

**BYOUNG KI SEO**

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 Ulsan National Institute of Science and Technology  
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**EDUCATION**


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<b>PhD</b>	KAIST, Mathematics Dissertation: "Recurrence of Multiples of Irrational Numbers Modulo 1" Committee: G.H. Choe (Chair), S.H. Bae, I. Song, U.J. Choi, S.G. Hahn	Feb. 2004
<b>MS</b>	KAIST, Mathematics	Feb. 1999
<b>BS</b>	KAIST, Mathematics	Feb. 1997

**EMPLOYMENT**


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Associate Professor of Finance, <i>Ulsan National Institute of Science and Technology</i> , School of Business Administration	Mar. 2018 – Present
Assistant Professor of Finance, <i>Ulsan National Institute of Science and Technology</i> , School of Business Administration	Aug. 2012 – Feb. 2018
Quant / Trader, <i>Industrial Bank of Korea</i> , FX and Derivatives Team, Trading Department	Mar. 2006 – Jul. 2012
Researcher, <i>Utrecht University, the Netherlands</i> , Mathematical Institute	Feb. 2005 – Jan. 2006
Researcher, <i>Korea Advanced Institute of Science and Technology</i> , Institute of Natural Science	Mar. 2004 – Jan. 2005

**RESEARCH INTERESTS**


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Financial Engineering, Quantitative Finance, Market Microstructure, Fintech

**REFEREED PUBLICATIONS**

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- [1] Lee, Kyungsub & Byoung Ki Seo\* (2021). Analytic formula for option margin with liquidity costs under dynamic delta hedging. *Applied Economics*, forthcoming.
  - [2] Choi, Sanghak, Hyeonung Jang\*, Daejin Kim, & Byoung Ki Seo (2021). Derivatives use and the value of cash holdings: Evidence from the U.S. oil and gas industry. *Journal of Futures Markets* **41**(3), 361–383.
  - [3] Jang, Hyeonung & Byoung Ki Seo\*\* (2020). Monetary policy rate expectation and energy prices during the FOMC announcement period. *Finance Research Letters* **32**, 101093.
  - [4] Choi, Jaehyuk\*, Chenru Liu & Byoung Ki Seo (2019). Hyperbolic normal stochastic volatility model. *Journal of Futures Markets* **39**(2), 186–204.
  - [5] Lee, Kyungsub & Byoung Ki Seo\* (2018). Filtered historical simulation for initial margin of interest rate swap under Korean market. *Emerging Markets Finance and Trade* **54**(11), 2516–2532.
  - [6] Lee, Kyungsub & Byoung Ki Seo\* (2017). Performance of tail hedged portfolio with third moment variation swap. *Computational Economics* **50**(3), 447–471.
  - [7] Lee, Kyungsub & Byoung Ki Seo\* (2017). Modeling microstructure price dynamics with symmetric Hawkes and diffusion model using ultra-high-frequency stock data. *Journal of Economic Dynamics & Control* **79**, 154–183.
  - [8] Lee, Kyungsub & Byoung Ki Seo\* (2017). Marked Hawkes process modeling of price dynamics and volatility estimation. *Journal of Empirical Finance* **40**, 174–200.

- [9] Kim, Dong Han & Byoung Ki Seo\* (2003). The waiting time for irrational rotations. *Nonlinearity* **16**(5), 1861–1868.
- [10] Choe, Geon Ho & Byoung Ki Seo\* (2001). Recurrence speed of multiples of an irrational number. *Proceedings of the Japan Academy Series A – Mathematical Science* **77**(7), 134–137.

