The 3rd KAFE-JAFEE
International Conference on Financial Engineering

Date_
July 17~18, 2019

Venue_
Busan International Finance Center (BIFC),
Busan, Korea

Welcoming Message

It is our privilege and honor to hold the 3rd International Conference on Financial Engineering under the joint auspices of the Japanese Association of Financial Econometrics and Engineering (JAFEE) and the Korean Association of Financial Engineering (KAFE). We have the excellent opportunity to invite prominent scholars here, the Busan International Finance Center (BIFC), at the heart of the financial market in Korea. As the President of the KAFE and the Program Chair of the current conference respectively, we would like to welcome you all the participant to the world- renowned city Busan. Since the inaugural gathering started at Busan 2017, our conference has made substantial progress and matured enough to leap into the next stage. The 2nd conference held in Tokyo turned out to be a truly international conference under the joint auspices of National University of Singapore (NUS) and Columbia University in the City of New York. We would like to express our profound gratitude to Jiro Akahori (Ritsumeikan University), Takaki Hayashi (Keio University), Tadashi Ono (University of Tsukuba), Seisho Sato (University of Tokyo), and Hiroshi Tsuda (Doshisha University) for organizing the last conference.

The main topic of this 3rd conference is "The Innovation and Future of Financial Engineering" and high-quality research papers in the field of finance will be presented in each academic session. The selected papers will be published in the *Journal of Futures Markets* (SSCI), the *Investment Analysts Journal* (SSCI) or the *Asia-Pacific Financial Markets* (Scopus).

Our keynote speakers are Professors *Robert I. Webb* (University of Virginia), *Yuta Koike* (University of Tokyo), *Hideatsu Tsukahara* (Seijo University), and *Hyeng Keun Koo* (Ajou University), all of whom are world-class scholars in the field of financial engineering.

We acknowledge cosponsors' support and contribution to the conference. Among others, Korea Exchange (KRX), Korea Financial Investment Association, Busan Bank, Refinitiv Korea, IBK Securities, and BNK Asset Management, to make this conference possible. We also appreciate the participation of the National Pension Research Institute and its research fellows. We also sincerely appreciate the steadfast support and relentless participation from our KAFE members. Without their support, the KAFE would not reach the current status, albeit several setbacks hitherto. Thank you all.

Warm regards,

July, 2019

Chung-Hyun Chung, President of the KAFE
Doojin Ryu, Program & Review Chair

Program of the Conference

• Wednesday, July 17

8:30 ~ 9:00	Registration
9:00 ~ 11:20	Opening Remarks and Keynote Speeches
11:30 ~ 12:50	Conference Lunch (AVANI Central Busan Hotel)
1:00 ~ 2:50	Academic Sessions 1 and 2 (BIFC 52F 부산국제금융연수원)
3:00 ~ 4:50	Academic Sessions 3 and 4 (BIFC 52F 부산국제금융연수원)
5:00 ~ 6:30	Academic Sessions 5 and 6 (BIFC 52F 부산국제금융연수원)
6:40 ~ 8:30	Conference Dinner (AVANI Central Busan Hotel)

Registration (8:30 ~ 9:00)

Location: 51F Financial Education Room (51층 금융교육실), BIFC

Opening Remarks and Keynote Speeches (9:00 ~ 11:20)

Location: 51F Financial Education Room (51층 금융교육실), BIFC

Opening Remarks(9:00 ~ 9:10)

Chung-Hyun Chung, President, Korean Association of Financial Engineering
Hideatsu Tsukahara, President, Japanese Association of Financial Econometrics and Engineering

Congratulatory Message(9:10 ~ 9:15)

Chang-hee Jung, President & CEO of Derivatives Market Division, KRX

Keynote Speech (9:20 ~ 11:20)

Keynote Speech I Prof. Robert I. Webb (University of Virginia).
The internationalization of futures markets: Lessons from the past

Keynote Speech II Prof. Yuta Koike (University of Tokyo).
Asymptotic mixed normality of realized covariance in high-dimensions

Keynote Speech III Hideatsu Tsukahara (Seijo University).
Backtesting, prequential analysis and prediction process

Keynote Speech IV Prof. Hyeng Keun Koo (AJou University).
Consumption ratcheting, loss aversion, and long-term asset management

Academic Sessions(1:00 ~ 6:30)

Location: Busan International Finance Institute (52층 부산국제금융연수원), 52F, BIFC

• Thursday, July 18

9:00 ~ 10:30	Academic Sessions 7 and 8 (52층 부산국제금융연수원)
10:40 ~ 12:10	Academic Sessions 9 and 10 (52층 부산국제금융연수원)

Program

❖ Academic Session 1 (1 : 00~2 : 50, Wednesday, July 17)

Chair: Sooyoung Song (Chung-Ang University) (Room 2, 52F BIFC)

Title	Author
Optimal insurance with limited commitment in a finite horizon	Junkee Jeon (Kyung Hee University) Hyeng Keun Koo (Ajou University) Kyunghyun Park* (Seoul National University)
Leading the way? External lead managers and the performance of institutional equity funds	Hyoung-Goo Kang (Hanyang University) Min Yeon Han (Hanyang University) Sang-Gyung Jun* (Hanyang University) Ji Yeol Jimmy Oh (Hanyang University)
Equity network topology and dynamic volatility connectedness: An analysis of ASX sector indices	Sang Hoon Kang* (Pusan National University) Ron P. McIver (University of South Australia) Salvatore Ferraro (Evidente) Lei Xu (University of South Australia)
Finite mixture model approximation for the SABR distribution	Jaehyuk Choi* (Peking University HSBC Business School) Byoung Ki Seo (UNIST)
Anchoring bias of 52 week high price, idiosyncratic volatility and the cross-section of stock returns	Jungshik Hur* (Louisiana Tech University) Cedric Tresor Mbanga (Missouri State University)
Local volatility surface construction using Arrow-Debreu price with numerical quadrature	Hyuncheul Lim* (Chonnam National University) Hyeong-Ohk Bae (Ajou University)

❖ Academic Session 2 (1 : 00~2 : 50, Wednesday, July 17)

Chair: Jangwoo Lee (Pusan National University) (Room 3, 52F BIFC)

Title	Author
Are disposition effect and skew preference correlated? Evidence from account-level ELW transactions	Youngsoo Choi* (Hankuk University of Foreign Studies) Woojin Kim (Seoul National University) Eunji Kwon (Hankuk University of Foreign Studies)
Valuing multi-step barrier options with icicles	Hangsuck Lee* (Sungkyunkwan University) Seongjoo Song (Korea University)
Weather and volatility: Evidence from the Korean stock markets	Taekyung Kim (Chung-Ang University) Shiyong Yoo* (Chung-Ang University)
Optimal execution strategies with generalized price impact in a discrete-time setting	Masaaki Fukasawa (Osaka University) Masamitsu Ohnishi (Osaka University) Makoto Shimoshimizu* (Osaka University)
Forecasting corporate default with machine learning	Hyeongjun Kim (Yeungnam University)
Insider trade clustering and large variations in stock prices: Evidence from the Korean stock market	Soon Hong Park (Chungnam National University) Hyunjung Im* (Chungnam National University) Byungkwon Lim (Korea Housing Finance Corporation)

❖ Academic Session 3 (3:00~4:50, Wednesday, July 17)

Chair: Robert I. Webb (University of Virginia) (Room 2, 52F BIFC)

Title	Author
Spillover effects in the global copper futures markets: Asymmetric multivariate GARCH approaches	Hyun-Bock Lee (Korea Institute Geoscience & Mineral Resources) Cheol-Ho Park (Chungbuk National University
A binomial asset pricing model in a categorical setting	Takanori Adachi* (Tokyo Metropolitan University) Katsushi Nakajima (Ritsumeikan Asia Pacific University) Yoshihiro Ryu (Ritsumeikan University)
BitMEX bitcoin derivatives: Price discovery, informational efficiency and hedging effectiveness	Carol Alexander (University of Sussex Business School) Jaehyuk Choi* (Peking University HSBC Business School) Heungju Park (Sungkyunkwan University) Sungbin Sohn (Peking University HSBC Business School)
CDS implied volatility, option implied volatility, and the cross-sectional stock returns	Biao Guo* (Renmin University of China) Yukun Shi (University of Glasgow) Yaofei Xu (University of Glasgow) Cheng Yan (Essex University)
Economic regime-based dynamic allocation strategies	Dohyoung Kwon (National Pension Research Institute)
The impact of non-cash collateralization on the OTC derivatives markets	Kazuhiro Takino (NUCB Business School)

❖ Academic Session 4 (3:00~4:50, Wednesday, July 17)

Chair: Jiro Akahori (Ritsumeikan University) (Room 3, 52F BIFC)

Title	Author
Global asset allocation strategy using a Hidden Markov model	Eunchong Kim* (Yonsei University) Nak Young Lee (Yonsei University) Hanwook Jeong (Kyungpook National University)
New evidence of competition and innovation from patent data in Korea	Pando Son (Dong-A University)
KOSPI200 option multiplier and its effect on arbitrage opportunities	Joonhyuk Song (Hankuk University of Foreign Studies)
Market runs of hedge funds during financial crisis	Sangwook Sung (SERI) Hoon Cho (KAIST) Dohyun Chun* (KAIST) Doojin Ryu (Sungkyunkwan University)
A prepayment-risk-neutral pricing model for Korean mortgage-backed securities	Seryoong Ahn* (Korea Housing Finance Co.) Wan Young Song (Korea Housing Finance Co.) Ji-Hun Yoon (Pusan National University)
Is shareholder's wealth transferred to investors on pricing of equity carve-outs by private information in Korea?: Evidence from chaebol's and non-chaebol's equity carve-outs	Jong-Hyun Choi (Dankook University)

