief executive officer, Cummins Engine Company, Inc.

**Gary G. Schlarbaum**, partner, Miller, Anderson & Sherrerd

**Sheila Tschinkel**, senior vice president and director of research, Federal Reserve Bank of Atlanta.

## RESEARCH WORKSHOPS

Workshops conducted at the Owen School throughout the year provide a forum for the exchange and testing of new ideas in areas of current research. During 1992-93 the following researchers presented work on finance topics:

**Clifford A. Ball**, Owen School: "Stock Price Distributions with Stochastic Volatility and Option Pricing: An Alternative Approach"

**Simon Benninga**, Wharton School and Hebrew University: "Dynamic Wealth Redistribution, Trade, and Asset Pricing"

**Alexandros Benos**, Stanford: "Overconfidence in Financial Markets: A Limited Rationality Model of Trading"

**Ravi Bhushan**, MIT: "An Informational Efficiency Perspective on the Post-Earnings-Announcement Drift"

**Michael J. Brennan**, UCLA and London Business School: "Brokerage Commission Schedules"

**Charles Cao**, University of Chicago: "Pricing Foreign Currency Options with Stochastic Volatility"

**Tarun Chordia**, UCLA: "The Structure of Mutual Fund Charges"

**William G. Christie**, Owen School: "Dissimilar Market Structures and Market Liquidity: A Transactions Data Study of Exchange Listings"

**John M. Clapp**, University of Connecticut: "Market Microstructure in Real Estate and Financial Markets: Evidence from the Price-Volume Relationship"

**B. Espen Eckbo**, University of British Columbia:

"Ownership Structure and Corporate Dividends"

**Jeff Flemming**, Duke: "The Rationality of Market Volatility Forecasts Implied by S&P 100 Index Option Prices"

**Kenneth D. Garbade**, Bankers Trust Company: "Hedging Raw Materials with Refined Products"

**Roger D. Huang**, Owen School: "Energy Shocks and Financial Markets"

**Prem C. Jain**, Tulane: "Tax Benefits from Mergers"

**Arnold Juster**, Carnegie Mellon: "A Dynamic Model of Dividend Policy"

**Steven N. Kaplan**, University of Chicago: "The Valuation of Cash Flow Forecasts: An Empirical Analysis"

**Philip Kearns**, University of Rochester: "Pricing Interest Rate Derivative Securities when Volatility is Stochastic"

**Craig M. Lewis**, Owen School: "Initial Margin Policy and Volatility in the Crude Oil Futures Market"

**A. Craig, MacKinlay**, Wharton School: "Distinguishing Among Asset Pricing Theories"

**Victor K. Ng**, University of Michigan: "Price Dynamics in Physical Commodity Spot and Futures Markets: Spreads, Spillovers, Volatility and Convergence in Refined Petroleum Products"

**Stephen Penman**, University of California/Berkeley: "The Articulation of Price Earnings Ratios and Model to Book Ratios and the Evaluation Growth"

**Robin Prager**, Owen School: "The Effects of Cable Television Deregulation on Prices and Welfare"

**Barry Schachter**, Tulane and CFTC: "An Analysis of the Risk in Discretely Rebalanced Option Hedges and Delta-Based Techniques"

**Charles P. Thomas**, Board of Governors of the Federal Reserve System: "War and Peace: Recovering the Market's Probability Distribution of Crude Oil Futures Prices During the Gulf Crisis"

**Rex Thompson**, SMU: "Tests of a Signalling Hypothesis: The Case of Fixed versus Adjustable Rate Debt"

**Toshiaki Watanabe**, Yale: "A Nonlinear Filtering Technique for Estimating Stochastic Volatility Models with an Application to Daily Returns in the New York Stock Exchange"

## CURRENT ACTIVITIES OF CENTER FACULTY

**CLIFFORD BALL**, associate professor (finance and statistics). M.Sc., Ph.D., mathematics (New Mexico, 1980).

Conducts research in options, bond, and futures pricing and statistical applications to finance. Current research topics: pricing interest-rate contingent claims; EMS cur-

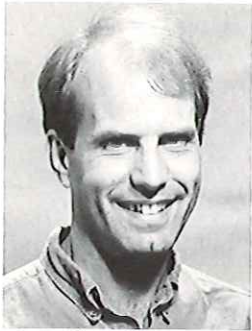
rency options; statistical estimation of diffusion processes employed in financial modeling. Prior to joining the Owen School in 1990, Ball was a faculty member at the University of Michigan Business School and the London Business School. He also has served as a consultant with the investment firm of Shearson, Lehman & Hutton. Ball teaches finance and statistics and was a finalist for the James A. Webb award for excellence in teaching.



Clifford Ball

Recently, Ball discussed a panel of papers on the stochastic volatility of security prices at the American Statistical Association meetings in Boston. His paper, "A Jump Diffusion Model for the European Monetary System," (co-authored with Antonio Roma) is forthcoming in the *Journal of International Money and Finance*. Another paper, "A Review of Stochastic Volatility Models with Application to Option Pricing," is forthcoming in *Financial Markets, Institutions, and Instruments*. He also serves as a referee for numerous research journals.

**PAUL CHANEY**, associate professor (accounting). M.B.A., Ph.D. (Indiana, 1983), C.P.A., C.M.A.



Paul Chaney

Conducts research on the economic consequences and capital-market effects of accounting information.

His paper, "An Empirical Investigation of Factors Affecting the Earnings Association Coefficient," (with Debra Jeter)

was published in the November

1992 issue of the *Journal of Business, Finance, and Accounting*. A second paper, "New Product Innovations and Stock Price Performance," (with Tim Devinney) was published in the September 1992 issue of the *Journal of Business, Finance, and Accounting*.

