PhD Project **2025FIN1**: Household Finance

Advisors **Dr. Thomas Post , and Prof Dr Dirk Brounen .**

Project This PhD project is focused on enhancing the understanding of financial decision making. There is an increasing interest in the literature on how investors, households, and consumers make financial decisions on saving for retirement, investments, mortgages, and inheritance. Individuals often do not behave according to classical rationality assumptions but have a variety of behavioral and psychological motivations for their actions. For example, retail investors tend to trade too much and under-diversify, driven by motives related to entertainment, familiarity, speculation, and hobby, while consumers use mental accounting to try and save for retirement or their children's' college education while paying their day-to-day bills.

As such, the proposed PhD project will fall under the heading of 'household finance', 'behavioral finance', or 'consumer financial decision-making.' Knowing what underlies and drives individuals' financial decision-making is important, as there is an increasing self-responsibility for building up and managing retirement wealth in recent years. After years of strict government control over household financials regarding pensions, mortgage structures, and insurances by setting strict standards, we now enter a new era in which a lot of these default settings are gradually replaced by a set of choices. Households are expected to take charge of the long-term planning of their financial wealth and health, assuming these households possess both the financial awareness and literacy to cope with these decisions in a prudent manner.

Hence, there is a clear societal relevance to understand individuals' financial awareness, how they make their financial decisions, whether they act in their best (financial) interest, and how their decisions shape their subjective financial well-being. Eventually, this understanding forms the basis for designing and testing policy interventions (e.g. nudges) that help to make "better" choices.

Research environment

The candidate will – through Maastricht University's School of Business and Economics as well as the supervisors' network be ideally positioned to perform world-class research with high societal relevance and impact. The Finance Department has a strong group of researchers in household and behavioral finance as have other departments with which we collaborate (e.g., Economics, Marketing). The School of Business and Economics hosts the BEELAB allowing to run experimental research. Moreover, the supervision team is connected to Netspar – a large pension think tank and knowledge network as well the Dutch financial industry. That is, there is access to a large academic research network as well as the opportunity to run field surveys and experiments.

Candidate The candidate is expected to have affinity with and knowledge of such topics as behavioral economics & finance or psychology and should have a demonstrated ability to perform research in this field, as evidence by excellent grades for courses in at least some of these respective fields. Excellent grades mean a GPA of 8 or above on a scale of 1-10 (if applying from an educational system with a different grading system, please provide a translation of these grades to a 1-10 scale). The candidate should be open to various research methods, that is to work with, for example, publicly available household survey data, proprietary administrative data, administer surveys or run lab and field experiments.

Literature:

- Campbell, John Y. 2006. Household Finance, The Journal of Finance, 61(4), 1553-1604.
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- Lusardi, A. and O.S. Mitchell. 2023. The Importance of Financial Literacy: Opening a New Field. Journal of Economic Perspectives 37(4), 137-154.

PhD Project **2025FIN2**: Indoor Air Quality, Health, and Productivity

Advisors **Prof. dr., Nils Kok, Dr.Juan Palacios, and Prof. dr. Piet Eichholtz** .

Project Given that people spend over 90 percent of their time in buildings, it seems intuitive that indoor climate affects human performance – e.g. productivity, human capital accumulation, and health. But interestingly, that hypothesis has hardly been exposed to rigorous empirical testing in the field. The current evidence relies on smaller laboratory experiments and survey data. To establish the robustness and scalable applicability of these findings, it's crucial to conduct thorough, large-scale field studies, where exposure and incentives are real.

This PhD project aims to uncover the impact of indoor air quality on human health and performance in various building types, including schools, homes, offices, and retail spaces, both in the short and long term. It forms an integral part of a broader ongoing research initiative at Maastricht University, where the current studies revolve around aspects such as indoor air quality (CO2 levels, fine particles, humidity, etc.), temperature, lighting (both natural and artificial), noise levels, and visual aspects (like views of parks, skies, cars, or concrete) within the context of schools and offices. Building upon this existing work, the PhD project will expand the research scope to analyze human performance and indoor climate in multiple real-life settings across the Netherlands, Germany, and other locations. This research will be carried out a combination of field experiments and existing administrative datasets.

