

**Title: A risk management approach toward the assessment of sustainable sovereign debt levels****Supervisor: Dennis Bams** ([w.bams@maastrichtuniversity.nl](mailto:w.bams@maastrichtuniversity.nl) )

**Short text:** Subsequent to the Global Financial Crisis, many countries have seen their government debt levels increase substantially. From an economic stability perspective it is relevant to assess the sustainability of elevated debt levels. Large holders of sovereign bond portfolios such as pension funds are critically dependent on a proper risk assessment of sovereign bond risk.

IMF and the European Stability Board have developed a risk measuring system, in which specific indicators should remain within specific limits. In an ESM working paper by Gabriele et al, (ESM, 2017) entitled "Debt Stocks Meet Gross Financing Needs: A Flow Perspective into Sustainability", the authors pursue a statistical approach to define relevant explanatory variables for debt (un)sustainability.

The topic of this thesis proposal is to develop an economic foundation to support the assessment of sovereign debt sustainability. In particular, the Merton model uses the concept of a distance-to-default model in the context of company credit risk, making use of balance sheet information. This thesis topic seeks to adopt a Merton model a-like application for countries. In the empirical part of the thesis the model is to be empirically tested for a country of your choice.

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**Title: Bank performance indicators****Supervisor: Dirk Broeders** ([d.broeders@maastrichtuniversity.nl](mailto:d.broeders@maastrichtuniversity.nl))

**Short text:** A key indicator for bank performance is Return on Equity. This measure however is flawed as it is highly influenced by a bank's leverage and does not correct for the risk profile of a bank. A focus on RoE creates the wrong incentives for a bank's top executives and provided inadequate information to shareholders. In this study you will assess alternative bank performance indicators such as RORAC, RAROC, RORWA, etc. You can choose for a sample of EU or US banks. How did these indicators evolve over time, during periods of crisis? You can also look into possible relations between these risk adjusted indicators and for instance the stock performance of banks.

References: Admati et al. (2013) Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Socially Expensive, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2349739](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2349739)

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**Title: Household risk management****Supervisor: Dennis Bams** ([w.bams@maastrichtuniversity.nl](mailto:w.bams@maastrichtuniversity.nl) )

**Short text:** Households are in different phases of their life exposed to different risk drivers with in potential major financial consequences. You may think for example of the impact of divorce, unemployment, death and disability on mortgage requirements as well as on adequate saving for the retirement period. Households may act in a suboptimal manner regarding important consumption decisions as well as with regards to financial planning decisions.

The aim of this thesis proposal is to apply a risk management framework such as the COSO framework to develop for households. Subsequently, the thesis should include a relevant simulation study for different type of households in different economic circumstances. In particular the simulation should put forward ways in which risk drivers lead to potential undesirable outcomes and suggest what tools households have at their disposal to manage these risks.

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**Title: The effect of ESG on commodity risk (sustainable finance)****Supervisor: Bram van der Kroft** ([b.vanderkroft@maastrichtuniversity.nl](mailto:b.vanderkroft@maastrichtuniversity.nl))

**Short text:** This thesis track considers the impact of ESG information the resource consumption of companies. In this track you will consider the impact of ESG on the natural resource consumption of firms and subsequently analyse how this differs for different ESG motives (I will send you my paper on this). You will most likely use an event study to identify shocks in commodity prices or create a fama-french sensitivity model given the industry of the firm. This thesis topic will be somewhat quantitative of nature and truly novel, as I do not know any research that directly relates on this topic (please note that I will be writing an academic article on this myself in the near future). You will need to be able to work with data and perform regression analysis. You might also consider to look at the relation of risk benchmarks to ESG information.

For some further reading, consider reading up about the relations of ESG to financial returns (Flammer, 2013), the investor preference towards carbon emissions (which can be linked to oil prices or electricity prices) (Krueger et al., 2020) and especially the resource-based view of the firm (Wernerfelt, 1984; Hart, 1995)

**References:**

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, 5(2), 171-180. Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of management review*, 20(4), 986-1014. Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3), 758-781. Krueger, P., Sautner, Z., & Starks, L. T. (2020). The importance of climate risks for institutional investors. *The Review of Financial Studies*, 33(3), 1067-1111.