❖ Academic Session 5 (5:00~6:30, Wednesday, July 17)

Chair: Sang-Gyung Jun (Hanyang University) (Room 2, 52F BIFC)

Title	Author
Bank risk-tanking and market discipline: Evidence from CoCo bonds in Korea	Younghwan Lee (Seoul National University) Alex Haerang Park* (Seoul National University)
The determinants of bank profitability: Evidence from Mongolia	Khishigdelger Tsetsegdelger* (Hankyong National University) Yong Jae Shin (Hankyong National University) Yeong Suk Cho (Mokpo National University)
An optimal separation lapse for the internet banking: shareholding limit and loan concetration control	Sooyoung Song (Chung-Ang University)
Wrong-way risk: Definition and pricing	Lixin Wu* (Hong Kong University of Science and Technology) Dawei Zhang (Goldman Sachs, Hong Kong)
Company stock in defined contribution plans and stock return	Heejin Park* (Pusan National University) Kyojik "Roy"Song (Sungkyunkwan University)

❖ Academic Session 6 (5:00~6:30, Wednesday, July 17)

Chair: Youngsoo Choi (Hankuk University of Foreign Studies) (Room 3, 52F BIFC)

Title	Author
Do fund investors consider asset returns? Substitute relation among investment funds in Korea	Young-Min Kim (Kangwon National University)
Pension choice and firm leverage: An analysis of Korean firms	Hyejin Park (Korea Capital Market Institute)
The fundamental drives of house price fluctuations: Using disaggregated Korean house price indexes	Jieun Lee* (The Bank of Korea) Hosung Jung (The Bank of Korea)
Economic effects of social insurance for the elderly	Se Yung Bae* (Ajou University) Junkee Jeon (Seoul National University) Hyeng Keun Koo (Ajou University) Kyunghyun Park (Seoul National University)
The geography of international mutual funds	Young K. Park* (Sungkyunkwan University) Inwook Song (Korea Fund Ratings Co.)

❖ Academic Session 7 (in Korean; 9:00~10:30, Thursday, July 18)

Chair: Yeong Suk Cho (Mokpo National University)

Discussants: Jung-Hee Noh (National Pension Research Institute), Hyon Sok Lee (Sungshin Women's University)

(Room 2, 52F BIFC)

Title	Author
Complex ownership and pecking order theory	Min Geu Jung* (Gyeongnam National University of Science and Technology) Byoung Gon Kim (Changwon National University) Dong Wook Kim (Busan Economic Promotion Agency)
Idiosyncratic risk and foreign investors: Empirical evidence from the Korean stock market	Junho Hwang* (National Pension Research Institute)
The impact of corporate marginal tax rate and cost of capital on capital structure, cashflow and profitability	Hyon Sok Lee (Sungshin Women's University) Mi Hwa Chung* (Sungshin Women's University)

❖ Academic Session 8 (in Korean; 9:00~10:30, Thursday, July 18)

Chair: Pando Son (Dong-A University)

Discussants: Hankyung Lee (Gyengsang National University), Sang Goo Lee (Catholic University of Pusan)

(Room 3, 52F BIFC)

Title	Author
An empirical study on the influence of bitcoin price change and KOSPI 200 futures market	Byung Jin Yim* (Yeungnam University) Tae-Sun Im (Seoul Cyber University)
A study on the systematic effects of foreign investors on domestic stock market	Woohyun Kim* (Pusan National University) Youngtae Byun (Kyungsung University) Soo-Kyung Kim (Tongmyong University)
Effect of stock market on equity investment funds by investor	Young-Min Kim (Kangwon National University)
Announcement effects of mezzanine securities with refixing and call option provisions	Yongsik Kim (Korea Exchange)

❖ Academic Session 9 (in Korean; 10:40~12:10, Thursday, July 18)

Chair: Intae Jeon (The Catholic University of Korea)

Discussants: Seong Ju Moon (Gyengsang National University), Mookwon Jung (Kookmin University)

(Room 2, 52F BIFC)

Title	Author
The effect mortgage prepayment charges on the MBS prepayment risks	Chun-Kyu Kim* (Chungnam National University) Byungkwon Lim (Housing Finance Research Institute)
A study on the spillover effects of the Korean industry indices using spillover index	Daesung Jung* (Busan National University) Jonghae Park (Gyeongnam National University of Science and Technology)
Practical method of constructing implied and local volatility surfaces	Hyuncheul Lim (Chonnam National University)
The Relationship between firm's technology innovation and wage inequality	Pando Son (Dong-A University) Yongsoo Choi (Dong-A University)

❖ Academic Session 10 (in Korean; 10:40~12:10, Thursday, July 18)

Chair: Hong Bae Kim (Dongseo University)

Discussants: Kihwan Lee (Korea Maritime & Ocean University)

(Room 3, 52F BIFC)

Title	Author
A study on market reaction by KSIC around quarterly earnings announcements	Hankyung Lee* (Gyeongsang National University) Jinsu Kim (Gyeongsang National University)
Investors' response according to establishment authorization related to the Korean internet banks	Gwang Yong Kim* (Gyeongsang National University) Jinsu Kim (Gyeongsang National University)
The necessity and the effect on the latent Greeks	Minjae Kim (NH Investment & Securities)
How to manage underfunded portfolio using dynamic stochastic programming	Junhwa Ban (independent) Taeyong Kim* (KB Securities co.)

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Academic Session 5 Chair: Sang-Gyung Jun (Hanyang University)

Academic Session 6 Chair: Youngsoo Choi (Hankuk University of Foreign Studies)

Academic Session 7 Chair: Yeong Suk Cho (Mokpo National University)

Academic Session 8 — Chair: Pando Son (Dong-A University)

Academic Session 9 — Chair: Intae Jeon (The Catholic University of Korea)

Academic Session 10 — Chair: Hong Bae Kim (Dongseo University)

Academic Session 1

Chair: Sooyoung Song
(Chung-Ang University)

- **Optimal insurance with limited commitment in a finite horizon**
  Junkee Jeon (Kyung Hee University), Hyeng Keun Koo (Ajou University), Kyunghyun Park* (Seoul National University)
- **Leading the way? External lead managers and the performance of institutional equity funds**
  Hyoung-Goo Kang, Min Yeon Han, Sang-Gyung Jun*, Ji Yeol Jimmy Oh (Hanyang University)
- **Equity network topology and dynamic volatility connectedness: An analysis of ASX sector indices**
  Sang Hoon Kang* (Pusan National University), Ron P. McIver (University of South Australia), Salvatore Ferraro (Evidente), Lei Xu (University of South Australia)
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  Jaehyuk Choi* (Peking University HSBC Business School), Byoung Ki Seo (UNIST)
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  Hyuncheul Lim* (Chonnam National University), Hyeong-Ohk Bae (Ajou University)

Optimal Insurance with Limited Commitment in a Finite Horizon*

Junkee Jeon† Hyeng Keun Koo‡ Kyunghyun Park§

Abstract

We study a finite horizon optimal contracting problem with limited commitment. A risk-neutral principal enters into an insurance contract with a risk-averse agent who receives a stochastic income stream and is unable to make any commitment. This problem involves an infinite number of constraints at all times and at each state of the world. Miao and Zhang (2015) have developed a dual approach to the problem by considering a Lagrangian and derived a Hamilton-Jacobi-Bellman equation in an infinite horizon. We consider a similar Lagrangian in a finite horizon, but transform the dual problem into an infinite series of optimal stopping problems. For each optimal stopping problem we provide an analytic solution by providing an integral equation representation for the free boundary. We provide a verification theorem that the value function of the original principal's problem is the Legender-Fenchel transform of the integral of the value functions of the optimal stopping problems. We also provide numerical simulations results of the optimal contracting strategies.

Keywords : Optimal contract, Limited commitment, Principal-Agent problem, Optimal stopping problem, Variational inequality, Singular control problem

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Leading the Way? External Lead Managers and the Performance of Institutional Equity Funds*

Hyoung-Goo Kang[1], Min Yeon Han[2], Sang-Gyung Jun[3], Ji Yeol Jimmy Oh[†4]

Abstract

Institutional sponsors increasingly seek outside help in investment management by delegating the decisionmaking to external lead managers. Whether this enhances performance, however, is yet to be examined. We fill the gap using a unique dataset of Korean institutional sponsors that enables a detailed comparison of domestic equity funds selected by the sponsors against those by lead managers. We find that lead managers allocate their capital more efficiently and are able to identify managers with greater skill. Their positive implications on performance appears to emanate from the lead managers' ability to detach themselves from the sponsors' internal organizational issues.

JEL Classification: G11, G20, G23.

Keywords: Delegated portfolio management, institutional investors, intermediated investment management, outsourced CIO, investment pool.

* We thank Jules van Binsbergen, Jayne Bok, Jaewon Choi, Campbell Harvey, Hugh Hoikwang Kim, Kuan-Hui Lee, Inmoo Lee, In Jung Song, Tim Wong, and all other seminar participants at the 12thCAFMoftheKoreanSecuritiesAssociation,KAIST School of Business, and Seoul National University for their insightful comments. We acknowledge and are grateful for generous financial support provided by the Korean Ministry of Strategy and Finance.
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Equity network topology and dynamic volatility connectedness: An analysis of ASX sector indices

Sang Hoon Kang,[a] Ron P. McIver,[b] Salvatore Ferraro,[c] and Lei Xu[d]

Abstract.

This study investigates total, directional and net directional volatility connectedness across 11 ASX sector indices. We employ the spillover index of Diebold and Yilmaz (2014) to measure the magnitude and direction of volatility connectedness. Additionally, we visualize volatility connectedness relationships as links within a complex network to capture the propagation path of volatility connectedness across the 11 ASX sectors. Our results indicate that recent financial crises intensified the degree of volatility connectedness, supporting the contagion hypothesis across the 11 ASX sectors. Importantly, the financial sector is the main transmitter of volatility connectedness in the 11-sector network.