**TARUN CHORDIA**, assistant professor (finance). M.B.A. (Tulane, 1987), Ph.D. (UCLA, 1993).

Chordia is the newest Center member, having joined the Owen faculty this summer after completing his Ph.D. in Finance at UCLA. He has a Bachelors in Chemical Engineering from the Indian Institute of Technology, Delhi and a Masters in Chemical Engineering from Tulane University. Prior to his doctoral studies, he worked for Citibank, Bombay as a relationship and credit manager in the Financial Institutions Group.

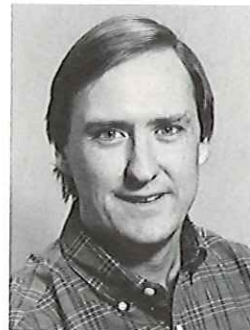


Tarun Chordia

Research interests include financial institutions (specifically mutual funds), corporate finance, and market micro-structure. His dissertation, "Essays on the Sale of Information and Investment Services in Financial Markets," analyzes the complex questions of (1) how brokerages may be selling information, (2) how competition effects the information sellers decision of direct versus indirect sale, and (3) how mutual funds structure their loads and redemption fees and investment strategies.

Chordia has presented his research at the American Finance Association and the Western Finance Association meetings. One of his papers, "Brokerage Commission Schedules," (with Michael Brennan) has been accepted for publication in the *Journal of Finance*.

**WILLIAM G. CHRISTIE**, assistant professor (finance). M.B.A., Ph.D. (Chicago, 1980, 1989).



William G. Christie

Christie joined the Owen faculty in 1989 after receiving his Ph.D. from the University of Chicago. He worked as a financial analyst at Hewlett Packard (Canada) Limited and the Ford Motor Company of Canada after completing his M.B.A.. His current research

interests include the importance of taxes and agency costs as determinants of dividend policy, the intraday evolution of bid-ask spreads in dealer markets, the competitiveness of dealer markets (particularly during periods of market stress), and the differences in trading costs realized by firms that move between dealer markets and specialist systems.

His publications include "Dividend Yield and Expected Returns: The Zero-Dividend Puzzle" in the *Journal of Financial Economics* and "The Changing Relation between Stock Returns and Dividend Yields" (with Roger D. Huang) forthcoming in the *Journal of Empirical Finance*. He presented "Dissimilar Market Structures and Market Liquidity: A Transactions Data Study of Exchange Listings" (with Roger D. Huang) at the 1993 Banking Research Center/Journal of Financial Intermediation Conference at Northwestern University. His paper, "Market Structure and the Intertemporal Evolution of Bid-Ask Spreads for NASDAQ Securities," (with K.C. Chan and Paul Schultz at The Ohio State University) is included on the program for presentation at the 1993 conference of the Western Finance Association. Christie has also presented his work at the 1990 European Finance Association meetings, the 1991 conference of the Western Finance Association, and the 1992 conference of the Southwestern Finance Association. He was the recipient of the 1993 Executive M.B.A. Award for Excellence in Teaching, and shared in the Dean's Award for Excellence in Teaching in both 1991 and 1993.



**MARK A. COHEN**, associate professor (economics). M.A., Ph.D. (Carnegie-Mellon, 1985).

Conducts research on government regulation, law and economics, white-collar and corporate crime. Before joining the faculty at the Owen School, Cohen was senior economist with the U.S. Sentencing Commission and earlier worked for the Federal Trade Commission, the U.S.



Mark Cohen

Environmental Protection Agency, the U.S. Department of Treasury, and the U.S. Senate Banking Committee. Cohen's writing has appeared in such publications as the *Journal of Law and Economics* and the *Yale Journal on Regulation*.

In addition to his ongoing research on corporate crime, Professor Cohen has recently focused his attention on the effect of environmental regulation and compliance on the financial performance of publicly traded firms. He also spent two weeks this past summer in Japan, meeting with government, academic, and business leaders in the field of environmental protection and beginning a research project comparing the effect of government policy in the U.S. versus Japan as it relates to environmentally sound manufacturing. During the past year, Cohen presented papers on corporate crime at the American Law and Economics Association Annual Meetings, the European Association of Environmental and Resource Economists, the American Society of Criminology Annual Meetings, and the John M. Olin School of Business, Washington University.

**J. DEWEY DAANE**, The Frank K. Houston Professor of Finance, Emeritus; senior advisor, Financial Markets Research Center. M.P.A., D.P.A. (Harvard, 1949).



J. Dewey Daane

Conducts research on monetary economics and international finance. Daane is a former member of the Board of Governors of the Federal Reserve System and is currently a public director and member of the finance committee of the National Futures Association, having been re-elected

in February for another three-year term. He is also a former public director of the Chicago Board of Trade. Daane served for many years as chairman of the Money Market Committee and vice-chairman of the Trust Board of the Sovran Bank/Central South in Nashville.

During the past year Daane participated in the 29th Annual Conference on Banking Structure and Regulation sponsored by the Federal Reserve Bank of Chicago, the 17th annual economic symposium on public issues sponsored by the Federal Reserve Bank of Kansas City in

Jackson Hole, Wyoming, and the Annual Meetings of the International Monetary Fund and World Bank in Washington, D.C. He is a regular respondent to the *Wall Street Journal* semi-annual economic surveys and to the quarterly *USA Today* surveys.

He taught seminars in Monetary Policy in Theory and Practice and Current Problems in Economic Policy at Middlebury College in Vermont last fall and is currently engaged in writing a history of Equitable Securities Corporation, Nashville, Tennessee.

**ROGER D. HUANG**, professor (finance). M.A., Ph.D. (Pennsylvania, 1980).



Roger D. Huang

Current research examines execution costs under alternative market structures, fixed income volatility, short-run predictability of stock prices, maturity premiums in U.S. Treasury markets, financial asset pricing, and the relation between oil and financial markets.