Note:

1. \* indicates the corresponding author.
2. \*\* indicates the corresponding author when his supervising student is the first author.
3. The order of authors for all papers is alphabetical. (Finance, Economics, and Mathematics)

Overall:

1. *h.index*: 3(WoS), 4(Google Scholar)
2. Total Citation: 38(WoS), 75(Google Scholar)

**WORK IN PROGRESS**

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- Lee, Kyungsub & Byoung Ki Seo\*. Modeling bid and ask price dynamics with an extended Hawkes process and its empirical applications for high-frequency stock market data. (under review, 2<sup>nd</sup> round in *Journal of Financial Econometrics*)
- Jang, Hyeonung, Jonathan Landy, YongSeok Jho & Byoung Ki Seo\*. Early stage detection of financial market crash using model-free framework of machine learning. (under review)
- Jang, Hyeonung & Byoung Ki Seo\*. When we leave the information on the table: information shock and stock price underreaction to monetary policy. (under review)
- Jang, Hyeonung & Byoung Ki Seo\*. Transmission of central bank communication to emerging economies: evidence from the Korean stock market. (under review)
- Choi, Jaehyuk & Byoung Ki Seo, Finite mixture model approximation for the SABR distribution.
- Choi, Jaehyuk & Byoung Ki Seo, Valuing American option with non-parametric regression with fast Gauss transformation.
- Choi, Jaehyuk, Young-June Choi & Byoung Ki Seo, On computation of the distribution of non-identical and correlated lognormal random variables.

**REFEREED CONFERENCE PRESENTATIONS**

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*International*

- Jang, Hyeonung, Jonathan Landy, YongSeok Jho, & Byoung Ki Seo\* (2019). Financial Market Crash and Phase Transition: Through Model-Free Framework with Machine Learning. presented at *the Quantitative Methods in Finance 2019 Conference*, Sydney, Australia.
- Lee, Kyungsub & Byoung Ki Seo\* (2018). Expected Liquidity Cost under Delta Hedging Process. presented at *the 10<sup>th</sup> World Congress of the Bachelier Finance Society*, Dublin, Ireland.
- Jang, Hyeonung & Byoung Ki Seo\* (2018). Abnormal Energy Price Movements Prior to FOMC Announcements. presented at *the 2018 International Conference on Energy Finance*, Beijing, China.
- Lee, Kyungsub & Byoung Ki Seo\* (2017). Expected Liquidity Cost under Delta Hedging Process. presented at *the Quantitative Methods in Finance 2017 Conference*, Sydney, Australia.
- Choi, Jaehyuk & Byoung Ki Seo\* (2016), Valuing American Option with Non-Parametric Regression with Fast Gauss Transformation. presented at *the 9<sup>th</sup> World Congress of the Bachelier Finance Society*, New York, USA.
- Lee, Kyungsub & Byoung Ki Seo\* (2015). Marked Hawkes Process Modeling of Price Dynamics and Volatility Estimation. presented at *the 11<sup>th</sup> Conference of Asia-Pacific Association of Derivatives*, Busan, Korea.

*Domestic*

- Lee, Kyungsub & Byoung Ki Seo\* (2019). Expected Liquidity Cost for Dynamic Delta Hedging. presented at *the 2019 Busan Mini Conference of Financial Mathematics*, Busan, Korea.

Lee, Kyungsub & Byoung Ki Seo\* (2019). Expected Liquidity Cost for Dynamic Delta Hedging. presented at the 2019 Workshop with Allied Finance Society, Bangkok, Thailand.

## PATENTS

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Seo, Byoung Ki, Hyeonung Jang, So Yun Park, & In Young Na . Visualization Method for Spread Using Candle Chart. Korean Patent, No. 10-2132599

## AWARDS

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2020 Technology Innovation Award, *Korean Artificial Intelligence Association*, Dec. 2020

2019 Innovation Cradle for Training Energy Manpower, *Ministry of Trade, Industry and Energy*, Sep. 2019

Best Paper Award, *The 14<sup>th</sup> Conference of Asia-Pacific Association of Derivatives*, Jul. 2018

Commendation, *Mayor of Ulsan Metropolitan City*, Mar. 2018

Outstanding Teaching Award, *Ulsan National Institute of Science and Technology*, Mar. 2014

