Does Student Debt Affect Entrepreneurship and Career Choices?

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According to statistics from the Federal Reserve Board, the level of student debt has nearly tripled in the last decade, from 521 billion dollars outstanding in 2005 to 1.3 trillion in 2015. Over the same time, according to data from the Kauffman Foundation, the percentage of new entrepreneurs each year represented by the age 20-34 group has declined by over a fifth, from 31% to 24%. Given the importance of entrepreneurship in the economy and the ever-rising cost of education, there is an urgent need to understand whether more student debt depresses the motive for entrepreneurship and risky career choices more generally.

Student debt may impact entrepreneurship through several channels. It is well-known that entrepreneurs often rely on their own debt capacity or wealth to finance their initial businesses, and debt may directly constrain students from starting businesses. Debt may also make students effectively more risk-averse by raising the prospect of personal financial distress. Quasi-experimental evidence in other contexts suggests that these channels are important. For example, Rothstein and Rouse (2011) and Field (2009) show that college and law students with less debt are more likely to go into low-paid "public interest" jobs.

On the other hand, there is little causal evidence on whether student debt meaningfully affects entrepreneurship. The negative correlation between student debt and entrepreneurship (e.g., as in Ambrose, Cordell, and Ma (2015)) may reflect broader secular trends. The literature has faced two main challenges. The first is in identifying a group of students who are reasonably potential entrepreneurs ex ante. College students are arguably still in an experimental phase of their career life cycle and are likely to be credit constrained. Law students often require years of experience before starting their own firms. A second challenge is that assessing entrepreneurship and risk-taking requires studying longer-run outcomes at the individual level (Manso, 2016).

Our project aims to fill this gap. We ask whether student debt causally affects entrepreneurship choices among business school (B-school) students. These students are a self-selected group interested in business and management in a setting where they can learn about entrepreneurship through courses, alumni, and also peers (Lerner and Malmendier, 2013). Given the average age of 27 at top B-school programs, B-school students are also at a stage where they are relatively young but have valuable experience for starting a business. We aim to

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measure the effect of student debt at the individual level on the likelihood of becoming an entrepreneur or going to a start-up company. We focus not only on immediate choices after graduation, but also on long-run outcomes.

We exploit a quasi-experimental setting where a business school ("the school") allocates merit-based scholarships to admitted students each year using a pre-defined rule. The rule allocates money from a broad scholarship pool to the top-ranked students until the pool is exhausted. Each year, there is a clear discontinuity in who receives a scholarship as a function of these rankings. Because scholarships are direct transfers which reduce a student's overall need for debt, the rule allows us to use a regression discontinuity design (RDD) to identify the casual effect of student debt on career outcomes. If student debt has a meaningful effect on outcomes, we should see that students who just-qualified for a scholarship become entrepreneurs or take riskier career choices more often than students who just-failed to qualify.

We conducted a preliminary analysis of the "first-stage" of this RDD design, covering student cohorts from 2009-2015 and a total of 842 students. Pooling across cohorts, Figure 1 and Table 1 document that students who just-qualified received 20,000 dollars more in scholarship funding than students who just-failed to qualify, who received zero by construction. On average, this decreased their ex ante financing needs by an economically significant 24 percent. The figure and table also show that, among students who took on any debt, students who just-qualified for the scholarship took on 13,000 dollars less in student debt ex post than students who just-failed to qualify.

In the next step, we plan on examining the second stage: whether students who just-qualified for the scholarship are more likely to become entrepreneurs or make riskier career choices, what types of businesses they started, and whether their businesses succeeded. We plan on working with several pieces of data. First, we plan on acquiring detailed information on the history of career choices since graduation from LinkedIn, the premier online professional network. Second, we will use data to the extent possible from the school's own alumni information and career office databases. Third, we plan on supplementing data, to the extent possible, from the credit registry, to gain a more complete picture of the students' debt finances. Recent research has suggested that more student debt may lead to more debt of other types (Fry, 2014; Mezza et al., 2016).

Our preliminary analysis demonstrates the validity of the proposed quasi-experiment as an exogenous shock to student debt. Linking it to career choice and entrepreneurship has important implications for our understanding of why experienced, business-minded young may choose to enter entrepreneurship, and why their entrepreneurship rates have changed so much in the past ten years.