Huang presented papers at several places during the spring and summer of 1993. He presented "Dissimilar Market Structures and Market Liquidity: A Transactions Data Study of Exchange Listings" at George Mason University in February and at the Commodities Futures Trading Commission in May. In May, he also attended the symposium on Globalization and the Reform of Financial Institutions and Markets at Northwestern University where he presented a paper jointly with William G. Christie.

During the same time period, Huang's paper, "The Changing Functional Relation Between Stock Returns and Dividend Yields," (with William G. Christie) was accepted by the *Journal of Empirical Economics*.

**CRAIG M. LEWIS**, associate professor (finance). M.S., Ph.D. (Wisconsin, 1986), C.P.A.



Craig M. Lewis

Conducts research on corporate financial policy, accounting earnings management, futures, and options. Current research topics include the time series behavior of volatility, margin policy, market responsiveness to earnings announcements, and earnings management.

Published papers by Lewis include the information content of implied volatilities from stock index options, multi-period corporate financial policy choices, the valuation of convertible debt, and recapitalization as a takeover defense. His paper, "Are Debt and Leases Substitutes?" (with James S. Schallheim) appeared in *The Journal of Financial and Quantitative Analysis*, and another paper, "Stock Market Volatility and the Information Content of Stock Index Options," (with Theodore E. Day) appeared

in the *Journal of Econometrics*.

During the past year, Lewis's paper, "Initial Margin Policy and Stochastic Volatility in the Crude Oil Futures Market," (with Theodore E. Day) was presented at the Third Annual Winter Finance Conference at the University of Utah and the Fifth Annual Conference of the Financial Options Research Centre at the University of Warwick. Lewis discussed a paper at the Western Finance Association conference in Whistler, British Columbia. He also served as a referee for numerous research journals and was on the program committee for the Financial Management Association.

**RONALD W. MASULIS**, The Frank K. Houston Professor of Finance, formerly The Valere Blair Potter Professor of Management. M.B.A., Ph.D. (Chicago, 1978).



Ronald W. Masulis

Conducts research in the fields of corporate finance, financial institutions, capital markets, and most recently international finance. His research on capital structure changes and the security issuance process is widely referenced.

Prior to joining the Owen School in 1990, Masulis taught for many years at UCLA and worked as a financial economist at the Securities and Exchange Commission, the Federal Home Loan Bank Board and the Federal Savings and Loan Insurance Corporation. From 1986 to 1990, he was The James M. Collins Professor of Finance and executive director of the Center for the Study of Financial Institutions and Markets at SMU. Masulis has served on the board of directors of the American Finance Association and the executive committee of the Western Finance Association and is associate editor of a number of well known finance journals.

This April he presented "Corporate Financing Choices: A Survey of Theory and Evidence" at the Hitotsubashi International Symposium on Financial Markets in the Changing World in Tokyo. In May and June, he was a visiting professor of finance at the European Institute of Business Administration (INSEAD) in Fontainebleau, France, one of Europe's foremost business schools, where he participated in an International Corporate Finance Programme for executives. In June he presented "Overnight and Daytime Stock Return Dynamics on the London Stock Exchange" at ESSEC, a leading French business school in Cergy, France.

This spring his paper, "Common Stock Offerings Across the Business Cycle: Theory and Evidence," (with Hyuk Choe and Vikram Nanda) was published as the lead article in the new *Journal of Empirical Finance*. Also, "Adverse Selection and the Rights Offer Paradox" (with Espen Eckbo) appeared in the *Journal of Financial Economics*.

**DAVID C. PARSLEY**, assistant professor (economics). A.M. (Indiana, 1979), Ph.D. (California, Berkeley, 1990).

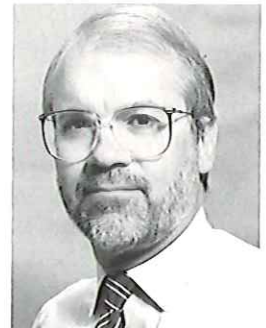


David C. Parsley

Joined the Owen faculty in 1990 after completing his Ph.D. at the University of California at Berkeley. Prior to his doctoral studies, he worked as a research associate at the Federal Reserve Bank of San Francisco. He conducts research on the effects of exchange rates on price levels, the persistence of the U.S. trade deficit, price dispersion among U.S. cities, and exchange rate volatility and international trade.

Parsley presented a paper, "The Rigidity of Prices Reconsidered," at the American Economics Association meetings in Anaheim in January. He will present papers at the Southern Economics meetings in New Orleans in November and at the American Economics meetings in Boston in January.

**DAVID T. SCHEFFMAN**, The Justin Potter Professor of American Competitive Enterprise. Ph.D. (M.I.T., 1971).



David T. Scheffman

Conducts research on Business strategy, marketing, pricing, regulation, antitrust, and industrial organization. Current research topics: mergers in the electric power industry, antitrust policy, pricing, distribution channels, and input exchange agreements. During the past year, Scheffman published "Ten Years of Merger Guidelines: A Retrospective, Critique, and Prediction," "Strategy and Vertical Relationships in the Soft Drink Industry," and *Strategy, Structure and Antitrust in the Carbonated Soft Drink Industry* (with T. Muris and P. Spiller), a book published by Quorum Books.

Scheffman gave several presentations during the past year to academics and groups from the business and legal communities on antitrust policy, mergers, strategic planning, and marketing.

**HANS R. STOLL**, The Anne Marie and Thomas B. Walker Professor of Finance; director, Financial Markets Research Center. M.B.A., Ph.D. (Chicago, 1966).

His current research topics include the short-run prediction of stock returns, the measurement of transactions costs, the transmission of oil price shocks to other financial markets, and the efficiency of dealer versus auction markets.