JEL classification: C58; F37; G14; G15; Q31

Keywords: dynamic volatility spillovers; financial crisis; connectedness; sector indices

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Acknowledgements: The authors thank the Australian Centre for Financial Studies (ACFS) for funding support of this project under the 2017 ACFS Academic Research Grant Program. Additional financial support for the participation of Professor Kang in this project was received from the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2017S1A5B8057488).

Finite mixture model approximation for the SABR distribution

Jaehyuk Choi and Byoung Ki Seo

Abstract.

In this paper, we represent the stochastic-alpha-beta-rho (SABR) model distribution as a parsimonious finite mixture of base models: Black-Scholes-Merton model (beta=1), Bachelier (beta=0), and constant-elasticity-of-variance (rho=0). With the mixture model approach, the European option prices and Greeks under the SABR model are computed as the weighted sum of those under the base model and Monte-Carlo simulations are performed easily. The mixture model components are obtained from the terminal volatility and integrated variance pairs evaluated with the leading orders of the Karhunen-Loeve expansion of Brownian bridge and Gaussian quadratures. Numerical examples demonstrate the accuracy and efficiency of the method.

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Anchoring Bias of 52 Week High Price, Idiosyncratic Volatility And the Cross-Section of Stock Returns

Jungshik Hur*, Cedric Tresor Mbanga**

ABSTRACT

We test the implications of anchoring bias in George and Hwang (2004) and investor sentiments for the idiosyncratic volatility puzzle. We find that high idiosyncratic volatility stocks that are far from their 52-week highs are even more overpriced when bad news arrives. We document no overpricing for high idiosyncratic volatility stocks that are close to their 52-week highs when good news arrives. Moreover, this puzzle disappears when investor sentiments are low, but it is even stronger when bad news reaches the market in good times. Our findings are robust to weighing scheme, data frequency (daily and monthly idiosyncratic volatility), January seasonality, and other important variables.

Keywords: Anchoring Bias; Limits of Arbitrage; Investor sentiment; Idiosyncratic Volatility

JEL classification: G11; G12; G14

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Local volatility surface construction using Arrow-Debreu price with numerical quadratures

Hyuncheul Lim[1], Hyeong-Ohk Bae[2]

Abstract

We develop a new method to construct local volatility surfaces for the stock index markets. Using sequentially linked numerical quadrature or functionally linked network, we obtain accurate Arrow-Debreu prices [1] and local volatilities. With these local volatilities we reconstruct market vanilla call and put option values by the Dupire model. There are two purposes of our method. The first is construction of the local volatility surface suitable for Monte-Carlo methods. The Monte-Carlo method is the main pricing method for complex derivatives with local volatilities. The second is more accurate reconstruction of market call options using our proposed method. Our test case shows that in most stock index markets this new methodology provides better accuracy than finite difference methods.

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Academic Session 2

Chair: Jangwoo Lee
(Pusan National University)

- **Are disposition effect and skew preference correlated? Evidence from account-level ELW transactions**
  Youngsoo Choi* (Hankuk University of Foreign Studies), Woojin Kim (Seoul National University), Eunji Kwon (Hankuk University of Foreign Studies)
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- **Insider trade clustering and large variations in stock prices: Evidence from the Korean stock market**
  Soon Hong Park, Hyunjung Im* (Chungnam National University), Byungkwon Lim (Korea Housing Finance Corporation)

Are Disposition Effect and Skew Preference Correlated? Evidence from Account-Level ELW Transactions

Youngsoo Choi [+], Woojin Kim [*] and Eunji Kwon [#]

Abstract

This paper examines whether two well-known cognitive biases, namely disposition effect and skew preference, may reflect a common feature of less sophisticated investors. Based on a unique proprietary dataset that provides the details of all transactions - including account identifier and direction of the trade - in the Korean ELW (Equity Linked Warrant) market between 2009 and 2011, we find that investors who sell winners too quickly and hold losers too long are also more likely to prefer trade out-of-the money ELWs. Both disposition effect and skew preference are more conspicuous among less sophisticated investors. When we sort all investors into four groups based on the degree of disposition effect and skew preference, those that are less (more) subject to both biases exhibit the best (worst) risk-adjusted trading performance. Our findings suggest that disposition effect and skew preferences occur simultaneously, which could adversely affect trading performance.

JEL Classifications: G13, G23, G41

Keywords: Disposition Effect, Skew Preference, Lottery, Option, ELW (Equity Linked Warrant), Korea

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Valuing Multi-step Barrier Options with Icicles☆

Hangsuck Lee[a], Seongjoo Song[b]

Abstract

Barrier options are a type of option whose payoff depends on whether the underlying asset price reaches a pre-determined barrier level. Ordinary barrier options have one horizontal barrier level throughout the entire lifetime, but Lee et al. [16] proposed step barrier options, allowing three different piecewise constant barrier levels. Along with vertical barriers attached to the horizontal barriers, step barrier options could be easily embedded into equity-linked products. In this paper, we propose *multi-step barrier options*, which generalizes the step barrier options in terms of number of steps. These options, while having flexible payoff structures, allow for explicit pricing formulas under the Black-Scholes model, which means that we obtain a general, explicit expression of the price of the step barrier option with any number of steps. They also have the advantage of easily approximating options with arbitrary barriers, including curved barriers, with sufficiently many steps. The class can be further generalized by attaching vertical branches of barriers to the horizontal ones as in Lee et al [16].

Multi-step barrier options allow multiple horizontal barrier levels of any finite number in the given time horizon. The horizontal barrier levels are placed in the subinterval periods, acting as a knock-in or knock-out trigger. Using the actuarial method of Esscher transform and the factorization formula, we derive the option pricing formulas under the general framework with vertical branches to horizontal barriers. Similarly as in the ordinary barrier option, we consider eight types of multi-step barrier options and derive explicit option pricing formulas under the Black-Sholes model. The joint distribution of the Brownian motion at the end of subintervals of time and their partial maximums are obtained through the joint probability that the Brownian motion hits the multi-step barriers at selected subintervals. The joint distributions are not only an interesting application of the well-known Esscher transform in itself, but also play a critical role in our derivation of the pricing formulas for multi-step barrier options and their variants. We explore the formulas through numerical examples, demonstrating their applicability to the analysis of an investment with an arbitrary curved barrier.

Keywords: Brownian motion, Esscher transform, barrier option, step barrier, multi-step barrier, icicles

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Weather and Volatility: Evidence from the Korean Stock Markets

Taekyung Kim[1], ShiyongYoo[2]

ABSTRACT

This study is about the effect of five different weather factors—temperature, solar radiation, cloudiness, precipitation, and fog—on the trading ratio of three investor types—individual, institutional, and foreign—and KOSPI returns as well as volatility in Korean stock markets. This paper analyzes not only direct weather effects on volatility but also indirect weather effects on it through the trading ratio by investor type. The results are as follows. First, the weather has a direct impact on index volatility. Second, weather has a significant relationship to trading ratio by investor type. Third, the weather has an indirect effect on volatility through trading ratio by investor type.

Key words: Weather effect, Volatility, Indirect weather effect, Trading ratio by trader type, Foreign investor

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Optimal execution strategies with generalized price impacts in a discrete–time setting*

Masaaki FUKASAWA[§‡], Masamitsu OHNISHI[†‡], and Makoto SHIMOSHIMIZU[†¶]

Abstract

In this paper, we examine a discrete-time optimal trade execution problem with generalized price impacts. We extend a model recently discussed in Ohnishi and Shimoshimizu (2019), which consider price impacts of (aggregate) random trade execution orders posed by noise–traders as well as a large trader. Although Ohnishi and Shimoshimizu (2019) assume that trading volumes submitted by noise–traders are serially independent, this paper allows a Markovian dependence. Our new problem is formulated as a Markov decision process with state variables including the last noise–traders' orders Over a finite horizon, the large trader with Constant Absolute Risk Aversion (CARA) von Neumann-Morgenstern (vN–M) utility function is assumed to maximize the expected utility from the final wealth. By applying the backward induction method of dynamic programming, we characterize the optimal value function and optimal trade execution strategy, and conclude that the trade execution strategy is a time–dependent affine function of three state variables: the remained trade execution volume of the large trader, (so–called) the residual effects of past price impacts caused by both of the large trader and other noise–traders, and the new state variable, i.e., the last trade execution orders submitted by noise–traders. This model enables us to investigate how the execution strategies and trade performances of a large trader are affected by the orders of the noise–traders.

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Forecasting Corporate Default with Machine Learning

Hyeongjun Kim*

Abstract

This empirical study attempts to predict corporate default by using machine learning methodology. The Recurrent Neural Network (hereafter, RNN) technique allows us to use time-series data to classify firms into default risk groups. In this paper, predictability power of RNN is compared with several conventional corporate default models.

Keywords Bankruptcy; Corporate Default; Forecasting; Machine Learning; Neural Networks

JEL Classification G12, G17, G33

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Insider Trade Clustering and Large Variations in Stock Prices: Evidence from the Korean Stock Market

Soon Hong Park[1], Hyun Jung Im[2], Byungkwon Lim[3]

Abstract

This paper examines whether insider trade clustering is associated with large stock return variations (i.e., crash or jump risk) in Korea. Recent studies argue that not all insider trading is informative and insider trade clustering distinctly yields higher stock price performance than non-clustering. To investigate private information of insider trade clustering, we separate insider trade clustering into sale clusters and purchase clusters and then document whether trading behavior of insider sale (purchase) clusters is related to the likelihood of a crash (jump). We find that insider sale clusters which occurred over the past month of a crash are strongly related to the information flowed over a short period of time. However, we find that insider purchase clusters are less associated with the likelihood of a jump. Our results provide empirical evidence that insiders share private information and insider sale clusters contain robust short-lived negative information. Overall, our findings suppor that insider trade clustering, in particular insider sale clusters, results from agency problems.

