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Education

2014–2019	<i>Ph.D. in Finance</i> (expected)	University of Maryland, College Park
2005–2011	<i>Ph.D. in Physics</i>	University of California, San Diego
2001–2005	<i>B.S. in Physics</i>	University of Science and Technology of China

Work Experience

2012–2014	<i>Research Scientist</i>	IBM T.J. Watson Research Center, Yorktown Heights
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Research Interests

Asset Pricing, Market Microstructure, Behavioral Finance, Risk Management, Machine Learning

Working Papers

“Statistical Arbitrage with Uncertain Fat Tails”

*presented at the U.S. Securities and Exchange Commission (SEC), Doctoral Symposium in August 2018

Abstract: I develop a model of statistical arbitrage trading in an environment with “fat-tailed” information. If risk-neutral arbitrageurs are uncertain about the variance of fat-tail shocks and if they implement max-min robust optimization, they will choose to ignore a wide range of pricing errors. Although model risk hinders their willingness to trade, arbitrageurs can capture the most profitable opportunities because they follow a linear momentum strategy beyond the inaction zone. This is equivalent to a machine-learning algorithm called LASSO. Arbitrageurs can also amass market power due to conservative trading under this strategy. Their uncoordinated exercise of robust control facilitates tacit collusion, protecting their profits from being competed away even if their number goes to infinity. In an extended model where an insider strategically interacts with those arbitrageurs, the insider can induce them to trade too aggressively, giving herself a reversal trading opportunity. Doing so distorts price informativeness and threatens market stability.

“What if the Long Forward Rate is Flat?”

Abstract: I give a simple proof for the long-run pricing kernel decomposition developed by Hansen and Scheinkman (2009). In a stationary Markovian economy, the long forward rate is flat and the pricing kernel can be easily factorized in a multiplicative form of the transitory and permanent components. The permanent (martingale) component plays a key role as it induces the change of probabilities to the long forward measure where the long-maturity discount bond serves as the numeraire. I derive an explicit expression for this martingale component. It reveals a strong restriction on the market prices of risk in a popular approach of interest rates modeling. This approach neglects the permanent martingale component and restricts risk premia in a way undesirable for model calibration. Further analysis demonstrates the advantages of equilibrium modeling of a production economy since it is featured with a path-dependent pricing kernel that has a non-degenerate permanent martingale.

Work in Progress

Tail Risk and Liquidity Withdrawal in Algorithmic Trading (with Albert Pete Kyle)

Heterogeneous Benchmarks and Price Informativeness (with Yajun Wang and Wen Chen)

Sand in the Wheels of Commerce (with Steve Heston)

– Comment on “*Dynamic Duopolistic Competition with Sticky Prices*” Fershtman & Kamien, *Econometrica* (1987)

Presentations

2018 U.S. Securities and Exchange Commission, Doctoral Symposium hosted by the DERA, session on cybersecurity and machine learning, “*Fat Tails, Robust Control, and Algorithmic Trading*”

2018 University of Maryland, Brownbag Seminar, “*Tail Risk, Phantom Liquidity, and Algo Trading*”

2016 University of Maryland, Brownbag Seminar, “*Value of Private Signals in Financial Markets*”

2015 University of Maryland, Brownbag Seminar, “*What if the Long Forward Rate is Flat?*”

Professional Services

Referee for *Review of Derivatives Research*, *Proceedings of the National Academy of Sciences* (PNAS)

Teaching Experience

2016 Instructor Rating: 3.9/4.0 International Finance (UG)

2015 Instructor International Corporate Finance (UG)

2017 Assistant Financial Management (MBA), Fixed Income Analysis (MBA, MS)

2016 Assistant Derivative Securities (MS), International Investments (MBA, MS)

2015 Assistant Institutional Asset Management (MBA, MS)

References

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Publications in Physics

1. "Behaviors and strategies of bacterial navigation in chemical and nonchemical gradients"
Bo Hu and Yuhai Tu, *PLoS Computational Biology*, 10 (6), e1003672 (2014)
2. "How input noise limits biochemical sensing in ultrasensitive systems"
Bo Hu, Wouter-Jan Rappel, and Herbert Levine, *Physical Review E*, 90, 032702 (2014)
3. "Precision sensing by two opposing gradient sensors: how does *E. coli* find its preferred pH level?"
Bo Hu and Yuhai Tu, *Biophysical Journal*, 105, 276-285 (2013)
4. "Coordinated switching of bacterial flagger motors: evidence for direct motor-motor coupling?"
Bo Hu and Yuhai Tu, *Physical Review Letters*, 110, 158703 (2013)
5. "How input fluctuations reshape the dynamics of a biological switching system?"
Bo Hu, David A. Kessler, Wouter-Jan Rappel, and Herbert Levine, *Physical Review E*, 86, 061910 (2012).
6. "Survival of the fittest or the flattest?" (Invited Commentary)
Bo Hu, *Physics of Life Reviews*, 9, 266 (2012).
7. "The effects of input noise on a simple biochemical switch"
Bo Hu, David A. Kessler, Wouter-Jan Rappel, Herbert Levine, *Physical Review Letters*, 107, 148101 (2011)
8. "How geometry and internal bias affect the accuracy of eukaryotic gradient sensing"
Bo Hu, Wen Chen, Wouter-Jan Rappel, and Herbert Levine, *Physical Review E*, 83, 021917 (2011)
9. "Quantifying information transmission in eukaryotic gradient sensing and chemotactic response"
Bo Hu, Wen Chen, Wouter-Jan Rappel, Herbert Levine, *Journal of Statistical Physics*, 142, 1167 (2011)
10. "Design principles and specificity in biological networks with cross-activation"
Bo Hu, Herbert Levine, and Wouter-Jan Rappel, *Physical Biology*, 8, 026001 (2011)
11. "Physical limits on cellular sensing of spatial gradients"
Bo Hu, Wen Chen, Wouter-Jan Rappel, and Herbert Levine, *Physical Review Letters*, 105, 0481041 (2010)
12. "Phenomenological approach to eukaryotic chemotactic efficiency"
Bo Hu, Danny Fuller, W. F. Loomis, Herbert Levine, Wouter-Jan Rappel, *Physical Review E*, 81 (2010)
13. "Mechanisms and constraints on yeast MAPK signaling specificity"
Bo Hu, Wouter-Jan Rappel, and Herbert Levine, *Biophysical Journal*, 96, 4755 (2009)
14. "Efficient routing on complex networks"
Gang Yan, Tao Zhou, Bo Hu, Zhong-Qian Fu, Bing-Hong Wang, *Physical Review E*, 73, 046108 (2006)
15. "Mutual attraction model for both assortative and disassortative weighted networks"
Wen-Xu Wang, Bo Hu, Bing-Hong Wang, and Gang Yan, *Physical Review E*, 73, 016133 (2006)
16. "Mutual selection model for weighted networks"
Wen-Xu Wang, Bo Hu, Tao Zhou, Bing-Hong Wang, Yan-Bo Xie, *Physical Review E*, 72, 046140 (2005)
17. "General dynamics of topology and traffic on weighted technological networks"
Wen-Xu Wang, Bing-Hong Wang, Bo Hu, Gang Yan, Qing Ou, *Physical Review Letters*, 94, 188702 (2005)
18. "Power-law distribution of wealth in population based on a modified Equiluz-Zimmermann model"
Yan-Bo Xie, Bing-Hong Wang, Bo Hu, and Tao Zhou, *Physical Review E*, 71, 046135 (2005)