Hans R. Stoll

During the past year, Stoll participated in a conference on the Operation and Regulation of Financial Intermediaries in Financial Markets held at the Stockholm

School of Economics. His summary of the financial markets papers presented at the conference has been published by the Swedish Economic Council, sponsor of the conference. He presented his paper, "Market Microstructure and Stock Return Predictions," (co-authored with Roger Huang) at the annual meeting of the European Finance Association in Lisbon, Portugal, at the University of Florida, and at McGill University in Montreal, Canada. In October, Stoll gave the lead-off lecture on the subject of Microstructure of Capital Markets at a conference on Empirical Research in Capital Markets held at Osnabruck, Germany, sponsored by the German equivalent of the National Science Foundation. Stoll continues as a member of the Shadow Securities and Exchange Commission, which met in November to discuss Executive Compensation and Market Value Accounting. The proceedings of that conference are contained in the Winter 1993 issue of the *Journal of Applied Corporate Finance*. Also in the same issue is Stoll's paper, "Organization of the Stock Market: Competition or Fragmentation?" In December, he spoke in Toronto, Canada, on "Industrial Organization of Securities Markets: Economic Forces and Regulatory Issues" at a conference sponsored by the Association of Investment Management and Research. In the spring of 1993, he spoke at Wharton's Securities Industry Institute on the subject of "Portfolio Trading Costs: Myth versus Reality," and he spoke at the Squaw Valley meeting of the Berkeley Program in Finance on the subject of "Equity Trading Costs In-the-Large and In-the-Small." On June 20 to 24, Stoll presided over the annual meeting of the Western Finance Association held at Whistler, Canada, his last obligation as president of that organization.

Stoll's publications during the past year include "Principles of Trading Market Structure," which appeared in the *Journal of Financial Services Research*, and "The Design of Trading Systems: Lessons from Abroad" (with Roger Huang), which appeared in the *Financial Analysts Journal*. Stoll also served as a guest editor of a special issue of the *Journal of Financial Services Research*, "Microstructure of World Trading Markets," which appeared in January 1993 and contained selected papers from the April 1992 conference of the Financial Markets Research Center. He co-edited (with Ron Masulis) a special issue of *Financial Management* on the subject of "Market Microstructure and Corporate Finance." Stoll recently became an editor of the *Journal of Derivatives*, and he continues to serve on the editorial boards of six other academic journals. Stoll is co-author (with Robert Whaley) of the book, *Futures and Options: Theory and Applications*.

**H. MARTIN WEINGARTNER**, The Brownlee O. Currey Professor of Finance. M.S., Ph.D. (Carnegie Mellon, 1962).

Weingartner taught previously at Chicago, MIT, and Rochester. He is a past president of The Institute of Management Sciences and is associate editor of *Management Science*. His publications include *Mathematical Programming and the Analysis of Capital Budgeting Problems* and numerous articles.

His paper, "How to Settle an Estate," (co-authored with Bezalel Gavish) was published in *Management Science* this past June.



H. Martin Weingartner

## FACULTY RESEARCH PAPERS

Current working papers completed or revised since January 1992 are listed below. Individual copies may be obtained by writing Mrs. Pat Scott, Owen Graduate School of Management, Vanderbilt University, Nashville, TN 37203.

91-04 "Exchange Rate Pass-Through: Evidence from Aggregate Japanese Exports," by **David C. Parsley**. (Forthcoming in *Southern Economic Journal*)

This paper presents evidence that aggregate exchange rate pass-through declined for Japanese exports during the 1980's. The analysis investigates pass-through at a sectoral level and asks whether a general decline occurred across all industry sectors, or whether there were particular sectors responsible for the aggregate decline. Pass-through is found to vary widely across the six sectors considered, but no evidence of a decline in any individual sector is found. The conclusion is that a decline in aggregate pass-through may be the result of a shifting commodity composition of trade in which those sectors having lower aggregate pass-through account for a growing proportion of Japanese exports.

91-07 "A Branching Model for Bond Price Dynamics and Contingent Claim Pricing," by **Clifford A. Ball**. (January 7, 1992)

Financial claims that depend on future levels of interest rates are increasing in importance. Examples include: Eurodollar Futures contracts, futures options written on long treasury bonds, variable rate loans, variable-rate mortgage contracts, and their derivative securities. This paper puts forward a branching model for bond price dynamics and develops a discrete time scheme for pricing the corresponding derivative assets. A Markov Chain structure is employed and the required numerical procedure is outlined. The model can estimate, under certain circumstances, the bond option model introduced by Cox, Ingersoll, and Ross (1985).

91-10 "Information Trading and Fixed Income Volatility," by **Campbell R. Harvey** and **Roger D. Huang**. (April 1992)

We study the intraday and interday volatility patterns in the Eurodollar and Treasury bill futures markets using transaction data from the Chicago Mercantile Exchange and the London International Financial Futures Exchange. Volatility in the Eurodollar futures contracts is concentrated at the same time on both the exchanges and coincides with U.S. macroeconomic

news released between 7:30am and 8:30am Central Time. We show that this concentration of volatility is distinct from volatility induced by trading procedures at the opening by examining the opening market volatilities on different exchanges and at different opening times. We also find evidence of increased volatility due to private information trading between 10:30am and 11:30am Central Time when the Federal Reserve Bank implements its policies through open market operations.

- 91-11 "The Changing Functional Relation Between Stock Returns and Dividend Yields," by **William G. Christie** and **Roger D. Huang**. (June 1993)

This paper provides a new approach for evaluating whether expected stock returns compensate investors for the tax differential between dividends and capital gains. We estimate the relation between dividend yields and risk-adjusted returns using a technique that does not assume linearity, and we exploit the information in the resulting cross-sectional patterns. Our results reveal a rich variety of nonlinear shapes, the majority of which contradict the hypothesis that equilibrium equity returns reflect the tax differential. The overall evidence does not provide support for any particular hypothesis, implying that no exploitable systematic relation exists between dividend yields and expected returns.