References

Ambrose, Brent W., Larry Cordell, and Shuwei Ma, 2015. The impact of student loan debt on small business formation. Working paper, Federal Reserve Bank of Philadelphia.

Field, Erica, 2009. Education debt burden and career choice: Evidence from a financial aid experiment at NYU law school. *American Economic Journal: Applied Economics* 1, p. 1-21.

Fry, Richard, 2014. Young adults, student debt and economic well-being. Working paper, Pew Research Center's Social and Demographic Trends project.

Lerner, Josh, and Ulrike Malmendier, 2013. With a little help from my (random) friends: Success and failure in post-business school entrepreneurship. *Review of Financial Studies* 26, p. 2411-2452.

Manso, Gustavo, 2016. Experimentation and the Returns to Entrepreneurship. *Review of Financial Studies,* forthcoming.

Mezza, Alvaro, Daniel R. Ringo, Shane M. Sherlund, and Kamila Sommer. On the Effect of Student Loans on Access to Homeownership. Working Paper, 2016

Rothstein, Jesse, and Cecilia Rouse, 2011. Constrained after college: Student loans and early-career occupational choices. *Journal of Public Economics* 95, p. 149-163.

Table 1. Effect of Merit Based Scholarship on Debt

$$y = treat\ (rrank \leq 0) + rrank + treat \times rrank + controls + \varepsilon$$

Panel A shows the coefficients for a regression of scholarship amount in thousands dollars on a *treatment* dummy defined as one if the relative ranking of the student is to the left of the discontinuity and zero otherwise, *rrank* defined as the relative ranking of the individual with respect to the last student that received a scholarship, and the interaction between the treatment dummy and the relative rank. Columns 3 and 5 include *controls*: gender dummy, round of application dummy, year fixed effects, US citizenship dummy, work experience in months and estimated family contribution. Bandwidth represents the range of relative positions with respect to the discontinuity that are being use in each regression. For example, (-10,10) only considers individuals that were at most 10 position above or below the cutoff. The sample includes 2009 to 2015 cohorts. Standard errors are clustered by year, and p-values are shown below the coefficients. Panel B shows the same coefficient but for a subsample of students who took on any debt, and uses as a dependent variable the total amount of student debt taken by the student at the beginning of the year.

Panel A. Scholarships Amount (000s)

bandwidth	All	(-20,20)	(-20,20)	(-10,10)	(-10,10)
Treat	15.415	16.183	18.256	16.701	19.729
	0.000	0.000	0.000	0.000	0.000
Controls	N	N	Y	N	Y
N	842	729	529	518	382
r2	0.2	0.2	0.35	0.23	0.39

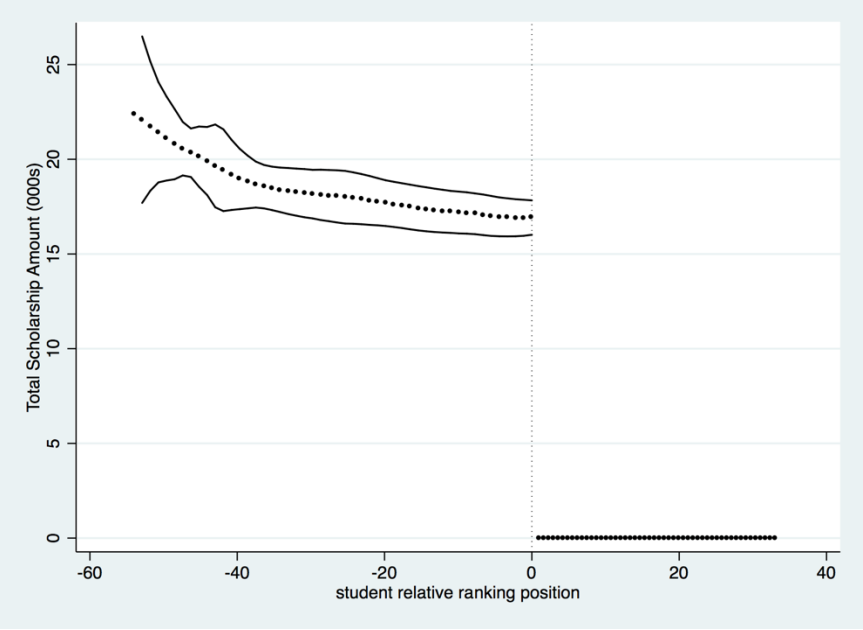
Panel B. Student Debt Amount (000s)

bandwidth	All	(-20,20)	(-20,20)	(-10,10)	(-10,10)
Treat	-10.595	-13.016	-17.291	-11.255	-13.09
	0.006	0.073	0.059	0.441	0.029
Controls	N	N	Y	N	Y
N	538	460	395	331	284
r2	0.03	0.02	0.2	0.02	0.24