Candidate We are looking for a PhD student with a background in economics or econometrics, with a recognizable interest in real estate, health, education, or labor markets. Of course, you have the analytical skills to create and study (very) large datasets, and ideally some experience in setting up large-scale field experiments. This position is embedded in the broader Finance Department at Maastricht University, and within that Department, in the Maastricht Center for Real Estate, which consists of 7 PhD students, 2 Post-Docs and 3 Faculty members.

Literature:

- Eichholtz, P., Kok, N. & Quigley, J.M. (2010). "Doing well by doing good? Green office buildings." American Economic Review, 100.5, 2492-2509.
- Eichholtz, P., Kok, N., & Quigley, J. M. (2013). "The Economics of Green Building." Review of Economics and Statistics, 95(1), 50-63.
- Künn, S., Palacios, J., & Pestel, N. (2023). "Indoor air quality and strategic decision making." Management Science, 69(9), 5354-5377.
- Künn, S., & Palacios, J. (2024). "Health Implications of Housing Retrofits: Evidence from a Population-Wide Weatherization Program. "Journal of Health Economics (forthcoming)
- Palacios, J., Eichholtz, P., Kok, N., & Duran, N. (2022). "Indoor Air Quality and Learning: Evidence from a Large Field Study in Primary Schools." MIT Center for Real Estate Research Paper, (22/13).
- Palacios, J., Eichholtz, P., Kok, N., & Aydin, E. (2021). "The Impact of Housing Conditions on Health Outcomes." Real Estate Economics, 49(4), 1172-1200.
- Palacios, J., Eichholtz, P. and Kok N. (2020). "Moving to Productivity: The Benefits of Healthy Buildings." PloS one, 15.8, e0236029.

PhD Project **2025FIN3**: Energy Efficiency, Household Finance, and Housing

Advisors **Prof. dr., Nils Kok and Prof Dr Dirk Brounen** .

Introduction Prof. dr. Nils Kok and prof. dr. Dirk Brounen are setting up a PhD project that studies "Energy Efficiency, Household Finance, and Housing". In this project, you will make extensive use of a unique micro dataset which blends details on various subsidies for homeowners (insulation, solar panels, heat pumps etc.) with the microdata of CBS on housing and household demographics. These data offer the opportunity to understand how previous subsidy designs have performed in practice. Knowledge that can help optimize future incentive schemes.

The PhD project will start in 2025, with the exact date depending on the availability of an outstanding candidate, but not later than September 1, 2025. The planned PhD thesis will consist of at least four research projects, each delivering a corresponding working paper, a peer- reviewed academic paper and a policy brief (e.g. ESB publication) discussing implications of the research for supervision and regulation. We also see a lot of potential for societal outreach in the media through the platform of the Maastricht Center for Real Estate.

Project 1 The first project will analyze the issue of subsidy sorting. Typical energy efficiency subsidies are generic, open to everyone. At the same time, some of these subsidies require quite some administrative effort during the application phase. The result is that past subsidies have been benefitting an nonrandom selection of households – not as the result of clever targeting, but rather as the result of certain types of household sorting into subsidies. Hence, in this first study we aim to analyze the data on several of energy efficiency subsidies during the past decade. Data that will tell us who applied, who pulled out, and who got served at the end. By linking this information to the CBS household microdata, we can add significant insights on the relevant factors that distinguish subsidy applying households from the non-appliers. We can also find out why some household get stranded during the application process, and which elements of the subsidy process are responsible for this. The results of this paper will help the government to tailor future subsidy designs to specific target audiences, and enhance the configuration of the subsidy process to ensure that these monetary incentives can be assigned as effective as possible.

Project 2 The second project will study energy efficiency subsidies and their eventual welfare outcomes. Here, we set up a broad ex-post empirical evaluation of energy reduction and health outcomes following (subsidized) investments in energy efficiency. While the first paper explains the outreach of subsidies, this second paper focuses on the impact of subsidies. The RVO subsidy dataset allows us to identify which households have invested in the energy efficiency of their home, including subsidy applicants that were rejected for subsidies. By tracking the relevant CBS microdata on energy consumption and health statistics, we can monitor and compare the material effects of these investments. The results of this paper will help to enhance the future cost-benefit tradeoff tooling for households, by including more factual outcomes on ex-post effects. A large fraction of households is still reluctant to invest in their home because they are poorly informed about benefits, or doubt the reliability of the projected effects. Validated results from this paper can bridge that gap, and provide and assure households of what to expect in return.