- 91-12 "An Analysis of Nonlinearities in Term Premiums and Forward Rates," by **Roger D. Huang** and **Charles S.Y. Lin**. (May 1993)

Previous studies often assume a linear relation between term premiums on Treasury securities and forward interest rates, although a nonlinear relation is a theoretical and an empirical possibility. To circumvent specification problems, this paper uses a nonparametric kernel approach that permits both linear and nonlinear relations. Although the linear specification that is consistent with the term structure models of Cox, Ingersoll, and Ross and others appears to be robust, we uncover evidence that expected term premiums and their sensitivities to forward premiums vary through time. Kernel regression models also generate humped term structures of expected term premiums that appear to move systematically with the business cycle.

- 91-13 "Measuring the Impacts of Dividend Capture Trading: A Market Microstructure Analysis," **Hyuk Choe** and **Ronald W. Masulis**. (October 5, 1992)

This study examines transactions data around cash dividend distributions by NYSE and AMEX listed common stocks for several separate tax regimes associated with years 1985, 1986 and 1988. Evidence of abnormally large and frequent purchase orders preceding the ex-date and abnormally large and frequent sell orders on the ex-date is uncovered. Shifts in specialists' bid-ask quotes and spreads are also found. The results are insensitive to measurement based on hourly sampling or transaction by transaction sampling. A significant increase in dividend capture activity is found in the 1988 period. Biases in returns calculated from transaction prices as well as returns based on cum- and ex-date closing prices are documented.

- 91-15 "An Empirical Analysis of Earnings Management: Evidence from Initial Public Offerings," by **Paul K. Chaney** and **Craig M. Lewis**. (July 1993)

This paper investigates how firms that made initial public offerings of equity between 1975 and 1984 report earnings. For a sample of 489 firms, we find a positive association between a proxy for income smoothing and firm performance. Firms that perform well tend to report earnings with less variability relative to cash from operations; while firms that perform poorly tend to report earnings that increase earnings variability relative to cash

from operations. In addition, the five-year earnings response coefficient is greater for firms that are able to smooth earnings relative to cash flows. This result is consistent with a hypothesis that the market is better able to assess the information content of earnings for firms with smoother earnings.

- 91-26 "Market Microstructure and Stock Return Predictions," by **Roger D. Huang** and **Hans R. Stoll**. (June 28, 1993)

To what extent are the empirical regularities implied by market microstructure theories useful in predicting the short-run behavior of stock returns? A two-equation econometric model of quote revisions and transaction returns is developed and used to identify the relative importance of different microstructure theories and to make predictions. Microstructure variables and lagged stock index futures returns have in-sample and out-of-sample predictive power based on data observed at five-minute intervals. The most striking microstructure implication of the model, confirmed by the empirical results, specifies that the expected quote return is positively related to the deviation between the transaction price and the quote midpoint while the expected transaction return is negatively related to the same variable.

- 91-28 "Overnight and Daytime Stock Return Dynamics on the London Stock Exchange," by **Ronald W. Masulis** and **Victor K. Ng**. (December 14, 1992)

Using a modified GARCH framework which allows shocks originating in trading and nontrading periods to have differing impacts and persistence on future volatility, we explore the time series properties of daytime and overnight returns on the London Stock Exchange. We find evidence that nontrading period shocks are less persistent than trading period shocks on trading period volatility, and the conditional distribution of the nontrading period return is much more fat-tailed than the conditional distribution of the trading period return. We also find evidence that bad news causes more volatility than good news in trading periods, but not in the nontrading periods, which might explain why corporations release bad news in nontrading periods. Our results are consistent with the hypothesis that stock price volatility is related to the trading activities of informed investors.

- 91-36 "Insignificant and Inconsequential Hysteresis: The Case of U.S. Bilateral Trade," by **David C. Parsley** and **Shang-Jin Wei**. (Forthcoming in *Review of Economics and Statistics*)

This paper casts doubt on the validity of the hysteresis hypothesis as an explanation of the persistent US trade deficits in the 1980s. We propose two tests to investigate two different implications of the hysteresis. The first implication is that cumulative changes in exchange rates, in addition to current exchange rate levels, are important determinants of trade flows. The second implication is that foreign exporting firm's perceptions of exchange rate volatility will affect their decisions to enter or exit the market. We find little support for either aspect of the hysteresis hypothesis.

- 91-60 "Estimation of European Monetary System Exchange Rates," by **Clifford A. Ball** and **Antonio Roma**. (November 1992)

The European Monetary System (EMS) exchange rate mechanism enforces fixed fluctuation bands for exchange rates around a grid of central parities which is subject to realignment. Between shifts in central parity, we model the exchange rates of participating currencies by means of an Ornstein-Uhlenbeck process with reflecting barriers. This specification captures central bank intervention at band limits as stipulated in the EMS

mechanism and also allows for mean reversion in exchange rates within intervention limits. Building on recent work by Ricciardi and Sacerdote [1987], we implement full maximum likelihood estimation of the parameters of these time series dynamics for the most heavily traded bilateral exchange rates of the EMS system. Our model contains reflected Brownian motion as a nested special case. Therefore, the statistical procedure allows testing of the null hypothesis of a random walk inside the barriers against a specific alternative autoregressive process. This extends the test for mean reversion inside reflecting barriers proposed by Ball and Roma [1992], where an unspecified alternative is considered, and allows precise testing of the dynamic specification of macroeconomic models of enforcement of exchange rate fluctuation bands. We also perform Monte Carlo simulations to establish the small sample distribution of the estimated autoregressive parameter.