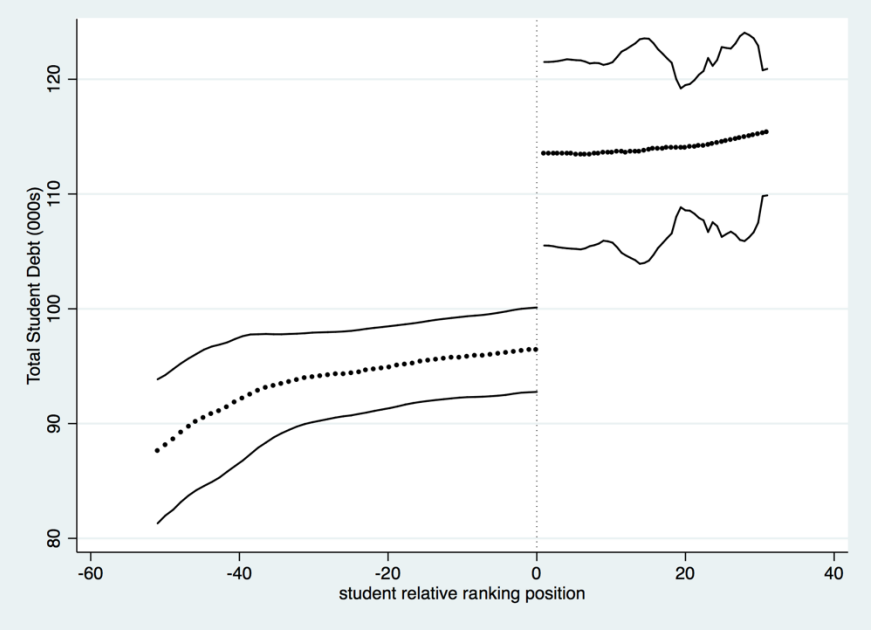
Figure 1. Discontinuity of Scholarships Amount and Student Debt Amount

Panel A plots a weighted local polynomial smooth function of scholarship amounts in the dotted line. The continuous line represents the 95% confident interval for each estimated point. We use a triangular kernel with a bandwidth of 40. The y-axis shows the scholarship amounts in thousands where the x-axis shows the relative ranking of students for each eligible criteria with respect to the scholarship cutoff. Panel B shows the analogous exercise where the total amount of student debt is on the y-axis.

Panel A. Scholarships Amount (000s)



Panel B. Student Debt Amount (000s)



Budget Description

The biggest challenge for our project requiring funding is data collection and research assistance. Our project requires extensive collection of data on long-term career outcomes and merging this with the scholarship data. Our primary focus for data on long-term outcomes comes from LinkedIn, the premier online professional network, which we hope to supplement using data from the school's career and alumni offices. As a supplement, we are also exploring the use of credit registry data to get a better picture of each student's overall financing situation.

The bulk of the grant funding would go towards helping fund these expenses, with the remainder of the expense coming from internal research budgets and potentially other grants. Our itemized budget is as follows:

- Cost of LinkedIn Recruiter Corporate account (highest level which allows access to all LinkedIn profiles): $899/month x 12 months = $10,800
- Cost of data collection / research assistant: $7500
- Remainder of funds applied to helping mitigate any costs of supplemental data: $1,700

TOTAL: $ 20,000

The principal investigators in this project are Ing-Haw Cheng and Felipe Severino, Assistant Professors of Business Administration, Tuck School of Business, Dartmouth College. Briefly, Professor Cheng received his Ph.D. in Economics from Princeton University in 2009. He has published in leading academic journals such as the *American Economic Review* and *Journal of Finance*. Professor Severino received his Ph.D. in Financial Economics from the Massachusetts Institute of Technology in 2014 and has written extensive research on issues in household finance and entrepreneurship published in the *Journal of Financial Economics* and *Review of Financial Studies*. We have no relevant or material financial interests that relate to the research discussed in this proposal.