## GRANTS

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Principal Investigator, (KRW 1,175 Million) “A machine learning and statistical inference framework for explainable artificial intelligence.” <i>Institute for Information &amp; Communications Technology Planning &amp; Evaluation (IITP) grant funded by the Korea government (MSIT). No. 2017-0-01779.</i>	Jan. 2019 – Dec. 2021
Principal Investigator, (KRW 920 Million) “Human Resources Program in Energy Technology.” <i>Korea Institute of Energy Technology Evaluation and Planning (KETEP) grant funded by the Korea government (MOTIE). No. 20184010201680.</i>	Mar. 2019 – Jun. 2021
Co-Researcher, (20.00% out of the total KRW 90 Million) “Blockchain Based System Engineering.” <i>Internal fund of Ulsan National Institute of Science and Technology.</i>	Jan. 2018 – Dec. 2019
Co-Researcher, (18.00% out of the total KRW 1,145 Million) “Human Resources Program in Energy Technology.” <i>Korea Institute of Energy Technology Evaluation and Planning (KETEP) grant funded by the Korea government (MOTIE). No. 20184010201680.</i>	Jun. 2016 – Feb. 2019
Co-Researcher, (14.55% out of the total KRW 1,100 Million) “A machine learning and statistical inference framework for explainable artificial intelligence.” <i>Institute for Information &amp; Communications Technology Planning &amp; Evaluation (IITP) grant funded by the Korea government (MSIT). No. 2017-0-01779.</i>	Jul. 2017 – Dec. 2018
Co-Researcher, (10.00% out of the total KRW 274 Million) “Building Ulsan Industry-University Convergence Campus.” <i>Korea Institute for Advancement of Technology (KIAT) grant funded by the Korea government (MOTIE).</i>	Jul. 2015 – Jun. 2016
Principal Investigator, (KRW 32 Million) “Modelling Initial Margin for Over-the-Counter Derivatives Market.” <i>Korea Exchange (KRX)</i>	Jan. 2015 – May. 2015
Co-Researcher, (17.00% out of the total KRW 18 Million) “Basic Documentation for Master Plan of Financial Hub Related to North-East Asia Oil Industry.” <i>Ulsan Metropolitan City</i>	Oct. 2014 – Feb. 2015
Principal Investigator, (KRW 16 Million) “Financial Mathematics and Valuation of Exotic Derivatives Products.” <i>Korea Science Academy of KAIST</i>	Mar. 2014 – Dec. 2014

Overall: KRW 2,558 Million (KRW 2,143 Million as P.I.)

## COURSE TAUGHT

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### *Undergraduate*

Introduction to Financial Engineering  
Applied Linear Algebra  
Fixed Income Securities

### *Graduate*

Financial Engineering  
Financial Mathematics  
Statistical Modeling in Finance  
Quantitative Methods in Finance  
Market Analysis  
Market Investigation  
Financial Modeling

## STUDENT ADVISING

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### *Ph.D. Student Advising*

Hyeonung Jang (Mar. 2014 ~ Feb. 2021)  
Jaemin Jung (Mar. 2019 ~ Present)  
Jihyun Kim (Mar. 2020 ~ Present)

### *Thesis Committee Chair*

Hyeonung Jang (Ph.D., Feb. 2021)

### *Thesis Committee Member*

Ji Heok Kwon, Soyeong Jeong (M.S., Aug. 2014), Kyung Duk Park (M.S., Feb. 2015), Hyun-Jo Kim (M.S., Aug. 2017), Moise Busogi (Ph.D., Aug. 2017), Chaehyun Kim (Ph.D., Feb. 2019), Ye Eun Chun (M.S., Aug. 2020), Youngjin Park, Linh Nguyen Thi My (M.S., Feb. 2021), Sunghyun Seo (MOT, Feb. 2021)

### *Professional Master Advising*

Ji-Saeng Noh, Michael Kiejung Chae (PSM, ~ Feb. 2014), YoungKyu Jang (PSM, ~ Aug. 2014), Yoon Song Park, Haeju Lee (PSM, ~ Feb. 2015), Eun Yeong Kim, Seolbin Kim, Won Bae Park, Soonkeun Ahn, Pyeonggang Yi, Yong Jin Juhn, Seonhyeong Cho (PSM, ~ Aug. 2015), Haeyong Jeong (PSM, ~ Feb. 2016), Sang Woo Lee, Hosung Lee, Junyoung Jung, Sung Jin Cheon, Hugo Konrad Victor, Co Noel Bansig (PSM, ~ Aug. 2016), Seunghun Jang (PSM, ~ Feb. 2017), Donggun Lee (PSM, ~ Aug. 2017), Sangwon Chung (PSM, ~ Feb. 2018), Shinjae Park (PSM, ~ Aug. 2018), Dongcheon Lim, Gwiyoung Jin (PSM, ~ Feb. 2019), Kuknam Lee, EuiJin Hwang (PSM, ~ Feb. 2020), Donkoo Jeong (PSM, ~ Aug. 2020), Jeonghae Lee (PSM, ~ Feb. 2021), Unil Kwag, Nachyun Park (PSM, ~ Present)