Project 3 The third project studies intrahousehold spillover effects of energy efficiency subsidies. By studying the detailed information on RVO subsidies applicants, we can learn about the sequence, preferences, and timing of energy efficiency measures within households. Insights in these matters can help to enhance the future impact of energy efficiency policy design by capitalizing on the observed spill-over effects. Once we know what the typical first steps of these energy efficiency improvements looks like, we can use this knowledge to time and trigger subsequent investments with targeted subsidy design. By evaluating package deals, specific subsidy horizons, and subsidy shocks, we can learn more about how to speed up household decision making regarding energy efficiency measures.

Project 4 A fourth paper concludes the PhD project by assessing the external spillover effects of energy efficiency subsidies. Over the years, we have observed geographical clustering of effects when tracking energy efficiency improvements in the housing market. For instance, the installation of solar panels of one house tends to affect the likelihood of solar adoption rates for surrounding households. This peer effect is often attributed to peer learning. Latent energy efficiency plans can be stimulated by observing the realization of similar plans in your vicinity. The RVO subsidy data can help us to verify the size of these external spill-over effects. In this fourth paper, we will quantify the cluster effects of energy efficiency investments, and establish whether subsidized investments within one household triggers non-subsidized investments in related households. By combining the results of paper 3 and 4, we can better assess the full impact of energy efficiency stimuli.

Candidate We are looking for a PhD student with a background in economics or econometrics, with a recognizable interest in environmental economics and housing markets. Of course, you have the analytical skills to create and study (very) large datasets, and ideally some experience in setting up large-scale field experiments. This position is embedded in the Finance Department at Maastricht University, and within that Department, in the Maastricht Center for Real Estate, which consists of 7 PhD students, 1 Postdoc, and 4 Faculty members.

Literature:

- 'Converting the Converted: Subsidies and Solar Adoption,' 2024, Erdal Aydin, Dirk Brounen, Linde Kattenberg and Nils Kok.
- 'The Efficacy of Energy Efficiency: Measuring the Returns to Home Insulation,' 2023, Piet Eichholtz, Linde Kattenberg and Nils Kok.
- 'The Capitalization of Energy Efficiency: Evidence from the Housing Market,' 2020, Journal of Urban Economics, Erdal Aydin, Dirk Brounen and Nils Kok.
- 'The Impact of Housing Conditions on Health Outcomes,' 2020, Real Estate Economics, Erdal Aydin, Piet Eichholtz, Nils Kok and Juan Palacios.
- 'Information Provision and Energy Consumption: Evidence from a Field Experiment,' 2018, Energy Economics, 71, Erdal Aydin, Dirk Brounen and Nils Kok.
- 'Energy Efficiency and Household Behavior: The Rebound Effect in the Residential Sector,' 2017, RAND Journal of Economics, 48 (3), Erdal Aydin, Dirk Brounen and Nils Kok
- 'The Capitalization of Green Labels in the California Housing Market,' 2014, Regional Science and Urban Economics, Matthew E. Kahn and Nils Kok.
- 'Energy Literacy, Awareness, and Conservation Behavior of Residential Households,' 2013, Energy Economics, 38 (July), Dirk Brounen, Nils Kok and John Quigley.
- 'Residential Energy Use and Conservation: Economics and Demographics,' 2012, European Economic Review, 56(5), with Dirk Brounen, Nils Kok and John Quigley.
- 'On the Economics of Energy Labels in the Housing Market,' 2011, Journal of Environmental Economics and Management, 62(2), Dirk Brounen and Nils Kok.

PhD Project **2025FIN4**: Institutional Investment, Sustainability, and Real Estate

Advisors **Prof. dr., Nils Kok**, **Dr.Juan Palacios**, **and Prof. dr. Piet Eichholtz** .

Project The goal of this PhD project is to advance our understanding about how institutional investments impact the sustainable performance of real estate assets. In particular, the project will analyze the role of institutional investors in shaping the sustainable and financial performance of properties.

The primary focus of this PhD research is on sustainable impact investments, with the objective of shedding light on previously unexplored dimensions of institutional investor preferences in promoting sustainability. This research aims to address key questions at the intersection of economics, finance, and environmental science, exploring how investors can drive meaningful sustainability outcomes while achieving their financial objectives.