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Native Language: English

Appointments:

Dartmouth College, Tuck School of Business
Assistant Professor of Business Administration, July 2013 – Present
Harvey H. Bundy III T'68 Faculty Fellow, 2015-2016
University of Michigan, Ross School of Business
Assistant Professor of Finance, July 2009 – June 2013

Education:

Ph.D., Economics, Princeton University, June 2009
M.A., Economics, Princeton University, June 2006
B.S. (Honors), Mathematics, University of Chicago, June 2001

Papers

1. Convective Risk Flows in Commodity Futures Markets, with Andrei Kirilenko and Wei Xiong (2015), *Review of Finance*, 19(5), 1733-1781.

2. Yesterday's Heroes: Compensation and Risk at Financial Firms (2015), with Harrison Hong and José Scheinkman, *Journal of Finance*, 70(2), 839-879.

3. Why Do Hedgers Trade So Much? (2014), with Wei Xiong, *Journal of Legal Studies*, 43(S2), S183-S207.

4. Wall Street and the Housing Bubble (2014), with Sahil Raina and Wei Xiong, *American Economic Review,* 104(9), 2797-2829.

5. The Hazards of Debt: Rollover Freezes, Agency, and Bailouts (2012), with Konstantin Milbradt, *Review of Financial Studies,* 25(4), 1070-1110.

6. The Effect of the Run-Up in the Stock Market on Labor Supply (2000), with Eric French, *Economic Perspectives (Federal Reserve Bank of Chicago)*, 48-65.

Reviews / Chapters

7. The Financialization of Commodity Futures Markets (2014), with Wei Xiong, *Annual Review of Financial Economics*, 6, 419-441.

Working Papers

8. The VIX Premium, May 2016.

9. Do Managers Do Good With Other People's Money? with Kelly Shue and Harrison Hong, NBER working paper no. 19432, April 2016.

10. Corporate Governance Spillovers, April 2011.

Conferences and Seminars

(denotes scheduled)*

2016: Norwegian School of Economics*, University of Connecticut Risk Management Conference*, University of Hong Kong*, Utah Winter Finance Conference

2015: Financial Intermediation Research Society Meetings, Northern Finance Association Meetings, University of Michigan Mitsui Finance Symposium, University of Utah

2014: American Economic Association Meetings, American Finance Association Meetings (2 sessions), Financial Intermediation Research Society Meetings, University of British Columbia Winter Finance Conference, SFS Cavalcade

2013: American Finance Association Meetings, Econometric Society Meetings, European Finance Association Meetings, Florida State University SunTrust Conference, NBER Corporate Finance (Fall, co-author), University of California Davis/CalPERS Sustainability Symposium, University of Chicago Sloan Conference on Benefit-Cost Analysis of Financial Regulation, University of Toronto (Econ)

2012: BSI Gamma Foundation Venice Conference, Center for Economic Analysis of Risk (CEAR) Georgia State Conference, European Central Bank, NBER Spring Meetings (Behavioral Finance), NBER Summer Institute (3 sessions: Corporate Finance, Risks of Financial Institutions, Monetary Economics), Columbia Business School, Dartmouth College (Tuck), Harvard Business School, Northwestern University (Kellogg), Stanford University GSB, University of California at Berkeley (Haas), University of Pennsylvania (Wharton)

2011: American Finance Association Meetings, Federal Reserve Bank of Chicago Conference on Banking (two papers), Financial Intermediation Research Society Meetings, NBER Systemic Risk and Macro Modeling Initiative, Paris Spring Corporate Finance Conference, Princeton/Cambridge Workshop in Finance, University of Florida (Warrington), University of Toronto

2010: Federal Reserve Bank of New York, NBER Conference on Market Institutions and Financial Risks, University of Kansas Southwind Conference, Western Finance Association Meetings

2009: Boston University, Dartmouth College (Tuck), Harvard Business School, London School of Economics, NBER Summer Institute (Risk of Financial Institutions), Princeton University, University of California-San Diego (Rady), University of Colorado-Boulder (Leeds), University of Michigan (Ross), University of Notre Dame (Mendoza), University of Pennsylvania (Wharton), University of Rochester (Simon), Washington University-St. Louis (Olin), Western Finance Association Meetings