JEL classification: G14, G18

Keywords: Insider trade clustering; Stock price crash risk; Agency problems; Largest shareholders; Private information

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Academic Session 3

Chair: Robert I. Webb
(University of Virginia)

- **Spillover effects in the global copper futures markets: Asymmetric multivariate GARCH approaches**
  Hyun-Bock Lee (Korea Institute Geoscience & Mineral Resources),
  Cheol-Ho Park (Chungbuk National University)
- **A binomial asset pricing model in a categorical setting**
  Takanori Adachi* (Tokyo Metropolitan University),
  Katsushi Nakajima (Ritsumeikan Asia Pacific University),
  Yoshihiro Ryu (Ritsumeikan University)
- **BitMEX bitcoin derivatives: Price discovery, informational efficiency and hedging effectiveness**
  Carol Alexander (University of Sussex Business School),
  Jaehyuk Choi* (Peking University HSBC Business School),
  Heungju Park (Sungkyunkwan University),
  Sungbin Sohn (Peking University HSBC Business School)
- **CDS implied volatility, option implied volatility, and the cross-sectional stock returns**
  Biao Guo* (Renmin University of China), Yukun Shi, Yaofei Xu (University of Glasgow),
  Cheng Yan (Essex University)
- **Economic regime-based dynamic allocation strategies**
  Dohyoung Kwon (National Pension Research Institute)
- **The impact of non-cash collateralization on the OTC derivatives markets**
  Kazuhiro Takino (NUCB Business School)

Spillover Effects in the Global Copper Futures Markets: Asymmetric Multivariate GARCH Approaches

Hyun-Bock Lee[1] and Cheol-Ho Park[2]

Abstract

This study examines changes in return and volatility spillovers between LME/COMEX and SHFE copper futures markets before and after the global financial crisis and after introduction of night trading session (NTS) to SHFE by using VAR-BEKK-GJR-GARCH, VAR-CCC-GJR-GARCH, and VAR-DCC-GJR-GARCH methods. Daily opening and closing prices of copper futures prices in LME, COMEX and SHFE are converted to C(close to close returns), O(open to open returns), N(close to open returns), and D(open to close returns). This study found followings. Firstly, return spillovers from LME/COMEX-C (or D) to SHFE-O (or N) increase after the global financial crisis. However, introduction of NTS to SHFE is unlikely to largely contribute to the expansion of return spillovers of SHFE-O (or N) on LME/COMEX-C (or D). Secondly, volatility spillovers of SHFE-D is transmitted to LME-N only before the global financial crisis, but to COMEX-N together with LME-N after the global financial crisis. Introduction of NTS to SHFE is likely to contribute to the expansion of volatility spillovers between LME/COMEX-C and SHFE-O. Thirdly, asymm3-etric volatility spillovers of SHFE-N are transmitted to COMEX-D before the global financial crisis and to LME-D after the global financial crisis. However, the asymmetric volatility spillovers caused by the global financial crisis or introduction of NTS to SHFE are not shown between LME/COMEX-C and SHFE-O. Fourthly, SHFE is assumed to be rather integrated with LME than with COMEX because LME has more impact on SHFE than COMEX in terms of return spillovers from LME/COMEX-C (or D) to SHFE-O (or N). Moreover, the correlation between LME-C (or D) and SHFE-O (or N) is found to be stronger than that between LME-C (or D) and COMEX-O (or N). Fifthly, the global financial crisis influence the correlations between LME/COMEX-C and SHFE-O and between LME/COMEX-D and SHFE-N. The introduction of NTS to SHFE contribute to co-movement between SHFE-D and LME/COMEX –N.

Key Words: Spillover, SHFE, LME, COMEX, Multivariate-GARCH, global financial crisis, night trading session

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A BINOMIAL ASSET PRICING MODEL IN A CATEGORICAL SETTING

TAKANORI ADACHI, KATSUSHI NAKAJIMA AND YOSHIHIRO RYU

Abstract. Adachi and Ryu introduced a category **Prob** of probability spaces whose objects are all probability spaces and whose arrows correspond to measurable functions satisfying an absolutely continuous requirement in [Adachi and Ryu, 2019]. In this paper, we develop a binomial asset pricing model based on **Prob**. We introduce generalized filtrations with which we can represent situations such as some agents forget information at some specific time. We investigate the valuations of financial claims along this type of non-standard filtrations.

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2010 *Mathematics Subject Classification.* Primary 91B25, 16B50; secondary 60G20, 91Gxx .
Key words and phrases. binomial asset pricing model, categorical probability theory, generalized filtration.
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BitMEX Bitcoin Derivatives: Price Discovery, Informational Efficiency and Hedging Effectiveness

Carol Alexander[a,b], Jaehyuk Choi[c], Heungju Park[d], Sungbin Sohn[c,*]

Abstract

Several unregulated centralised bitcoin derivatives exchanges list contracts suitable for leverage trading and hedging by retail investors. Of these, BitMEX has much the greatest market share. Using minute-by-minute high frequency data in BitMEX from 1 July 2016 to 3 January 2019, we examine its price discovery role and hedging effectiveness. We find that the BitMEX perpetual swap leads the spot prices on three major bitcoin spot exchanges – Bitstamp, Coinbase, and Kraken. Bid-ask spreads, inter-exchange spreads and relative trading volumes are important determinants of this price discovery. Further analysis shows that BitMEX derivatives have significantly positive net spillover effects and that informational efficiency is greater on BitMEX than on all three spot exchanges. Finally, we show that BitMEX derivatives serve as an effective hedge against the bitcoin spot market.

Keywords: Component share, cryptoasset, cryptocurrency, high frequency, information share, market efficiency, minimum variance hedge, spillover

JEL: G14

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CDS implied volatility, option implied volatility, and the cross-sectional stock returns *

Biao Guo[†1] **, Yukun Shi**[‡2] **, Yaofei Xu**[§2] **, Cheng Yan**[¶3]

Abstract

We examine the informational content difference between credit and options markets by extracting volatilities from corporate CDSs (credit default swap) and equity options. The normalized spread between CIV (CDS implied volatility) and OIV (option implied volatility) negatively predicts future stock returns, a zero-cost trading strategy that long (short) in the portfolio with the smallest (largest) spread generates a significant average monthly return, even after controlling for stock characteristics and traditional risk factors. Such findings extend the current cross-market analysis, shed lights on portfolio construction and highlight the importance of information flow for asset pricing.

JEL classification: C11, C12, C13, G11, G12.

Keywords: CDS; Implied volatility; Equity option; Equity returns

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Economic Regime-based Dynamic Allocation Strategies

Dohyoung Kwon *

Abstract

This article presents a practical framework for dynamic asset allocation strategies based on changes in macro environments. I develop a composite macro indicator of monthly tracking the U.S. business-cycle activity to identify economic regimes and suggest a dynamic strategy of tilting exposures to the attractive assets based on the identified regime. Out-of-sample analysis in performance shows that the dynamic approach outperforms the static benchmark-based approach after taking transaction costs into account, improving risk-adjusted returns significantly. The result has an important implication for portfolio managers that effectively develop a dynamic asset allocation strategy throughout economic cycles in order to enhance the long-term portfolio performance.

JEL Classification Numbers: C13, G11

Keywords: Dynamic asset allocation; Dynamic factor allocation; Economic regimes; Business cycle; Time-varying returns; Time-varying risks

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The impact of Non-cash Collateralization on the OTC Derivatives Markets

Kazuhiro Takino*

In this study, we propose a microeconomics model to verify the effects of the non-cash collateralization on the liquidity of the OTC derivatives markets in which both cash and non-cash assets are accepted. The liquidity in our study is measured as an equilibrium volume of the derivatives contract. The equilibrium volume is obtained by solving the utility maximization problem of the collateral payer who is a risk-averse and wants to optimize her/his capital. The capital amount of the collateral payer depends on the non-cash asset used as collateral. We consider both an option and forward contracts as an example. Our sensitivity analysis shows that there are optimal combinations of the cash and non-cash collaterals to maximize the liquidity of the derivatives. Especially, as regards the option case, the market requires both the cash and non-cash collaterals for the liquidity. Overall, the introduction of the non-cash collateralization boosts the liquidity of the derivatives contracts. We also find how the arrangements of collateralization boost the liquidity of the OTC derivatives markets. Moreover, we demonstrate that the combination of the cash and the non-cash collaterals maximizing the liquidity differs that maximizing the participant's utility. This leads the optimal combination is not efficiency by means of Pareto criteria.