This interdisciplinary line of work includes developing methodologies to evaluate the timing, scale, and effectiveness of sustainability-driven investment strategies. For example, projects may investigate how institutional investors approach sustainable engagement in real asset investments, leveraging insights such as those presented in the study Timing Sustainable Engagement in Real Asset Investments. The research will explore strategies for aligning investment decisions with environmental objectives, assessing the risks and opportunities posed by climate change, and examining the broader societal and financial impacts of sustainable investments.

The successful candidate will engage in both applied research, employing quantitative and qualitative methods to analyze data, and design experiments and surveys. The PhD candidate will have the opportunity to contribute to a deeper understanding of how institutional investors can influence sustainability outcomes, providing actionable insights that inform policy and investment practices.The role olers the chance to collaborate with leading experts in the field, work on high- impact projects, and contribute to cutting-edge advancements in sustainable finance.

Candidate We are looking for a PhD student with a background in finance, economics or econometrics, with a recognizable interest in sustainability. Of course, you have the analytical skills to create and study (very) large datasets, and ideally some experience in setting up large-scale field experiments. This position is embedded in the Finance Department at Maastricht University, and within that Department, in the Maastricht Center for Real Estate, which consists of 7 PhD students, 1 Postdoc, and 4 Faculty members.

Literature:

- Eichholtz, P., Holtermans, R., & Kok, N. (2019). “Environmental Performance of Commercial Real Estate: New Insights into Energy Efficiency Improvements.” Journal of Portfolio Management.
- Eichholtz, P., Kok, N. & Quigley, J.M. (2010). "Doing well by doing good? Green office buildings." American Economic Review, 100.5, 2492-2509.
- Eichholtz, P., Kok, N., & Quigley, J. M. (2013). “The Economics of Green Building.” Review of Economics and Statistics, 95(1), 50-63.
- Eichholtz, P., Kok, N. & Yonder, E. (2012). “Portfolio Greenness and the Financial Performance of REITs.” Journal of International Money and Finance, 31(7).
- Eichholtz, P., Holtermans, R., Kok, N. & Yonder, E. (2019) ‘Environmental Performance and the Cost of Debt: Evidence from Commercial Mortgages and REIT Bonds,’ 2019, Journal of Banking and Finance, 102.
- Van der Kroft, B., Palacios, J., Rigobon, R. & Zheng S. (2024). “Timing Sustainable Engagement in Real Asset Investments.” NBER Working Paper 32646.
- Palacios, J., Eichholtz, P., Kok, N., & Aydin, E. (2021). “The Impact of Housing Conditions on Health Outcomes.” Real Estate Economics, 49(4), 1172-1200.
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PhD Project **2025FIN5**: The Impact of Quantitative Easing and Tightening on the Cross-Section of Stock Prices

Advisors **Prof. Dr. Dennis Bams and Dr. Iman Honarvar** .

Project The global financial landscape has been significantly influenced by the monetary policies of central banks, particularly through Quantitative Easing (QE) and Quantitative Tightening (QT). As the US faces a ballooning debt-to-GDP ratio, the sustainability of this debt is increasingly questioned. This project aims to explore how monetary tightening, potentially coupled with fiscal tightening, will affect the cross-section of stock returns, with a focus on sectoral impacts and international financial markets.

Several studies have examined the effects of QE and QT on various asset classes. For instance, Krishnamurthy and Vissing-Jorgensen (2011) examines the effect of the Federal Reserve's bond purchase on interest rates and bond yields. Another notable study, by D'Amico and Seida (2014) analyses the evolution of the effects of QE and QT on asset prices, focusing on their unexpected components. Breedon, Chadha, and Waters (2012) measures the impact of the UK's initial QE programme on bonds and a range of asset prices, finding significant effects on government bond yields. Finally Škare and Sinković (2021) provides insights into the relationship between quantitative easing (and) the US stock market growth.

This research aims to investigate the implications of monetary policies, specifically QE and QT, and potentially fiscal policies on the cross-section of stock returns. The key questions include: How will monetary tightening, potentially coupled with fiscal tightening, affect the cross-section of stock returns? Which sectors and types of stocks will be most negatively affected by these policies? What will be the impact on international financial markets, particularly emerging markets? Additionally, the research will explore which types of stocks, such as value vs. growth or small vs. large-cap stocks, thrive during such periods.