Service

Distinguished Referee, 2015, Review of Financial Studies

Best Discussant, 2013 University of Michigan Mitsui Life Symposium

Referee, American Journal of Agricultural Economics, The Econometrics Journal, International Economic Review, International Journal of Central Banking, International Journal of Financial Studies, Journal of Banking and Finance, Journal of Business Ethics, Journal of Economics and Management Strategy, Journal of Empirical Finance, Journal of Finance, Journal of Financial Economics, Journal of Financial Intermediation, Journal of Labor Economics, Journal of Law Economics and Organization, Journal of Money Credit and Banking, Management Science, Quarterly Journal of Economics, Review of Corporate Finance Studies, Review of Economic Studies, Review of Economics and Statistics, Review of Finance, Review of Financial Studies, Swiss National Science Foundation

Discussant:

- 2016: AFA
- 2015: FIRS, NBER Chinese Economy, NBER Commodities, NBER Market Microstructure, University of Oklahoma Energy Finance Conference
- 2014: AFA, Columbia University Corporate Governance Conference, FIRS, LSE Paul Woolley Centre Conference, NBER Summer Institute, Northern Finance Association Meetings, University of Minnesota Corporate Finance Conference
- 2013: AFA, University of Michigan Mitsui Life Symposium, WFA, NBER Commodities
- 2012: SFS Cavalcade
- 2011: FIRS, CFTC Commodities Conference, SFS Cavalcade

Program Committee, 2010, 2011, 2012, 2013 University of Michigan Mitsui Life Symposium, 2015 University of Oklahoma Energy Finance Conference, 2016 Midwest Finance Association, 2016 International Conference on Energy Finance

Session Chair, 2011 FIRS, 2017 AFA

Teaching

Tuck School of Business, Dartmouth College

Capital Markets (MBA Core); Fall 2015

Futures and Options Markets (MBA); Spring 2014, 2015, 2016

Ross School of Business, University of Michigan

Finalist, Ross Teaching Excellence Award, BBA Class of 2011

Financial Management (MBA Core); Fall 2012

Financial Analysis (MBA Core); Fall 2011

Financial Management (BBA Core); Fall 2009, 2010, 2011

PhD Student Committees:

Min Zhu (2010, World Bank), Seokwoo Lee (2012, George Mason University), Taylor Begley (2013, London Business School), Dan Weagley (2013, Georgia Tech)

Department of Economics, Princeton University

Winner, Towbes Prize for Outstanding Teaching, Princeton University, Class of 2008

Teaching Assistant, Joint Undergraduate/Masters-in-Finance Classes:

Options, Futures and Derivatives Pricing (W. Xiong), Fall 2007, Spring 2009
Institutional Finance: Crises and Liquidity (M. Brunnermeier), Fall 2008
Portfolio Theory and Asset Management (H. Hong), Fall 2007

Honors and Fellowships

Awards:

2013 University of Michigan Mitsui Life Symposium, Best Discussant
2011 Standard Life Investments ECGI Prize, Best working paper, "Yesterday's Heroes"
Winner, Towbes Prize for Outstanding Teaching, Princeton University, Class of 2008

Grants:

2016 NBER Household Finance Grant
2011 BSI Gamma Foundation Grant for "Do Managers Do Good"

Fellowships and Honors:

Dartmouth College (Tuck) Harvey H. Bundy III T'68 Faculty Fellow, 2015-2016
Princeton University Department of Economics Fellowship, 2004-2007
Princeton University Industrial Relations Section Fellowship, 2004-2006
University of Chicago, Undergraduate General Honors, 2001
Sigma Xi Scientific Research Society, Associate Member

Other Relevant Work History

Consultant, Deloitte Consulting, Minneapolis, Minnesota, 2001-2004
Research Assistant, Federal Reserve Bank of Chicago, Summer 1999

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Academic Positions	Dartmouth College Tuck School of Business	Assistant Professor of Business Administration	2014- present
Education	Massachusetts Institute of Technology Sloan School of Management	PhD. Financial Economics	2014
	Pontificia Universidad Católica de Chile	M.Sc. Ind. Engineering (Summa Cum Laude) Industrial Engineering	2007 2007
		B.Sc. Mechanical Engineering. (Summa Cum Laude) Minor in Astronomy and Astrophysics	2005

Fields Corporate Finance Financial Intermediation.