Keyword: OTC derivatives markets, counterparty risk, non-cash collateralization, demand-supply analysis

* NUCB Business School, Graduate School of Management

Academic Session 4

Chair: Jiro Akahori

(Ritsumeikan University)

- **Global asset allocation strategy using a Hidden Markov model**
  Eunchong Kim* (Yonsei University), Nak Young Lee (Yonsei University)
  Hanwook Jeong (Kyungpook National University)
- **New evidence of competition and innovation from patent data in Korea**
  Pando Son (Dong-A University)
- **KOSPI200 option multiplier and its effect on arbitrage opportunities**
  Joonhyuk Song (Hankuk University of Foreign Studies)
- **Market runs of hedge funds during financial crisis**
  Sangwook Sung (SERI), Hoon Cho, Dohyun Chun* (KAIST),
  Doojin Ryu (Sungkyunkwan University)
- **A prepayment-risk-neutral pricing model for Korean mortgage-backed securities**
  Seryoong Ahn*, Wan Young Song (Korea Housing Finance Co.),
  Ji-Hun Yoon (Pusan National University)
- **Is shareholder's wealth transferred to investors on pricing of equity carve-outs by private information in Korea?: Evidence from chaebol's and non-chaebol's equity carve-outs**
  Jong-Hyun Choi (Dankook University)

Global asset allocation strategy using a Hidden Markov model

Eunchong Kim[1], Nak Young Lee[2], Hanwook Jeong[3]

Abstract

This study uses the hidden Markov model(HMM) to identify the phases of individual assets and proposes an investment strategy using price trends effectively. We conducted empirical analysis for 15 years from January 2004 to December 2018 on universes of global assets divided into 10 classes and the more detailed 22 classes. Both universes have been shown to have superior performance in strategy using HMM in common. By examining the change in the weight of the portfolio, the weight change between the asset classes occurs dynamically. This shows that HMM increases the weight of stocks when stock price rises and increases the weight of bonds when stock price falls. As results of analyzing the performance, it was shown that the HMM effectively reflects the asset selection effect in Jensen's alpha and Treynor-Mazuy model. In addition, the strategy of the HMM has positive gamma value even in the Treynor-Mazuy model. Ultimately, HMM is expected to enable stable management compared to existing momentum strategies by having asset selection effect and market forecasting ability.

Key word: Price momentum, Hidden markov model, Asset allocation

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New Evidence of Competition and Innovation from Patent Data in Korea

Pando Son[1]

Abstract

This paper empirically investigates the relationship between innovation activity and competition for the Korean non-financial firms listed in Korea stock exchange market (KOSPI). We use firm-level patent activity data as proxy for innovation as well as industry adjusted level data for the period 1981-2014. This paper uses patent activity data as proxy for innovation of technological progress and also industry adjusted price-cost margin and HHI as product market competition measure. I match innovation data from Korean intellectual property office and financial data from FnGuide database. In previous paper, there are two competition views which are positive and negative relationship between competition and innovation, and one mixed view which is positive relation from escape competition effect and negative relation from Schumpeterian effect. It seems to be an inverted-U curve. The empirical findings are as follows: First, It finds that using firm size weighted patent and industry sale weighted patent as the proxy for innovation; and competition as the proxy for industry adjusted Lerner index, an inverted-U curve is found. This finding supports the empirical evidence found in Aghion et al (2005). Second, It finds that using firm size weighted patent and industry sale weighted patent as the proxy for innovation; and competition as the proxy for HHI(Herfindahl-Hirschman Index), also there is an inverted-U shape. Overall, there is the mixed result with an escape competition effect and Schumpeterian effect on firm's innovation in Korea. This result is new evidence in studying competition on firm's innovation.

Keyword: Innovation, Patent, HHI, PCM

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KOSPI200 Option Multiplier and Its Effect on Arbitrage Opportunities

Joon H. Song*

Abstract

This paper analyzes the effect of the KOSPI200 option trading multiplier changes on the efficiency of the option market. We conduct a quantitative analysis on the number of arbitrage opportunities using spread strategies.

In Korea's option market, the option trading multiplier in the KOPSI200 option market was raised from 100,000 won to 500,000 won in March 2012.The average number of arbitrage opportunities during the high option multiplier period was lower than that before the multiplier increase, but the probability of occurrence has increased. The multiplier has halved in March 2017, and both the number of occasions and the probability of occurrence of daily average arbitrage opportunities increased during the period. These findings suggest that a consistent direction between the degree of multiplier and arbitrage opportunities cannot be found.

Empirical study on the prevalence of arbitrage opportunities shows that there exists a nonlinear relationship between option multiplier and arbitrage opportunities when options market and underlying asset market factors are controlled. We found that the efficiency of the option market deteriorated relatively after the increase of the multiplier. We also conducted survival analysis on option arbitrage opportunities and no-arbitrage conditions. The results show that changes in option multiplier did not improve the speed at which the option market recovers to an efficient level and, hence, failed to meet the intended policy objectives to enhance market efficiency.

These results can be interpreted that the changes in the multiplier affect the composition of noise and informed investors in the market. The increase of option multiplier in 2012 may have reduced the number of informed traders as well as noise traders, and the recent policy change has enticed relatively more noise traders and their share in the market is even higher that before.

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Market Runs of Hedge Funds during Financial Crises

Sangwook Sung[a], Dohyun Chun[b], Hoon Cho[b], Doojin Ryu[c,*]

Abstract

A hedge fund's capital structure is fragile because uninformed fund investors are highly loss sensitive and easily withdraw capital in response to bad news. Hedge fund managers, sharing common investors and interacting with each other through market price, sensitively react to other funds' investment decisions. In this environment, panic-based market runs can arise not because of systematic risk but because of the fear of runs. We find that when the market regime changes from a normal state to a "bad" state (in which runs are possible), hedge funds reduce investment prior to runs. In addition, the market runs are more likely to occur in a market where hedge funds hold greater market exposure and uninformed traders have greater sensitivity to past price movement.

Keywords: market sustainability, market runs, hedge funds, limits of arbitrage, financial crises, synchronization risk

JEL Classifications: G01, G23

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A Prepayment-Risk-Neutral Pricing Model for Korean Mortgage-Backed Securities

Seryoong Ahn*, Wan Young Song†, and Ji-Hun Yoon‡

Abstract

KHFC is a state-run enterprise that provides long-term fixed rate mortgages and issues MBS of which underlying assets are the mortgages it provide. Most of the MBS issued by KHFC is in a pay-through type of CMO with multiple tranches and KHFC began issuing pass-through MBS recently. In this study, we suggest a prepayment risk neutral pricing model for these Korean MBS issued by KHFC, with a simpler structure of one tranche, rather than of multiple tranches due to the complexity embedded in the pricing a multiple-tranche MBS. We then compute and investigate the appropriate prices and spreads in the coupon rates between CMO and pass-through MBS issued in Korea.

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Is shareholder's wealth transferred to investors on pricing of equity carve-outs by private information in Korea? :

Evidences from *chaebol's* and *non-chaebol's* equity carve-outs

Jong-Hyun Choi*

Abstract.

This study explores the efficiency of book-building by using 90 equity carve-outs(ECOs) by the chaebol vs the non-chaebol from 2000 to 2013. I find the following observations. First, shareholders wealth of chaebol is transferred by non-reflections of parent's performances in issue price. Second, shareholders of non-chaebols implicitly transfer their wealth to limit bidders by investor's rent-seeking behavior. Third, market return during pre-pricing period is partially incorporated with both price update and underpricing in non-chaebol's ECOs, Fourth, private information of investors is not associated with underpricing(or opportunity cost of going public). These evidences are strongly consisted with prospect theory. Therefore, my findings provide that efficiency on book-building procedures of equity-carve outs is undermined in Korea.

*Dankook University

Academic Session 5

Chair: Sang-Gyung Jun
(Hanyang University)

- **Bank risk-tanking and market discipline: Evidence from CoCo bonds in Korea**
  Younghwan Lee, Alex Haerang Park* (Seoul National University)
- **The determinants of bank profitability: Evidence from Mongolia**
  Khishigdelger Tsetsegdelger*, Yong Jae Shin (Hankyong National University), Yeong Suk Cho (Mokpo National University)
- **An optimal separation lapse for the internet banking: shareholding limit and loan concetration control**
  Sooyoung Song (Chung-Ang University)
- **Wrong-way risk: Definition and pricing**
  Lixin Wu* (Hong Kong University of Science and Technology), Dawei Zhang (Goldman Sachs, Hong Kong)
- **Company stock in defined contribution plans and stock return**
  Heejin Park* (Pusan National University), Kyojik "Roy"Song (Sungkyunkwan University)

Bank Risk-Taking and Market Discipline: Evidence from CoCo Bonds in Korea

Younghwan Lee * Alex Haerang Park†

Abstract

We investigate whether the risk profile of contingent convertible (CoCo) bonds is well-priced by testing the sensitivity of bond spreads to bank asset volatility. We use credit default swap (CDS)-implied asset volatilities as a proxy variable of bank's underlying risk and regress bond spreads on them after controlling for bank and bond specific characteristics and macroeconomic factors. While equity holders (bankers) have an incentive to make riskier investments to trigger the write-off, such risk-taking behavior can be contained if CoCo bond investors punish it by demanding higher returns. We have found that investors in the Korean financial market distinguish the risk profile of CoCo bonds and require higher returns for an additional bank risk, which suggests the presence of market discipline with regard to CoCo bonds.

JEL classification: G12, G21, G28

Keywords: bank risk-taking, contingent convertible bonds, market discipline

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The Determinants of Bank Profitability: Evidence from Mongolia

Khishigdelger Tsetsegdelger[1], Yong Jae Shin[2], Yeong Suk Cho[3]

Abstract

We examine factors that determine the profitability of banks in Mongolia for the period of 2010-2018. Mongolia went through the transitional stage from centrally planned economic system to liberalized political and economic system during last two decades. The country is still on the early stage of development of market economy but one of the fasted growing economies around the world. At the same time, Mongolian banking sector has grown industry among the other since its economic and financial reform started. We find non-traditional activity and labor productivity impact on bank profitability as measured by ROA, ROE or NIM. In addition, capital ratio is positively related to ROA and NIM, but negatively related to ROE, and bank size and taxation have a negative impact on ROA, ROE and NIM. The results of this study will be useful information for the policy makers and bank regulators in formulating and implementing policies which may affect the performance of the banking sector in Mongolia.