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**Title: Can tail risk and systemic risk of financial institutions be jointly reduced?****Supervisor: Stefan Straetmans** ([s.straetmans@maastrichtuniversity.nl](mailto:s.straetmans@maastrichtuniversity.nl))

**Short text:** Systemic risk is at the forefront of regulatory and policy discussions since the banking and financial crisis of 2007-2009. Post-crisis financial regulatory reform also claims to tackle systemic risk by e.g. targeting so-called "SIFI's" (Systemically Important Financial Institutions) by imposing additional capital surcharges. The purpose is to disincentivize financial institutions to being systemically important. Recent research, however, questions whether it is possible to both regulate tail risk of financial institutions and their systemic contribution, see e.g. Beale et al. (2011). More specifically, by diversifying their risks, financial institutions reduce their own probability of failure. However, if many banks decrease their risks in comparable fashion, then the likelihood of multiple failures (systemic risk) may increase. Whereas the Beale et al. (2001) paper mainly provides a theoretical analysis of this apparent trade off (and resulting policy dilemma), the aim of the current research project is to provide more empirical evidence by calculating different proxies of tail risk and systemic risk over time and for many different institutions and by investigating their correlation. Is there indeed a negative correlation visible between popular measures of tail risk and systemic risk over time and across institutions?

**References:**

- Beale, N, Rand, D.G., Battey, H., Croxson, K, May, R.M., Nowak, M.A., 2011. Individual vs. Systemic risk and the Regulator Dilemma. *Proceedings of the National Academy of Sciences of the United States (PNAS)* 108 (31), 12647-12652.
  - De Jonghe, O., 2010. Back to the basics in banking? A Micro-analysis of Banking System Stability. *Journal of Financial Intermediation*, 19, 387-417.
  - Idier, J., Lame, G., Mésonnier, JS. 2014. How useful is the Marginal Expected Shortfall for the Measurement of Systemic Exposure? A practical assessment. *Journal of Banking and Finance* 47, 134-146.
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**Title: Finite endpoint distributions in economics and finance****Supervisor: Stefan Straetmans** ([s.straetmans@maastrichtuniversity.nl](mailto:s.straetmans@maastrichtuniversity.nl))

**Short text:** The boundedness of economic or financial variables is often open to discussion: is there a lower or upper bound and if so does it increase or decrease over time? For example, since the 1960s and the birth of the 'eco-movement' (even long before the discussions on the climate crisis even started), economists started to question the limits to (long run) growth and productivity given the limited resources of the earth. Are there boundaries to industrial output and productivity (probably yes) but (more importantly), how did these bounds change over time? Another example where boundedness plays a role is efficiency measurement (governmental institutions, banking sector etc). Do these institutions produce their goods and services at the lowest possible costs or are there 'inefficiencies' in the system? The estimation of finite endpoints provides an alternative methodology to measuring these inefficiencies within an institutional context. Yet another application could be in the domain of climate data: do temperature and weather distributions have finite endpoints and if so, does it shift rightward? Establishing this statistically may provide further empirical evidence for climate change.

**References:**

- Jesson J. Einmahl, John H. J. Einmahl & Laurens de Haan (2019) Limits to Human Life Span Through Extreme Value Theory, *Journal of the American Statistical Association*, 114:527, 1075-1080, DOI: 10.1080/01621459.2018.1537912
  - Daouia, A., Florens, JP, Simar, L. (2010). Frontier estimation and extreme value theory. *Bernoulli*. 16(4), 1039-1063, DOI: 10.3150/10-BEJ256
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**Title: Discrimination in lending: taste-based versus statistical discrimination****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** When banks make lending decisions, are they pricing risk ... or basing their decisions on a biased, discriminatory view? And ... how can we distinguish between the two? In this project, you look at discrimination in lending decisions. This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Ferguson, M. F. and S. R. Peters (1995). What constitutes evidence of discrimination in lending? *The Journal of Finance* 50(2), 739-748.
- Shaffer, S. (1996). Evidence of discrimination in lending: An extension. *The Journal of Finance* 51(4), 1551-1554.
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**Title: Discrimination in lending: an Algorithmic approach****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** Fintech has changed the way we make lending decisions. But ... has it lowered discrimination in lending? Can algorithms discriminate? And if so, how do they do it? This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Bartlett, R., A. Morse, R. Stanton, and N. Wallace (2019). Consumer-lending discrimination in the fintech era. Technical report, National Bureau of Economic Research.
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**Title: Discrimination in lending: Redlining ... or silver lining?****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** What is true of the individual, is not necessarily true of the group that individual belongs to. And ... vice versa. But how does that 'simple' wisdom affect lending decisions? In this project, you look at the impact of redlining in banking. This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Tootell, G. M. (1996). Redlining in Boston: Do mortgage lenders discriminate against

neighborhoods? *The Quarterly Journal of Economics* 111(4), 1049– 1079.