91-64 "Estimation of a Diffusion Process for Spot Rates," by **Clifford A. Ball** and **Walter N. Torous**. (March 1993)

Recently, Cox, Ingersoll, and Ross (CIR) proposed a parametric class of mean reverting square-root diffusion processes to model spot real interest rates in the development of a full equilibrium term structure model. Due to the complexity of the associated transition densities, little work has been attempted on the estimation of the parameters of this diffusion. There is considerable interest, however, in testing the term structure model. Discrete observations from this process may be approximated as realizations from an autoregressive process with variance proportional to level. The resultant parameter estimation problem is a straightforward application of generalized least squares (GLS) techniques. The full maximum likelihood estimation of parameters involves modified Bessel functions and requires excessive programming. We also estimate the CIR model by Generalized Method of Moments (GMM) for comparison purposes. In addition, we examine two factor models for bond price dynamics and estimate a simpler model induced by discrete time approximations. This line of research was pioneered by Brennan and Schwartz (1979,1981). The two factor models may be estimated by maximum likelihood and seemingly unrelated (multivariate) regression (SURE).

91-69 "Following the Pied Piper: An Empirical Analysis of Herd Behavior in Equity Returns," by **William G. Christie** and **Roger D. Huang**. (March 1992)

This paper empirically assesses the impact of herd behavior on equity returns. The measure we use to capture herd behavior is dispersions, defined as the cross-sectional standard deviation of equity returns. Using this measure, we are unable to detect the presence of herd behavior when the analysis is restricted to periods when herds are most likely to form. When we do not pre-specify the conditions under which herds would form, the intertemporal variation in dispersions is predictable using variables suggested by rational asset pricing models. These results alleviate our concerns that irrational herd behavior drives prices away from equilibrium.

91-70 "Data Frequency and the Number of Factors in Stock Returns," by **Roger D. Huang** and **Hoje Jo**. (June 1993)

Determining the number of factors that explain stock returns plays an important role in empirical tests of the Arbitrage Pricing Theory. This paper examines the sensitivity of the number of factors to different data frequencies using daily, weekly, and monthly returns. The empirical results are consistent with the null hypothesis that the number of factors is the same for different data frequencies once daily returns are adjusted for nonsynchronous trading. The evidence also identifies only one or two factors.

92-04 "Agency Costs, Shareholder Value, and the Undistributed Profits Tax of 1936-37," by **William G. Christie** and **Vikram Nanda**. (October 1992)

In 1936, the Federal Government attempted to force corporations to distribute a larger proportion of their after-tax profits as cash dividends by imposing a tax on undistributed profits. This paper explores the implications of this tax for shareholder wealth within the context of modern theories of corporate dividend policy. Despite the direct and indirect costs associated with the tax, its unexpected announcement produced a positive revaluation of corporate equity, with lower dividend payout firms experiencing the largest stock price increases. We interpret this as evidence of a substantial divergence between managerial and shareholder preferences regarding dividend payout policies, consistent with the presence of agency costs. In evaluating the actual growth in dividends in 1936, we find that dividend growth was particularly sluggish among firms judged more likely to be subject to higher agency costs after controlling for liquidity, long-term debt, and the growth in earnings.

92-05 "Are Dividend Omissions Truly the Cruellest Cut of All?" by **William G. Christie**. (January 1993)

Signaling and agency cost explanations of dividend policy predict that omissions, which represent the severest form of reduction, would trigger a larger average decline in equity value relative to reductions of less than 100%. This paper examines this hypothesis by comparing the announcement effects of dividend reductions and omissions. Firm-specific and economy-wide variables are used in a regression context to explain the variation in reduction announcement risk-adjusted returns. The functional form of the reduction regressions is then used to predict omission announcement risk-adjusted returns. The results indicate that the risk-adjusted returns for omissions are significantly smaller in magnitude than would be predicted from the reduction regressions alone. These results can not be traced to omissions that management attribute to growth related opportunities. Rather, the muted price reaction to dividend omissions appears to reflect the tendency for omitting firms to provide superior dividend performance during the five years following the omission relative to firms severely reducing their dividend.

92-18 "Why Do Corporations Become Criminals?" by **Cindy Alexander** and **Mark A. Cohen**. (August 1992)

92-25 "Intertemporal Variation in Exchange Rate Uncertainty and Traded Goods Prices in the Presence of Risk Neutrality," by **David C. Parsley** and **Ziyong Cai**. (June 1992)

92-26 "Exchange Rate Uncertainty and Trade Flows in the Presence of Risk Neutrality," by **David C. Parsley**. (September 1992)

92-32 "Initial Margin Policy and Stochastic Volatility in the Crude Oil Futures Market," by **Theodore E. Day** and **Craig Lewis**. (May 1993)

Dramatic short-run increases in the volatility of financial markets, such as the extraordinary volatility following the stock market decline in October 1987, have renewed interest in the relation between initial margin requirements and stock market volatility. We extend previous research on the nature of the relation between initial margin requirements and the volatility of markets by examining the behavior of the implied volatilities from call options on crude oil futures contracts under the assumption that volatility is stochastic. The spot volatilities implicit in the prices of crude oil options provide direct evidence concerning the  $\alpha$

*ante* effect of margin changes. Previous research examines *ex post* effects.

- 92-36 "Dissimilar Market Structures and Market Liquidity: A Transactions Data Study of Exchange Listings," by William G. Christie and Roger D. Huang. (April 20, 1993)

Firms often justify their decision to change trading location by citing expected improvements in liquidity. This paper examines realized changes in trading costs for firms that move from a dealer market to a specialist system in 1990. Using transactions data, our empirical results reveal structurally-induced average trading cost reduction of 4.7 (5) cents per share for firms moving from the NASDAQ/NMS to the NYSE (AMEX). These reductions vary by trade size and dollar spread in a manner consistent with the greatest benefits accruing to the less liquid stocks. Additionally, the trading cost reductions realized from listing and trading on the NYSE relative to the NASDAQ/NMS are balanced between reductions attributed to quote improvements and reductions attributed to order-flow competition. These dramatic improvements in liquidity are robust with respect to firm-specific effects since they are not confounded by a mismatching of firms across exchanges. Our results suggest that the expected reduction in trading costs appear to have been well-founded, particularly for firms that were relatively illiquid.