### *Student Club Advising*

Value Explorer (UNIST Investment Club, 2013 ~ Present)  
Feathering (UNIST Archery Club, 2014~2015)

## PROFESSIONAL ACTIVITY

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### *Journal Refereeing & Conference Discussion*

Journal of Economic Dynamics & Control, Finance Research Letters, Computational Economics, Journal of Derivatives and Quantitative Studies, Investment Analysts Journal, Korean Journal of Futures and Options, Conference of Asia-Pacific Association of Derivatives, Conference of Korea Derivatives Association, Conference of Korean Artificial Intelligence Association

### *Professional Organization Activity*

Organizing Chair, *2020 KAIA Summer Conference*, organized by Korean Artificial Intelligence Association, online, Aug. 2020  
Organizing Chair, *Rotman-UNIST Trading Competition 2017*, organized by UNIST & Rotman School of Management, University of Toronto, Ulsan, Aug. 2017  
Organizing Chair, *UNIST Trading Competition 2016*, organized by UNIST, Ulsan, Nov. 2016  
Organizing Chair, *4<sup>th</sup> International Conference on Energy Commodity Trading & Financial Engineering 2014*, organized by UNIST, Ulsan, Jul. 2014  
Organizing Chair, *3<sup>rd</sup> International Conference on Energy Commodity Trading & Logistics*, organized by UNIST, Ulsan, Jul. 2013

**Invited Talk & Lecture**

- Panel Moderation, Northern Economic Cooperation Strategy in the Post COVID-19 Era, *Seminar on Vitalization of Northern Economic Cooperation*, Ulsan Metropolitan City, Nov. 2020
- Lecture, Blockchain and Manufacturing, *Hyundai Heavy Industries Group Leader Course III*, UNIST, Jun. & Sep. 2018, Apr & Sep 2019, Oct. 2020
- Presentation, *Roundtable on Northeast Asia Oil Hub*, Ministry of Trade, Industry and Energy, Sep. 2020
- Panel Discussion, *How Will the Oil Market Change in the Post COVID-19 Era?* Korea Energy Economics Institute, Jun. 2020
- Discussion, Market Mechanisms of Derivatives Markets, *APAD 2019 Special Symposium*, Korea Derivatives Association, Jul. 2019
- Presentation, Collaboration to Activate Energy Market in Northeast Asia, *Investment Promotion Visit to Moscow of Ulsan Mayor*, Moscow, Jun. 2019
- Panel Moderation, Strategy to Vitalize Northern Economic Cooperation, *Seminar on Vitalization of Northern Economic Cooperation*, Ulsan Metropolitan City, May. 2019
- Presentation, Vision of Ulsan Energy Hub and Cooperation of Northeast Asia, *Special Lecture Series*, 1·2 Society, Nov. 2018
- Discussion, Collaboration to Activate Energy Market in Northeast Asia, Eastern Economic Forum, Vladivostok, Sep. 2018
- Discussion, Diversity of Product Lines and Market Quality in Derivatives Markets, *APAD 2018 Special Symposium*, Korea Derivatives Association, Jul. 2018
- Presentation, Financial Infrastructure Construction Plan to Activate the Northeast Asia Oil Hub, *Policy Seminar on Northeast Asia Oil Hub Activation*, Korea National Oil Corporation, Apr. 2018
- Lecture, Introduction to Derivatives Products, *Lectures on Energy Trading*, Energy & Mineral Resources Development Association of Korea, Mar. & Oct. 2016
- Lecture, Understanding Global Oil Trading, *UPA Lecture Series*, Ulsan Port Authority, Jul 2016
- Lecture, Structure of Oil Trading Markets and Trading Strategy, *Symposium of Ulsan Metropolitan City*, Ulsan Metropolitan City, Jun. 2016
- Lecture, The New Paradigm for Financial Structuring, *HUFS Math Colloquium*, Hankuk University of Foreign Studies, Jun. 2016
- Presentation, Briefing on Northeast Asia Oil Hub, *Campus Visit of President of Korea*, Jul. 2015
- Presentation, Northeast Asia Oil Hub: New Business Opportunity in Ulsan, Korea, *Investment Promotion Visit to New York of Ulsan Mayor*, New York, Jun. 2015
- Lecture, Derivatives Market in Korea, *WISSET Intensive Lecture on Financial Market*, University of Ulsan, Aug. 2013, Aug. 2014
- Presentation, Effect of Collateral for Credit Enhancement on price in OTC Derivatives Market, *Derivatives Finance Forum*, Korea Exchange, Nov. 2013