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**Title: Finding your banking market****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** In many empirical analyses, especially when we are measuring competition, we need to define the market in which firms operate. Are banks active nationally, in a certain city or in a state. In this project, you will research cross-elasticities, and think creatively of empirical methods to delineate markets. Great project for a student who likes microeconomics and banking.

**References:**

- Bikker, J.A. and J.W.B. Bos (2008). *Bank Performance: a theoretical and empirical framework for the analysis of profitability, competition and efficiency*, <https://www.routledge.com/Bank-Performance-A-Theoretical-and-Empirical-Framework-for-the-Analysis/Bikker-Bos/p/book/9780415569613>.

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**Title: What can we learn from simulating treatment effects?****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** Identifying the causal effect of a certain (policy) change in an empirical (regression) analysis is far from easy. All kinds of problems can appear that make things difficult: endogeneity, omitted variables, multicollinearity, etc. In this project, we want to investigate how we can assess the bias in treatment effects by simulating processes where we know that treatment cannot be properly identified.

**References:**

- <https://www.mostlyharmlesseconometrics.com>

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**Title: Pricing of default risk in the cross-section of European stocks****Supervisor: Alexander Lee** ([a.lee@maastrichtuniversity.nl](mailto:a.lee@maastrichtuniversity.nl))

**Short text:** The Merton model (1974) is useful in its incorporation of market information and volatility for the prediction of financial distress and bankruptcy of exchange-listed firms unlike backward looking models like the Altman-Z or Ohlson-O scores (2014) or (1980). In this thesis-topic we are interested in finding out whether distress risk is priced in the cross-section of European stocks by looking at whether excess distress risk is rewarded by higher returns. We do so similarly to Vassalou and Xing (2004). Data acquisition can be started at a smaller scale using Factset. Background knowledge of Empirical or Mathematical Finance will help but is not a prerequisite. I am currently performing similar research on the cross-section of US stocks.

**References:**

Merton, R. C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *The Journal of finance*, 29(2), 449-470.

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2014). Distressed firm and bankruptcy prediction in an international context: A review and empirical analysis of Altman's Z-score model. Available at SSRN 2536340.

Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of accounting research*, 109-131.

Vassalou, M., & Xing, Y. (2004). Default risk in equity returns. *The journal of finance*, 59(2), 831-868.

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**Title: #MeToo - Ripple down effects for corporations****Supervisor: Marco Ceccarelli** ([m.ceccarelli@maastrichtuniversity.nl](mailto:m.ceccarelli@maastrichtuniversity.nl))

**Short text:** The #MeToo movement gained global attention following the arrest of Harvey Weinstein in 2018. Lins et al. (2022) show how firms with a less sexist culture experienced positive abnormal returns. In other words, investors rewarded such firms. What is less clear is whether other stakeholder also exhibit such a behavior. You will start by replicating the findings of Lins et al. (2022) and then assess to what extent their

findings hold in longer horizons. In a second step you will assess the spillover effects of corporate sexism, e.g., on the financing opportunities of firms. For this topic a working knowledge of a statistical software (Stata or R) is advantageous.

**References:**

- Lins, Karl V. and Roth, Lukas and Servaes, Henri and Tamayo, Ane Miren, Sexism, Culture, and Firm Value: Evidence from the Harvey Weinstein Scandal and the #MeToo Movement (November 14, 2021). University of Alberta School of Business Research Paper No. 2019-509 , European Corporate Governance Institute – Finance Working Paper No. 679/2020, Available at SSRN: <https://ssrn.com/abstract=3458312> or <http://dx.doi.org/10.2139/ssrn.3458312>
- Adhikari, Binay K. & Agrawal, Anup & Malm, James, 2019. "Do women managers keep firms out of trouble? Evidence from corporate litigation and policies," *Journal of Accounting and Economics*, Elsevier, vol. 67(1), pages 202-225.
- Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of financial economics*, 94(2), 291-309.

**Title: Interventions in Long-Term Decision Making and Pension Communication****Supervisor: Thomas Post** ([t.post@maastrichtuniversity.nl](mailto:t.post@maastrichtuniversity.nl))**Short text:** Starting Date: immediately

Recent evidence shows that the majority of Dutch pension plan participants is poorly informed about their employer-sponsored pensions. This is striking as information on (for example) prospective benefits is personally relevant (it provides the most significant stream of overall pension income) and benefits are expected to change (due to current reforms). Such information is (according to standard theories of economic behavior) necessary to decide on potentially building up additional private savings. Moreover, the ignorance of most pension plan members is even more striking as receiving the information is fairly easy, that is, often just two mouse clicks away. This topic includes researching the relevant theories and testing various ways to manipulate pension communication in order to increase awareness (and potentially action) among pension plan members.