- 92-37 "Market Structure and the Intraday Evolution of Bid-Ask Spreads for NASDAQ Securities," by K.C. Chan, William G. Christie, and Paul H. Schultz. (July 1993)

The structural differences between the specialist markets (i.e. NYSE and AMEX) and the dealer market (i.e. NASDAQ/NMS) may translate into differences in the intraday width of bid-ask spreads. Using data downloaded from the Bridge Quotation System, this paper examines the intraday pattern in bid-ask spreads for two samples of NASDAQ stocks. We find that in contrast to the intraday pattern for NYSE stocks reported by Brock and Kleidon (1992) and McNish and Wood (1992), the bid-ask spread for NASDAQ securities narrows throughout the day, with the sharpest decline observed near the close of trading. These results are particularly interesting since they cannot be attributed to declines in volume or volatility near the close. Rather, they support the conjecture that the differences in intraday bid-ask spreads are induced by institutional differences between the specialist and dealer markets. In particular, the wider than average spreads near the open for NASDAQ stocks is consistent with the process of price discovery, while the narrowing of spreads near the close is linked to inventory management by individual dealers.

- 92-44 "Stock Price Distributions with Stochastic Volatility and Option Pricing: An Alternative Approach," by Clifford A. Ball and Antonio Roma. (March 27, 1993)

A number of stochastic volatility option pricing models have been introduced recently. Numerical pricing methods have been proposed, for example, see Wiggins (1987), though risk neutral or Martingale approaches, which provide analytical representations, are more elegant and usually more efficient. For these latter techniques, the distribution of the average variance of the price process plays a pivotal role. Whenever its moments may be computed, they may be employed to generate power series expansion approximations to the option prices as discussed by Hull and White (1987) for a simple volatility model. Alternatively, the whole moment generating function may be used to generate the security price density by Fourier inversion methods. Stein and Stein (1991) develop this approach.

However, they adopt a more plausible but unnecessarily complex model for volatility. We correct some errors in earlier work and introduce a plausible model for stochastic volatility which is mathematically tractable and allows both power series and Fourier inversion approaches to option pricing. This enables a measured assessment of the benefits of the simpler power series approach. We also carefully examine possible biases introduced by the stochastic volatility option pricing models and discuss the qualitative differences between Black-Scholes and stochastic volatility option prices.

- 92-45 "Mean Reversion Tests with Reflecting Barriers: An Application to the European Monetary System," by Clifford A. Ball and Antonio Roma. (December 1992)

This paper derives a statistical test, based on the first order autocorrelation, to ascertain whether a stochastic process evolving within reflecting barriers is mean reverting. Under these conditions the standard unit root analysis does not apply. Since the presence of reflecting barriers per se will induce mean reverting behavior, the detection of mean reversion inside the two boundaries requires that the effect of reflection be properly accounted for. This statistical procedure may find application in the empirical testing of target zones models for exchange rates. Krugman [1987, 1990] introduced a model of exchange rates within target zones which posits a nonlinear relation between the exchange rate and its fundamental determinants. The fundamentals process is assumed to be regulated. The nonlinear relation induces mean reversion in the exchange rates within the band. The test is applied to the exchange rate in terms of Deutsche Marks of five currencies participating in the European Monetary System. Our methodology is helpful in deciding whether the mean reverting behavior of these exchange rates is due solely to local behavior at the barriers, or whether a more complex model consistent with a nonlinear exchange rate-fundamental relation is warranted.

- 92-46 "Price Change and Trading Activity Dynamics on the London Stock Exchange," by Ronald Masulis and Victor Ng. (March 12, 1993)

In this paper, we examine the dynamic relations between daily return volatility and trading volume in the London stock market treating both as endogenous variables. Daily returns are decomposed into their close-to-open and open-to-close components. Trading volume is disaggregated into the number of trades and the average trade value, consistent with existing theoretical predictions. Several alternative measures of price volatility are examined, including an absolute value of open-to-close returns and the log of the daily high-low ratio. Ordinary least square estimates uncover empirical evidence that the relation between close-to-close return volatility and trading volume is primarily induced by a relation between the close-to-open return volatility and volume. Volatility measures are found to be weakly affected by prior trading volume. To allow for feed back effects from prices and volatility to volume, we also develop and estimate a trivariate GARCH system involving open-to-close returns, number of trades and average trade value. We estimate a constant correlation multivariate GARCH model with Student-t distributed conditional errors. The squared errors from one dependant variable are allowed to enter the conditional variances of the other dependant variables. An asymmetric leverage volatility effect is also estimated. Seasonalities and structural shift adjustments to prices and trading volume are also made. All measures of trading volume are found to be strongly affected by prior price volatility. The number of trades and the average trade value have very different dynamic behavior. We find that trading volume does not account for the asymmetric effect of past returns on the condi-

tional variance of the open-to-close returns. We also find evidence of time varying volatility for the volume measures and volatility spillovers between returns and volume.

92-47 "Impacts of Seasoned Equity Offerings on Market Microstructure and the Stock Return Generating Process," by Ronald Lease, Ronald Masulis, and John Page. (June 1992)

93-04 "A Review of Stochastic Volatility Models with Application to Option Pricing," by Clifford A. Ball. (March 27, 1993)

Over the last twenty years the Black-Scholes option pricing model has proven to be a valuable tool for the pricing of options and, more generally, for the management of hedged positions in the derivatives markets. However, a number of systematic biases in the model prices suggest that the underlying security volatility may be stochastic. This observation is further reinforced by empirical evidence from the underlying asset prices. In response to these observations, a number of stochastic volatility models for security price movement and related option pricing have been introduced. In this paper, we review some of the more popular stochastic volatility option pricing models for a variety of financial instruments. We also discuss the various empirical difficulties created by these models. We compare the new option prices with Black-Scholes prices to ascertain whether reported observational biases are eliminated. In addition, we outline the major unresolved research questions in this expanding literature.