**Academic Membership**

- Director (General), Korea Derivatives Association, Jan. 2017 ~ Present
- Director (International Relationship), Korean Artificial Intelligence Association, Apr. 2018 ~ Present
- Director (General), Korean Finance Association, Jan. 2020 ~ Dec. 2020
- Editorial Board, Korean Journal of Futures and Options, Mar. 2015 ~ Feb. 2017

**Industrial Consulting**

- Consulting, Trading Mechanism of Swap Market, Kim & Chang Law Firm, Dec. 2020
- Consulting, Cross Currency Swap Trading and Market Structure, Kim & Chang Law Firm, Jan. 2020

**Public Service (Selective)**

- Honorary Ambassador, *Association of Northeast Asia Regional Governments*, Apr. 2020 ~ Present
- Committee Member, *4<sup>th</sup> Industrial Revolution U Forum*, Ulsan ICT Promotion Agency, Jan. 2019 ~ Present
- Committee Member, *Future Vision Committee*, Ulsan Metropolitan City, Dec. 2018 ~ Present
- Committee Member, *Advising Committee for Hedging Oil Price*, Korea National Oil Corporation, May. 2020 ~ Dec. 2020
- Committee Member, *3<sup>rd</sup> Energy Master Plan*, Ministry of Trade, Industry and Energy, Mar. 2018 ~ Dec. 2018
- Committee Member, *KNOC Public Consulting Committee*, Korea National Oil Corporation, Jan. 2018 ~ Jan. 2021
- Committee Member, *Future and Energy Forum*, Ministry of Trade, Industry and Energy, Jan. 2017 ~ Apr. 2017

Committee Member, *Ulsan Creative Economy Council*, Ulsan Metropolitan City, Nov. 2014 ~ Nov. 2016

## **UNIST INTERNAL SERVICE**

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### ***Administrative Position***

Head, Energy Commodity Trading and Financial Engineering Track, Jun. 2013 ~ Aug. 2020  
Head, Management Engineering Track, Feb. 2018 ~ Jul. 2018  
Director, UNIST Blockchain Center, Feb. 2018 ~ Aug. 2019  
Director, Center for International Energy Trading, Mar. 2016 ~ Feb. 2018  
Head, Professional Science Master's Degree Program, Mar. 2013 ~ Feb. 2014, Mar. 2017 ~ Feb. 2018

### ***Committee***

Member, Industry-University Cooperation Steering Committee, Jan. 2021 ~ Present  
Member, Informatization Steering Committee, Feb. 2017 ~ Feb. 2021  
Member, Education Innovation Task Force, Oct. 2020 ~ Present  
Member, Graduate School of Interdisciplinary Management Committee, Mar. 2013 ~ Present  
Member, University Council, Dec. 2016 ~ Jun. 2020  
Member, University Evaluation Committee, Mar. 2018 ~ Jul. 2018  
Member, Industrial Complex Campus Establishment Promotion Task Force, Sep. 2014 ~ Feb. 2019  
Member, UNIST Future Creation Strategy Task Force, Apr. 2013 ~ Feb. 2014