JEL Classification: G21, G32

Keywords: Banking system; Bank profitability, Bank specific factor, Macroeconomic factor, Mongolia

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An Optimal Separation Lapse for the Internet Banking: Shareholding Limit and Loan Concentration Control

Sooyoung Song*

Abstract

In the financial industry, substantial volume of transaction requires a covert trading and demands a lot of expertise in producing a valuable information. Information asymmetry is inherently created within and persists. Thus it would be inevitable for the government to regulate the financial industry stronger than other industries within an economy. To the extent of separation between the banking and commerce, the soundness of finance may be hampered. Recently the emergence of Internet Only Bank, nevertheless, poses a daunting challenge against the conventional notion of the separation of banking and commerce. To foster competition within the Banking industry, of which the structure becomes more oligopolistic in the aftermath of the Great Recession, the new entrants (Internet Only Banks) are introduced in the industry. As the entrants require huge prior investment in the technical infrastructure for the Internet Only Banks to operate properly through the internet while offering banking services, the traditional regulation of shareholding limit must be an apparent obstacle, which have worked effectively for the past several decades since 1933 under the backdrop of separation of banking and commerce. Particularly in 2015, the government of Korea has lifted the shareholding limit regulation and open a path for the ICT industry fund to participate in the share ownership in the banking. In the meantime, non–ICT investors are still banned from banking industry. However, the non–ICT industry capital can still participate in the Internet Banking indirectly either through the ownership build–up in the ICT firm or via mimicking the ICT firm under the guise of ICT industry, while circumventing the ban effectively. Thus, still of concern is the effectiveness of the government's ban expected to lead to a sustainable separating equilibrium with which the desirable self–selection is accomplished. The current paper addresses this issue in lieu of information asymmetry as to the quality of portant participants in the banking industry. When the lift of shareholding limit is accompanied by the credit exposure control (particularly loan concentration ratio), the paper demonstrates, with the general setup of a theoretical model, that the effective ban is possible to the benefit of Internet Only Banking participants as well as the government in light of the expected outlay in the case of bailout due to the non–performing loan. Consequently, the welfare enhancing outcome is within the reach despite the separation lapse when we control the loan concentration ratio while allowing larger ownership of the Internet Only Banking for the ICT industry.

Key words: Separation Lapse, Loan Concentration Percentage, Self Selection

JEL Codes: D82, G23, G28, G38, K22

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Wrong-Way Risk: Definition and Pricing

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Abstract

We provide a mathematical definition of wrong-way risk, and develop a Monte Carlo simulation method that combines important sampling and minimizing variance for calculating the expectation value for rare events. A pricing example shows that the method is several dozen times faster than the standard Monte Carlo simulation method for calculating the wrong-way risk.

Key words: Credit valuation adjustment (CVA), Wrong-way risks (WWR), Right-way risk.

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Company Stock in Defined Contribution Plans and Stock Return

Heejin Park[1], Kyojik "Roy" Song[2]

Abstract

We posit that employee ownership through defined contribution (DC) plans results in managerial entrenchment, and then test the effect of the enactment of the Pension Protection Act of 2006 on the relation between the employee ownership and stock return. Using the data over the period of 1999-2014, we find that the portfolios of firms with large employee ownership significantly underperform the market before the adoption of the Act, but their risk-adjusted returns are not negative in the post-adoption period. Also, we document that firms with large employee ownership increase their firm value measured by Tobin's Q after the adoption of the Act. These findings suggest that the adoption of the Act has been very effective to mitigate the negative effect of managerial entrenchment by decreasing the employee ownership and reinforcing the fiduciary duty of plan trustees.

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Academic Session 6

Chair: Youngsoo Choi

(Hankuk University of Foreign Studies)

- **Do fund investors consider asset returns? Substitute relation among investment funds in Korea**
  Young-Min Kim (Kangwon National University)
- **Pension choice and firm leverage: An analysis of Korean firms**
  Hyejin Park (Korea Capital Market Institute)
- **The fundamental drives of house price fluctuations: Using disaggregated Korean house price indexes**
  Jieun Lee*, Hosung Jung (The Bank of Korea)
- **Economic effects of social insurance for the elderly**
  Se Yung Bae* (Ajou University), Junkee Jeon (Seoul National University), Hyeng Keun Koo (Ajou University), Kyunghyun Park (Seoul National University)
- **The geography of international mutual funds**
  Young K. Park* (Sungkyunkwan University), Inwook Song (Korea Fund Ratings Co.)

Do fund investors consider asset returns?: Substitute relation among investment funds in Korea

Young-Min Kim[1]

Abstract

This study aims to investigate whether fund investors change their investment fund type depending on the return change of assets such as stocks, bonds, and housing. For this purpose, we examine the substitution relation among the equity, bond, and real estate investment funds by employing the net inflow. In particular, investment funds are classified according to investment objective, investment region, and investor.

The main findings are as follows: first, the stock return of change is not attributed to the substitution relation among equity, bond, and real estate investment funds, which remains consistent across investment region and investors. Second, the yield change of three-year treasury bonds is attributed to the substitution relation between equity and bond investment funds. That is, if the bond yield increases and the bond prices decrease in turn, then money will go to the 'domestic' equity funds and goes out of the 'domestic and international' bond funds. The substitution relation is revealed between 'publicly placed' equity and 'publicly and privately placed' bond investment funds. Third, housing return of change is attributed to the substitution relation between domestic and international real estate investment funds. This implies that if housing prices rise, then money will go into the 'domestic' real estate investment funds and go out of 'international' real estate investment funds.

The substitution relations among investment funds suggest that fund investors consider the return change of assets when determining investment funds.

Keywords: Net inflow, equity investment funds, bond investment funds, real estate investment funds

JEL Classifications: C13; G2

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Pension choice and firm leverage: An analysis of Korean firms

Hyejin Park*

Abstract

This paper investigates the effects of defined benefit (DB) pension plans on firms' capital structure decisions. Given that contributions to defined benefit plan are tax deductible, firms with DB pension plans potentially have lower incentives to use debt as tax shields. Using data of Korean listed firms, we show that firms with pension plans have lower leverage ratios than firms without pension plans. We also show that the corporate tax rates are positively related to leverage ratios, supporting the existence of the tax advantages from debt financing. Our result shows that firms substitute pensions for regular debt in their capital structure decisions and is robust to alternative estimation methods.

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The Fundamental Drives of House Price Fluctuations: Using Disaggregated Korean House Price Indexes

Jieun Lee and Hosung Jung

The Bank of Korea

Abstract

House prices in Korea have risen substantially in the recent decade. However, the speed of house price appreciation has diverged according to housing characteristics such as price-level, dwelling size, and house age. Using the aggregated as well as disaggregated house price indexes at the district level, this paper investigates the determinants of house prices, focusing more on the demand-side factors. The main results of the analysis are the following: First, record low-interest rates and the relaxation of macroprudential policy regulations, together with the high level of household debt, contribute to house price appreciation—its effects particularly pronounce on low priced and small-sized housing. Second, the high ratio of Chonsei—a large fixed-sum deposit—to the property value has led more tenants to purchase houses, thereby contributing to increasing housing demand. Third, the districts with high representation of elder people experience house price appreciation especially in the high priced and large sized groups whereas the districts with high proportion of single household and children tend to have a negative impact on house price growth. Overall, the results indicate that the sources of house financing and changes in demographic structure are major factors to explain house price dynamics in Korea.

Economic Effects of Social Insurance for the Elderly

Se Yung Bae * Junkee Jeon † Hyeng Keun Koo ‡ Kyunghyun Park §¶

Abstract

In this paper we propose and provide a theoretical analysis of a model which can serve as a benchmark for studying economic effects of social insurance for the retired people. Specifically, we study a model in which all retired people are provided a stream of payments by the social insurance program and consider the consumption, investment, and retirement decisions of an economic agent who is still working.

We show that an increase in the social insurance payment (SIP) reduces optimal consumption, increases optimal risky investment and reduces the optimal threshold wealth level for retirement. The result of the model is consistent with the empirically observed strong positive correlation between social security coverage and stock market participation rates in a country.

Keywords : Social Insurance, Consumption, Portfolio Selection, Retirement, Optimal stopping problem, Variational Inequality, Duality

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The Geography of International Mutual Funds

Young K. Park[1], Inwook Song[2*]

Abstract

We investigate how geographic locations of international mutual funds affect fund performance and investment behavior for both emerging and developed markets. Using one- and three-factor alphas, we find that local funds outperform remote ones especially in emerging markets, but under the four-factor alpha, they tend to under-perform. A plausible explanation is that the excess returns for local fund managers are attributable to momentum and thus disappear when this is controlled. Regarding trading behavior, we find that fund trades correlate more with trades of other funds in the same(local) regions than with those in different(remote) regions. This finding is consistent with the networking (word of mouth) effect among investors.

Keywords: Geography, International Mutual Funds, Herding, Momentum, Market Timing

JEL Classification: G11, G21

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Academic Session 7

Chair: Yeong Suk Cho
(Mokpo National University)

- **Complex ownership and pecking order theory**

  Min Geu Jung* (Gyeongnam National University of Science and Technology),
  Byoung Gon Kim (Changwon National University),
  Dong Wook Kim (Busan Economic Promotion Agency)

- **Idiosyncratic risk and foreign investors: Empirical evidence from the Korean stock market**

  Junho Hwang* (National Pension Research Institute)

- **The impact of corporate marginal tax rate and cost of capital on capital structure, cashflow and profitability**

  Hyon Sok Lee, Mi Hwa Chung* (Sungshin Women's University)

Complex Ownership and Pecking Order Theory

Min Geu Jung[*], *Byoung Gon Kim*[**], *and Dong Wook Kim*[***]

This paper examines complex ownership structure firms and their motivations for the use of debt financing. Debt may facilitate expropriation of affiliate's wealth, and reduce agency costs. In the context of the pecking order theory, in terms of external financing, managers prefer to raise debt over equity–the cost of debt is lower compared to the cost of equity.