93-06 "The Structure of Mutual Fund Charges," by Tarun Chordia. (May 31, 1993)

This paper considers three reasons for the increasing popularity of mutual funds: diversification, transaction cost savings and risk sharing. Mutual funds represent a commingling of assets and are required to pay each redeeming investor a pro-rata share of the net asset value of the fund. This results in a better allocation of the liquidity risk amongst the investors. However, the fund's expected profits decrease in the probability of investor redemptions, and the mutual fund will thus seek to dissuade redemptions. We argue that load fees dissuade redemptions in open-end funds. A closed-end fund obviates the need for liquidation of holdings by the mutual fund in response to investor redemptions.

We provide evidence that mutual funds hold cash and cash equivalents in their portfolio in order to meet investor redemptions. We also demonstrate that, as predicted by the model, mutual fund cash holdings decrease with load fees. The results suggest that aggressive growth funds are more sensitive to cash flows and are more likely to rely on load fees to dissuade redemptions because they hold more of the smaller less liquid stocks.

93-07 "Brokerage Commission Schedules," by Michael J. Brennan and Tarun Chordia. (February 1993)

It is generally optimal for risk sharing reasons to base a charge for information on the signal realization. When this is not possible, a charge based on the amount of trading, a brokerage commission, may be a good alternative. The optimal brokerage commission schedule is derived for a risk neutral information seller faced with risk averse purchasers who may differ in their risk aversion. Revenues from the brokerage commission are compared with those from a fixed charge for information and the optimal mutual fund management fee.

93-08 "Forecasting Futures Market Volatility," by Theodore E. Day and Craig Lewis. (July 1993)

This paper compares the accuracy of forecasts of futures market volatility obtained from generalized autoregressive conditional heteroscedasticity (GARCH) models for the conditional volatility of the crude oil futures market with forecasts derived from the implied volatilities from call options on crude oil futures contracts. The results show that the implied volatilities from crude oil futures options have significant within-sample explanatory power. Although implied volatilities contain information which is incremental to the information contained in time series models for conditional volatility, we provide evidence that GARCH models of conditional volatility contain information that is not impounded by the prices of call options on crude oil futures contracts. Tests of the out-of-sample forecasting power of the alternative models indicate that implied volatilities tend to provide better forecasts than either historic volatility or the forecasts based on time series models for conditional volatility.

93-09 "Exchange Rate Pass-Through with Intertemporal Linkages: Evidence at the Commodity Level," by David C. Parsley. (July 1993)

This paper argues that the stability of exchange rate pass-through is not well tested in common econometric specifications of pass-through equations. This is because theoretically, the expectation of future exchange rates is an important omitted variable from typical import price equations, and, empirically, the use of aggregate data has severe limitations in this context. Commodity level results presented here indicate behavior over the 1980's consistent with the forward looking model presented.

## 1992-93 PUBLICATIONS

"The Effect of Size on the Magnitude of Long-Window Earnings Response Coefficients," by Paul K. Chaney (with Debra Jeter), *Contemporary Accounting Research*, Spring 1992.

"New Product Innovations and Stock Price Performance," by Paul K. Chaney (with Timothy Divinney), *Journal of Business, Finance, and Accounting*, September 1992.

"An Empirical Investigation of Factors Affecting the Earnings Association Coefficient," by Paul K. Chaney (with Debra Jeter), *Journal of Business, Finance, and Accounting*, November 1992.

"Intertemporal and Cross-Sectional Asset Return Variability," by William G. Christie and Roger D. Huang, *Contemporary Business Issues*, Proceedings of the 1992 Conference of the Academy of Business Administration, 1992.

"Politically Imposed Entry Barriers," by Mark A. Cohen (with Paul H. Rubin), *Eastern Economic Journal*, Vol.18, No.3, Summer 1992.

"Environmental Crime and Punishment: Legal/Economic Theory and Empirical Evidence on Enforcement of Federal Environmental Statutes," by Mark A. Cohen, *Journal of Criminal Law and Criminology*, Vol.82, No.3, 1992.

"Sentencing Guidelines and Corporate Criminal Liability

- in the U.S.," by Mark A. Cohen, *Business and the Contemporary World*, Vol.4, No.3, Summer 1992.
- "Criminal Penalties," by Mark A. Cohen, in *Innovations in Environmental Policy*, Thomas Tietenberg, ed. (Cheltenham, U.K.: Edward Elgar Publishing, 1992).
- "The motives of Judges: Empirical Evidence from Antitrust Sentencing," by Mark A. Cohen, *International Review of Law and Economics*, Vol.12, 1992.
- "Major World Equity Markets: Current Structure and Prospects for Change," by Roger D. Huang and Hans R. Stoll, *Monograph Series in Finance and Economics*, Monograph 1991-3.
- "Information and Volatility in the FX Markets," by Roger D. Huang (with Campbell Harvey), *Finanzmarkt und Portfolio Management*, Vol.6, 1992.
- "Transformed Securities and Alternative Factor Structures," by Roger D. Huang (with Hoje Jo), *Journal of Finance*, Vol.47, March 1992.
- "The Design of Trading Systems: Lessons from Abroad," by Roger D. Huang and Hans R. Stoll, *Financial Analysts Journal*, September-October 1992.
- "Stock Market Volatility and the Information Content of Stock Index Options," by Craig M. Lewis (with T. Day), *Journal of Econometrics*, Vol.52, 1992.
- "Are Debt and Leases Substitutes?" by Craig M. Lewis (with J. Schallheim), *Journal of Financial and Quantitative Analysis*, Vol.27, 1992.
- "Adverse Selection and the Rights Offer Paradox," by Ronald W. Masulis (with B. Espen Eckbo), *Journal of Financial Economics*, Vol.32, 1992.
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