Household Finance, Entrepreneurship and Real Estate Finance

Publications

"Loan Origination and Default in the Mortgage Crisis: The Role of the Middle Class" with Manuel Adelino and Antoinette Schoar. *Review of Financial Studies*, Accepted, January 2016

"House Prices, Collateral and Self-Employment" with Manuel Adelino and Antoinette Schoar. *Journal of Financial Economics,* Volume 70, Issue 5, pages 1583-1638, August 2015

Working Papers

"Loan Origination and Default in the Mortgage Crisis: Further Evidence" with Manuel Adelino and Antoinette Schoar. 2015

"Personal Bankruptcy Protection and Household Debt" with Meta Brown and Brandi Coates, 2015

"Credit Supply and House Prices: Evidence from Mortgage Market Segmentation" with Manuel Adelino and Antoinette Schoar, 2014.

Fellowships, Honors, and Awards

NBER Household Finance Grant	2011, 2016
MIT Sloan Doctoral Research Forum, First Prize	2014
MIT Sloan Finance Group Award	2012
MIT Sloan Nominated for Best TA Award	2012
MIT Sloan Arnoldo Hax Fellow	2010
MIT Sloan Doctoral Program Fellowship	2008-2014
Presidente de la República. Chilean Government Scholarship	2008
Chilean Board of Engineering. Best Chilean Industrial Engineering Student	2008
Pontificia Universidad Católica de Chile. Academic Excellence Award. Best Industrial Engineering Student	2007

Presentations

*: Discussant
+: Scheduled

AFA San Francisco, AEA San Francisco, AFA San Francisco, Real Estate Researcg Symposium Utah+	2016
AEA Boston, McGill University (Desaultes), UNC (Kenan-Flager) Junior Round Table, CFBP Research Conference, NBER Corporate Finance Spring, Banco Central Chile, Entrepreneurial Finance and Innovation Conference. Brandeis*, NBER Summer Institute (Capital Market and the Economy, Household Finance)	2015
Stanford University (GSB), University of Pennsylvania (Wharton), Dartmouth College (Tuck), London School of Economics, Imperial College, Washington University in St Louis (Olin), Federal Reserve Board of Governors, Corporate Finance Conference – Cornell University, European Conference on Household Finance in Stockholm, NBER Summer Institute (Household Finance), University of Southern California (Marshall)	2014

Teaching Experience

Dartmouth- Tuck. MBA Corporate Finance.	2014-present
MIT-Sloan. Teaching Assistant PhD Corporate Finance. MBA Entrepreneurial Finance, Advanced Corporate Finance, Mergers and Acquisitions, Finance Theory I	2010-2014
MIT Teaching and Learning Laboratory. Teaching Certification Program	2012
Pontificia Universidad Católica de Chile. Teaching Assistant (graduate level) Economics of Derivatives, Advanced Topics in Finance, Finance, Stochastic Models, Microeconomics, Dynamics	2002-2008

Referee

Quarterly Journal of Economics, Journal of Finance, Journal of Financial Economics, Review of Financial Studies, Management Science, American Economic Journal: Economic Policy, Review of Finance, Journal of Corporate Finance, Journal of Money, Credit and Finance, Journal of Empirical Finance.

Program Committee

Western Finance Association (2016), Midwest Finance Association, (2016)
MIT Sloan Doctoral Research Forum (2015)

Other Relevant Positions

Visiting Researcher. Federal Reserve Bank of New York	2013-present
Research Assistant to Professor Antoinette Schoar	2008-2010
Researcher Associate. P. Universidad Católica de Chile	2005-2008
Summer Internship. Coca Cola Company	2004

Other Research

"A Multicommodity Model of Futures Prices: Using Futures Prices of One Commodity to Estimate the Stochastic Process of Another" with Gonzalo Cortazar and Carlos Milla. *Journal of Futures Markets*, Vol.28, No. 6, Jun 2008.

KRX Best Paper Award. 4th Annual Conference of Asia Pacific Association of Derivatives (APAD)