To conduct our empirical analysis, we use panel data on 4,926 firms during the period from 2004 to 2015. We find that complex ownership structure affects debt finance decision and ultimate owners use less debt. Controlling shareholders of the firms that included in the cross-shareholding ownership structure type have greater incentives to use debt as tunneling and propping purpose.

Also we find that pyramidal-affiliated firms which included in the holding-company ownership structure type have higher leverage incentives for financial deficit.

Key Words : Complex Ownership, Capital Structure, Pyramidal Ownership, Controlling Shareholders, Pecking Order Theory

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Idiosyncratic risk and foreign investors: Empirical evidence from the Korean stock market

Junho Hwang[1]

Abstract

This paper examines the effect of foreign ownership on idiosyncratic risk of individual stock in Korean stock market. We find that foreign ownership is negatively related to idiosyncratic risk. This result is robust to multiple idiosyncratic risk measures and regression methods. We find two underlying channels through which foreign ownership reduces the idiosyncratic risk: through influencing price informativeness and enhancing monitoring effect. Our results support that foreign investors reduce the idiosyncratic risk by enhancing monitoring, while the informativeness channel has weaker explanatory power.

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The Impact of Corporate Marginal Tax Rate and Cost of Capital on Capital Structure, Cashflow and Profitability

Hyon Sok Lee*, Mi Hwa Chung**

This study is to examine the effect of marginal tax rate and capital cost on firm 's capital structure, cash flow and profitability. The analysis period is from 2002 to 2017, and targets are KOSPI and KOSDAQ listed companies. The marginal tax rate is estimated by the nonparametric method by Blouin, Core and Guay (2010). Based on this, the after-tax cost of debt, after-tax profit and free cash flow are estimated. The cost of equity capital was calculated using the CAPM and Fama-French three-factor model. The capital structure of the company is measured by dividing the book value of interest - bearing debt and assets by the market value of each asset, cash flow is free cash flow, profitability is after-tax earnings before interest and tax (EBIT) and net income (NI).

The analysis shows that the weighted average cost of capital (WACC) and cost of capital have a strong negative relationship with the capital structure. The after-tax cost of debt rather than the pretax cost of debt has a more significant explanatory power on the capital structure. As the marginal tax rate increases, the cash flow and profitability of the firm also show a significant increase. WACC has a positive effect on cash flow and cost of equity capital has a positive effect on profitability.

We directly estimates marginal tax rates for independent variables including after-tax operating profit or after-tax cost of debt. Therefore, it differs from previous studies using the average effective tax rate and the statutory maximum tax rate as proxy variables of the marginal tax rate. In addition, this study can be helpful to establish a financial strategy for enhancing firm value by showing the effect of capital cost and marginal tax rate on capital structure, cash flow and profitability.

Key Words: Marginal Tax Rate, Weighted Average Cost of Capital, Free Cash Flow, Capital Structure, Panel Analysis

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Academic Session 8

Chair: Pando Son

(Dong-A University)

- **An empirical study on the influence of bitcoin price change and KOSPI 200 futures market**

  Byung Jin Yim* (Yeungnam University), Tae-Sun Im (Seoul Cyber University)

- **A study on the systematic effects of foreign investors on domestic stock market**

  Woohyun Kim* (Pusan National University), Youngtae Byun (Kyungsung University)
  Soo-Kyung Kim (Tongmyong University)

- **Effect of stock market on equity investment funds by investor**

  Young-Min Kim (Kangwon National University)

- **Announcement effects of mezzanine securities with refixing and call option provisions**

  Yongsik Kim (Korea Exchange)

An Empirical Study on the Influence of Bitcoin Price Change and KOSPI 200 Futures Market

Yim, Byung-Jin*, Im, Tae-Sun**

This study is an empirical study on the Influence of the Bitcoin price and the KOSPI 200 Futures price. In this study we used 1,612 daily data of the Bitcoin price and KOSPI 200 Futures price from January 4, 2014 to Jun 3, 2019. There are two indicators of the Bitcoin price and the KOSPI 200 Futures price. We try to analyze the mutual influence and the causality between the Bitcoin price and the KOSPI 200 Futures price. We wish to analyze the extent of cross-influence. We employ impulse response function based on VAR model as well as variance decomposition after unit root tests and cointegration test. An important result of this study are summarized as follows:

First of all, raw time series data of the Bitcoin price and KOSPI 200 Futures price has unit roots. Secondly, first differential data of the Bitcoin price and KOSPI 200 Futures price has no unit roots. Third, there is at least one cointegration between Bitcoin price and KOSPI 200 Futures price. Finally, the correlation between of the Bitcoin price and KOSPI 200 Futures price is (+) 0.789052.

Key words: Bitcoin Price, KOSPI 200 Futures Price, Correlation, VAR model, Time Series Data

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A Study on the Systematic Effects of Foreign Investors on Domestic Stock Market

Woohyun Kim[1], Youngtae Byun[2], Soo-Kyung Kim[3]

Since the abolition of the foreign investment ceiling in May 1998, foreign investors' share of domestic stock investments has increased, and their trading behavior have had a significant impact on stock prices. In particular, foreign investors are mostly institutionalized, and they are either professional investors or large-scale investors. Therefore, this study examines the systematic direction of foreign investors' impact on domestic stock markets. In order to verify this, we construct a risk factor based on the foreign net buying amounts ratio and verify whether the risk factor has a risk premium using the time series and the cross-sectional regression method.

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Effect of Stock Market on Equity Investment Funds by Investor

Young-Min Kim*

Since the proportion of institutional investors in equity investment funds is getting larger and larger in the U.S. and Korea, this study aims to examine the effect of stock market on equity funds by investor.

The main findings are as follows: first, stock return affects only individual investors in the US and Korea. It affects negatively on US individual investors while it affects positively on Korean individual investors. Second, we find that stock volatility does not affect on fund inflow of institutional and individual investors. Lastly, institutional investors give effect on individual investors only in Korea. Business cycle does not affect on investors' inflows.

This study finds that the effect of stock market on equity investment funds is different by investor for the first time. We need more study on various investment funds.

Key Words : Equity Investment Fund, Individual and Institutional Investors, Stock Return, Stock Volatility

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Announcement Effects of Mezzanine Securities with Refixing and Call Option Provisions

Yongsik Kim*

Abstract

This paper analyzes the announcement effects of mezzanine securities with refixing and call option provisions. First, we show that the issuance announcements of mezzanine securities with refixing option have significantly negative effects on the stock valuation. Second, we find that the stock price reactions to announcements of the convertible bonds issue with call option are also significantly negative. This effects are maintained after controlling for the effect of negative market reaction to the provision of the refixing options.

*Korea Exchange

Academic Session 9

Chair: Intae Jeon

(The Catholic University of Korea)

- **The effect mortgage prepayment charges on the MBS prepayment risks**

  Chun-Kyu Kim* (Chungnam National University),
  Byungkwon Lim (Housing Finance Research Institute)

- **A study on the spillover effects of the Korean industry indices using spillover index**

  Daesung Jung* (Busan National University),
  Jonghae Park (Gyeongnam National University of Science and Technology)

- **Practical method of constructing implied and local volatility surfaces**

  Hyuncheul Lim (Chonnam National University)

- **The Relationship between firm's technology innovation and wage inequality**

  Pando Son, Yongsoo Choi (Dong-A University)

The Effect of Mortgage Prepayment Charges on the MBS Prepayment Risks

Chun-Kyu kim[*] and Byungkwon Lim[**]

This study examines whether the change of mortgage prepayment policy affects MBS prepayment rate using MBS data issued by the Korea Housing Finance Corporate (KHFC) between 2004 and 2018. The level of prepayment charges is associated with the prepayment behavior of borrowers. Therefore the prepayment charges could affect MBS prepayment rate. Our major findings are as follows. First, the conditional prepayment rate (CPR) is significantly higher for the MBS issued on and after 2012. However, the MBS issued on and after 2015 shows lower prepayment rates. These different results suggest that the systemic change in the prepayment policy in 2012 could importantly affect prepayment behavior in comparison with lowering the 0.3%p of prepayment rate in 2015. Second, the MBS issued on and after 2015 shows much higher CPR up to 36 months. Third, the effect of policy changes in prepayment charges lasts two years after 2012 and one year after 2015, respectively.

Overall, the level of prepayment charges is related to the CPR of MBS. Forecasting the mortgage prepayment is a critical factor when we estimate the price of MBS. Thus, if the policy authorities take account of the change in the mortgage prepayment policy in the future, they need to consider this factor when estimating a prepayment rate.

Key Words: Mortgage Loan, Mortgage-Backed Securities, Prepayment Fee, Prepayment Rate, Fixed Interest Rate

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A Study on the Spillover Effects of the Korean Industry Indices using Spillover index

Daesung Jung*, JongHae Park**

This study analyzed the spillover effects and characteristics of the industries using the spillover index proposed by Diebold and Yilmax (2012). The main results are as follows. First, we find that return spillover effects and volatility spillover effects exited in Korean industry indices observed through the spillover index. Second, we find that (leading) industries that have a great impact on other industries are service industry, transportation warehouse, construction industry, manufacturing industry, distribution industry, telecommunication industry, electric gas industry and financial industry. Third, we find that industries that are heavily influenced by other industries are services, retail, manufacturing, finance, construction, transportation, electricity, and communications. Fourth, the spillover index was the highest at the 2008 global financial crisis.

The above results show that the spillover effects of industry indices through newly developed spillover index can be used for the investment strategy and risk management considering the spillover effects.

Key Words : spillover effects, spillover index, global financial crisis, industry indices

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Practical Method of Constructing Implied and Local Volatility Surfaces

Hyunchul Lim*

In this article we show the method of calibrating the local volatility surface using quadrature method. The popularly used method is based on finite difference scheme and it suffers from discretization error. In addition, the location of the volatilities are in the opposite side of starting point of asset price process. These make a difference when applying the monte-carlo(MC) method to derivatives pricing with local volatilities which are calibrated from finite difference method(FDM). To handle this inconsistency, we adopt the quadrature (QUAD) method for the pricing tool of calibration.