The research will employ a combination of econometric models and time-series analysis to study the effects of QE and QT on stock prices. Key variables will include stock returns across different sectors, macroeconomic indicators such as inflation, interest rates, and GDP growth, and international financial market data, focusing on emerging markets. This research will provide insights into the sectoral impacts of monetary tightening and its broader implications for international financial markets. It will also contribute to the understanding of how fiscal and monetary policies interact to influence stock prices.

Candidate The candidate is expected to have affinity with and knowledge of such topics as finance, economics, statistics, and econometrics and should have a demonstrated ability to perform research in this field, as evidenced by excellent grades for courses in at least some of these respective fields. Excellent grades mean a GPA of 8 or above on a scale of 1-10 (if applying from an educational system with a different grading system, please provide a translation of these grades to a 1-10 scale).

Literature:

- Krishnamurthy, A., & Vissing-Jorgensen, A. (2011). The effects of quantitative easing on interest rates: channels and implications for policy (No. w17555). National Bureau of Economic Research.
- D'Amico, S., & Seida, T. (2014). Unexpected Supply Effects of Quantitative Easing and Tightening. Journal of Financial Economics.
- Breedon, F., Chadha, J. S., & Waters, A. (2012). The financial market impact of UK quantitative easing. Oxford Review of Economic Policy, 28(4), 702-728.
- Škare, M., & Sinković, D. (2021). Quantitative Easing, Stock Exchange, Inflation and Monetary Paradigm in the US: Lessons for Emerging Economies. Macroeconomic Responses to the COVID-19 Pandemic: Policies from Southeast Europe, 157-186.

PhD Project **2025FIN6**: Sustainable Investment and Consumption

Advisors **Dr. Peiran Jiao and Prof. Dr. Peter Werner** .

Project With the increasing concern about sustainability, two parallel trends have been co-existing. On the one hand, assets under management (AUM) in socially responsible investments (SRI) have experienced remarkable growth over the last decade. Around one-third of the total AUM in the U.S. account for sustainability in one way or another. To put this into perspective, in 2020, the total sustainable AUM by professional investment managers in the U.S. surpassed that of Europe, reaching 17.1 trillion U.S. dollars, compared to 3.07 trillion U.S. dollars in 2010, as reported by US SIF. The EU has 12 trillion U.S. dollars in sustainable AUM in 2021, as reported by EUROSIF. On the other hand, green consumption has risen in developing economies as well as industrialized nations (Kumar and Yadav, 2021). Green consumers typically have a preference for products that improve environmental or social outcomes, and are willing to pay higher prices for these goods. The aim of this project is to address the following questions. Do people engage in green investment and green consumption at the same time? Is it an optimal strategy to do both? Are these two parallel trends compatible in the sense that they both lead to a higher level of sustainability? What factors are driving the trends towards more sustainable consumption and investment? And accordingly, how can we design policies to further promote sustainable behavior?

These trends might suggest that people have genuine concerns about sustainability and are willing to sacrifice personal interests for the sake of improving environmental or social wellbeing. For instance, studies have documented sustainable investment behavior can potentially be explained by investors' social preferences, and investors are even willing to forgo financial performance in pursuit of sustainability goals (e.g. Riedl and Smeets, 2017; Gutsche and Ziegler, 2019; Bauer et al., 2021; Heeb et al., 2023). However, other papers suggest that investors are not completely aware of the financial consequences or expect better financial performances from sustainable strategies (Bauer et al., 2021; Bauer et al., 2024).

However, preferences for sustainable consumption and preferences for sustainable investment might not be completely compatible for fully rational agents. A general equilibrium theoretical model developed by Sauzet and Zerbib (2022) demonstrates that socially responsible consumers drive up the demand and price of green goods, but at the same time, green preferences in the financial market also lead to a premium on brown assets. Therefore, in order to hedge against the risk of higher prices of green goods, consumers should invest more in brown assets.

In this project, we plan to study sustainable consumption and investment together. We will adopt experimental and survey methodologies. Our aim is to test whether people are aware of the general equilibrium effect of their green consumption on asset pricing, and whether they take this into account when making an investment portfolio. It is possible that they are not aware, or that they are aware but their sustainability preference is so strong that they are willing to take the additional risk when doing both sustainable consumption and investment. In other words, their sustainability preferences might be consistent between consumption and investment, or individuals may see the two as substitutes. Our results will have important practical and policy implications.