The important characteristic of our methodology is the use of Arrow-Debreu prices as a building block. The Arrow-Debreu price is discounted transition density function of the log version of Dupire's model.

$$dx(t) = (\mu(t) - \frac{1}{2}\sigma^2(x,t))dt + \sigma(x,t)dW^Q(t), \tag{1}$$

The diffusion coefficient $\sigma(x,\ t)$ is a function of the state space, called local volatility.

Now we discretize the state space $(x,\ t),\ t>0,\ x\in\mathbb{R}$, and represent it by the mesh structure $M = \{x_{ij} | i = 1,\ \cdots,\ m,\ j = 1,\ \cdots,\ n\}$ where $x_{ij} = (x_i,\ t_j)$ and x_i is the abscissas of quadrature rule.

Arrow-Debreu price satisfies both of the Kolmogorov's forward and back-ward equations. More specifically along with the times of the process(1), the following backward equation of call option pricing and two forward equations are satisfied.

$$call(x_{l,j+1}|x_{i,j};\sigma) = \int_{-\infty}^{\infty} ad(x_{\cdot,j+1}|x_{i,j};\sigma)\max(e^x - e^{x_l},\ 0)dx \tag{2}$$

$$Call(x_{l,j+1}) = \int_{-\infty}^{\infty} AD(x_{\cdot,j})call(x_{l,j+1}|x_{\cdot,j};\sigma)dx, \tag{3}$$

$$AD(x_{l,j+1}) = \int_{-\infty}^{\infty} AD(x_{\cdot,j})call(x_{l,j+1}|x_{\cdot,j};\sigma)dx, \tag{4}$$

where we calculate at each mesh points $x_{l,j+1}$ and $x_{i,j}$. The notation $x_{\cdot,j}$ represents continuous(unitized) log asset x at time t_j. But when we apply the quadrature rule to these integrations then each of the integral changes to finite summation that only needs $x_{i,j}$. With this, $\sigma = \sigma(x_{i,j})$, max $(e^x - e^{x_l},\ 0)$ is the call option payoff at time t_{j+1} with strike e^{x_l}; $call(x_{l,j+1}|x_{i,j};\ \sigma)$ is the call option price at the state space $x_{i,j}$ with $x_{i,j}$ with strike e^{x_l} and maturity t_{j+1}. From the first two formula, we are able to calibrate the local volatilities.

$$\underset{\sigma}{\arg min} \sum_{x2} \left(Call(x_{l,j+1};\ \sigma) - \widetilde{Call}(x_{l,j+1})\right)^2 \tag{5}$$

where $\widetilde{Cal\ l}$ is market observed call price. Last formula prepares the Arrow-Debreu prices for the next time step.

Actually the Arrow-Debreu prices($AD(x_{l,j+1})$) are bootstrapped by using the previous time step Arrow-Debreu prices($AD(x_{i,j})$) and new local Arrow-Debreu prices($ad(x_{l,j+1}|x_{i,j})$) which starts from time t_j to time t_{j+1}.

Compared to FDM, QUAD method recovers call option prices in more detail. About 100 to 200 of quadrature nodes(abscissas) gives very accurate result. Calibration using QUAD is, among other things, suitable for the derivatives pricing by MC method. At Appendix we will show a number of results by QUAD. All test case show very accurate results especially that are well suited for shorter or longer out of the money call options.

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The Relationship between Firm's Technology Innovation and Wage Inequality

Son, Pando[1] · Choi, Yongsoo[2]

Abstract

This paper empirically investigate whether firm's technology innovation affect wage inequality using human capital corporate panel data of Korea Research Institute for vocational education & training over period of 2005-2015. Previous papers have found the evidence that technology innovation among many factors plays in key role to explain the technology innovation. As a result, we empirically test to find the same evidence in Korea. In this paper, we use new product development and level of introduction over 3 years, number of application, and number of register, which are used as proxy variable for technology innovation respectively. We implement OLS estimation to find its relationship and find as follows: First, we find that new product development and introduction of new product that is proxy variable for technology innovation influence to affect wage inequality positively and significantly at 1%. This evidence implies that firms that introduced and developed new products could have higher payment among same industry firms and thus technology innovation invokes wage inequality in each industry. Second, we find that number of application as proxy for technology innovation gives wage inequality positive effect significantly. Third, we document that number of register as proxy variable for technology innovation affect positively and significantly at 1%. Therefore, our results suggest that technology innovation gives labors wage inequality.

Keyword: Wage inequality, Technology innovation, Apply, Register

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Academic Session 10

Chair: Hong Bae Kim
(Dongseo University)

- **A study on market reaction by KSIC around quarterly earnings announcements**
  Hankyung Lee*, Jinsu Kim (Gyeongsang National University)
- **Investors' response according to establishment authorization related to the Korean internet banks**
  Gwang Yong Kim*, Jinsu Kim (Gyeongsang National University)
- **The necessity and the effect on the latent Greeks**
  Minjae Kim (NH Investment & Securities)
- **How to manage underfunded portfolio using dynamic stochastic programming**
  Junhwa Ban (independent), Taeyong Kim* (KB Securities co.)

A Study on Market Reaction by KSIC around Quarterly Earnings Announcements

Hankyung Lee*, and Jinsu Kim**

This paper investigates the impact on the stock price and examines trading behavior by investor types and by KSIC (Korea Standard Industry Classification) around quarterly earnings announcements. Empirical results are as follows.

First, there is a significant difference between total sales and operating profit as a result of analyzing the market response by dividing the group by sales, operating profit, and net profit. However, there is no significant difference in the operating and net profit. Second, there is a significant difference by KSIC around qaurterly earnings announcement. Third, the trading behavior by investor type showed different market responses. Fourth, when all profits increase (ΔY+, ΔQ+), foreign investor are net-buyer before the announcement and then net-seller after the announcement. When all profits decrease (ΔY+, ΔQ+), foreign investor are net-sellers. On the other hand, individual investors continued to net buyer before and after earnings disclosures.

Key Words: Quarterly Earnings Announcement, Investor Type, Event Study, Net Buy and Selling Ratio, KSIC

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Investors Response According to Establishment Authorization Related to the Korean Internet Banks

Gwang Yong Kim* and Jinsu Kim**

This study examines the responses of investors participating in the stock market through event study for companies applying for preliminary approval for the first and second Korean Internet bank. Hence, the event day is set the day when the financial authorities announced the preliminary authorization, the results are as follow.

First, as a result of analyzing the whole sample, the average abnormal returns increased on the event day but decreased on the following day. It seems that investors consider the internet banks as a positive signal and the effects are temporary.

Second, based on this analysis, we classified the companies that were approved as the internet banks and those who were not. The average abnormal returns of the companies participating in the approved consortium showed a pattern similar to the average abnormal returns of the whole sample, the value is much larger. In other words, investors' expectations for the internet bank are reflected. However, the average abnormal returns of companies participating as shareholders in the unapproved consortium showed a decline on that day.

Third, we also divided the whole sample into the first and second announcements. The average abnormal returns on the first announcement day increased, but those on the second announcement decreased. On the second day of the announcement, it is interpreted that investors consider such unapproved consortium as a negative signal because the financial authorities do not permit any consortium to apply for preliminary approval.

Key Words: Internet Banks, Establishment Authorization, Event Study, Abnormal Return, Investors Response

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The necessity and the effect of the Latent Greeks

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The issued derivatives product is administered based on the greeks, the sensitivity analysis of the market data. The hedge amount is determined from delta and vega, and the risk of theta is managed to alleviate the negative carry. Then the high order sensitivity like gamma is jumped into explanation, if the linear order greeks can not successfully decompose the origin of the profit and loss.

However, the latent greeks, which are generated from the market convention or the way of handling the market data, are needed to be researched previously. The latent greeks can complement the prediction of unexplained MtM change by linear order greeks, and, further more, be used to find out the method to reduce residual risk, which was easily misconceived as the high order risk.

In this paper, the latent greeks are calculated and the effect of them is analyzed. In the beginning, the influence of the maturity shift on MtM change of FtD swap is studied: Here, the necessity of the PL management related to the market convention is shown. Then the risk from incoherent policy, that the volatility surface is stored with sticky moneyness convention while the delta is calculated under sticky strike scenario, is discussed. Strike shift greeks is developed to disentangle that puzzled, and the cognate feature with sticky moneyness greeks is demonstrated. Also, this paper informs that to investigate the importance of latent greeks accurately, the effect of the volatility shape distort has to be preferentially calculated.

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How to manage underfunded Portfolio using Dynamic stochastic programming

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We develop a portfolio management model for LDI with expected shortfall risks through a dynamic stochastic programming approach and analyze optimal weights of assets over the investment horizon depending on varying parameters of shortfall risks allowable. Futhermore, we offer how to manage unfunded portfolio as well as remedies to the portfolio.

Our model is an implementation of [S.Das et al., 2014] from the practical perspectives based on a cascade model for economic scenario generations and a method of stabilizing portfolio weights. Our approach is very applicable to practical settings in the following senses; First, our model adopts a cascade model for generating scenarios of asset return calibrated to historical data and capital market assumptions. Second, our model is flexible in structure enough to take realistic constraints into the model such as maximum limits for weights of investible risky assets, RBC and solvency II. Third, a large number of assets can be included in the investment universe of our model with help of stabilizing the portfolio weights.

Key Words : Liability Driven Investment, Shortfall Risk, Dynamic Stochastic Programming, Strategic Asset Allocation, Cascade Model

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