Candidate This project is for a diligent and ambitious student. We need our candidate to be proactive and cooperative, and to have knowledge of economics and/or finance, and especially those related to behavioral economics and finance, sustainable finance, socially responsible investment and consumption and to have a strong interest in the topic. Experience in experimental design and execution is highly beneficial.

Although we do not require knowledge of a specific programming language for this project, we expect our candidate to have strong programming and analytical skills, and experience with programming for statistical analyses and experimental interfaces.

The candidate is expected to also teach during the PhD. The teaching can be done within the Department of Finance, on courses that fit the candidate's background. It might also be possible to arrange some teaching in the Department of Microeconomics and Public Economics.

Literature:

- Bauer, R., Dong, B., & Jiao, P. (2024). Sustainability Preferences: The Role of Beliefs. Available at SSRN 4889330.
- Bauer, R., Ruof, T., & Smeets, P. (2021). Get real! Individuals prefer more sustainable investments. The Review of Financial Studies, 34(8), 3976-4043.
- Heeb, F., Kölbel, J. F., Paetzold, F., & Zeisberger, S. (2023). Do investors care about impact?. The Review of Financial Studies, 36(5), 1737-1787.
- Gutsche, G., & Ziegler, A. (2019). Which private investors are willing to pay for sustainable investments? Empirical evidence from stated choice experiments. Journal of Banking & Finance, 102, 193-214.
- Kumar, S., & Yadav, R. (2021). The impact of shopping motivation on sustainable consumption: A study in the context of green apparel.Journal of Cleaner Production, 295, 126239.
- Riedl, A., & Smeets, P. (2017). Why do investors hold socially responsible mutual funds?. The Journal of Finance, 72(6), 2505-2550.
- Sauzet, M., & Zerbib, O. D. (2022). When green investors are green consumers. In Proceedings of the EUROFIDAI-ESSEC Paris December Finance Meeting.

PhD Project **2025FIN7**: Personalised Pension Plans

Advisors **Prof. dr. Rob Bauer, and Dr. Marlene Koch,** .

Pension systems around the world are moving from defined benefit towards defined contribution (DC) schemes. In a DC system, fewer risks are shared among all pension fund participants, while more risks are borne individually. Personal characteristics such as preferences, income and (housing) wealth, in addition to age, thus become more important, implying the need for a more personalised optimal design.

Our research contributes to the design problem. We analyse the trade-off between fully personalised portfolios and a limited number of structured products. Fully personalised plans may not be cost effective, whereas a fully standardised product may induce welfare costs for various groups of individuals. In assessing the costs of sub-optimal decisions, the benchmark is the optimal individual plan. Deriving optimal dynamic strategies is, however, computationally difficult in realistic settings. Using advances in machine learning to approximate unknown functions we work on extending the class of models that can be solved with Monte Carlo simulations. This enables the analysis of a richer set of portfolios with personal incomes that are correlated with financial returns. Mixing scenarios from multiple models allows for optimised policies that account for model uncertainty.

The results contribute to ongoing discussions on the implementation of pension policies, involving mass customization of portfolio plans at low costs based on personal data.

Keywords Pensions, Portfolio management, Heterogeneity, Machine learning, Monte Carlo simulations, Optimisation

Literature:

- Diris, B., F. Palm and P. Schotman (2015), Long-term strategic asset allocation: an out-of-sample evaluation, Management Science 61, 2185-2202
- Hoevenaars, R., R. Molenaar, P. Schotman and T. Steenkamp (2014) Strategic asset allocation for long-term investors: parameter uncertainty and prior information, Journal of Applied Econometrics 29, 353-376
- Lutgens, F., and P. Schotman (2010) Robust portfolio optimization with multiple experts, Review of Finance 14, 343-383
- Shen, S., A. Pelsser and P. Schotman (2019) Robust hedging in incomplete markets, Journal of Pension Economics and Finance 18, 473-493
- Branger, N., P. Rodrigues and C. Schlag (2018) Level and slope of volatility smiles in long-run risk models, Journal of Economic Dynamics and Control 86, 96-122

Candidate Highly motivated student with good English communication skills and proactive and resolute attitude. Background (at the level of M.Sc.) in either finance, economics, econometrics, applied mathematics, or computer science. Excellent programming skills. Basic knowledge in machine learning. Interest in applications in finance.