Note, this topic is very broad in terms of research angle, method, and data. Regarding research strategies, focus, and interventions it includes, for example:

- textual manipulation of messages
- website, visuals, and tool design
- communication channel (direct, via employer, ...; online, offline, social media, ...)
- and timing (life events) interventions
- emotional triggers
- design of default options and products
- as well as big data approaches (data and text mining).

Therefore, contact Dr. Thomas Post well in advance before the thesis skill period to discuss and narrow down a concrete topic.

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**Title: Heuristics and Financial Product Valuation****Supervisor: Thomas Post** ([t.post@maastrichtuniversity.nl](mailto:t.post@maastrichtuniversity.nl))**Short text:** Starting Date: immediately

It is well-known that the average investor or consumer of a financial products uses shortcuts and heuristics to make financial decisions. Often, those heuristics induce behavior that leads to financial mistakes and individual welfare losses. While many papers have looked at decision-making heuristics and biases already (hyperbolic discounting, overconfidence, trend extrapolation...) the current topic is about valuation heuristics. That is, given a certain financial product, what "back-of-the-envelope" mathematical models do normal people apply when they try to value a financial product (e.g. an annuity) to get an idea about of the product is worth the price. The results of such a study are highly relevant as understanding decision making processes and valuation heuristics is key to design smart interventions to improve consumer financial decision making (and a test of an idea could be part of the thesis).

Literature, especially from the literature on mathematics education, will be provided as a jump off point.

Contact Dr. Thomas Post well in advance before the thesis skill period to discuss and narrow down the concrete topic and research design.

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**Title: How do households form home price expectations?****Supervisor: Thomas Post** ([t.post@maastrichtuniversity.nl](mailto:t.post@maastrichtuniversity.nl))**Short text:** Starting Date: immediately

Expectations about how future home prices might change have been found to be a major determinant for households' decisions on, for example, buying or renting a home. What is rather unclear today is how households form those expectations in the first place, that is, how do they make up their mind on that issue? Do they just extrapolate past trends, think about the (macro-) economic environment, ...

For this project, data has already been collected in a large U.S. sample that is ready to be

analyzed. The data is very rich in terms for how people form expectations and household characteristics (demographics, financial literacy, ...). Some affinity with playing with data and running regressions are a plus for this topic.

Contact Dr. Thomas Post well in advance before the thesis skill period to discuss and narrow down the concrete topic and research design.

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**Title: Experience-Based Learning in Finance****Supervisor: Dr. Peiran Jiao** ([p.jiao@maastrichtuniversity.nl](mailto:p.jiao@maastrichtuniversity.nl) )

**Short text:** Personal experiences influence subsequent decisions. For instance, people who lived through negative events, such as economic downturns and financial crises, tend to make consumption and/or investment decisions consistent with either elevated risk aversion or pessimistic beliefs about future economic conditions (e.g. Malmendier and Nagel, 2011, Malmendier et al. 2011, Giannetti and Wang, 2016, Knüpfer et al., 2017). In particular, attaching too much weight on the payoff component in experience can lead to biases (Kaustia and Knüpfer, 2008, Choi et al., 2009), even when payoffs are just the result of luck (Anagol et al., 2015). Learning based on personal experiences can be either rational (improving investors' skills and reducing their biases) or irrational (naively repeating previously successful actions). Payoffs from personal experiences can influence subsequent preferences and/or beliefs (Jiao, 2017). This project will rely on a combination of theoretical, empirical and experimental approaches to investigate the effects of personal experiences and experienced payoffs in repeated decision-making under uncertainty with feedback. The hope is to also disentangle the preference- and belief-based channels of these potential effects, and to generate useful implications for marketing and financial decision-making.

**References:**

- Anagol, S., Balasubramaniam, V., & Ramadorai, T. (2015). The Effects of Experience on Investor Behavior: Evidence from India's IPO Lotteries.
- Choi, J. J., Laibson, D., Madrian, B. C., & Metrick, A. (2009). Reinforcement learning and savings behavior. *The Journal of finance*, 64(6), 2515-2534.
- Giannetti, M., & Wang, T. Y. (2016). Corporate scandals and household stock market participation. *The Journal of Finance*, 71(6), 2591-2636.
- Jiao, P. (2017). Payoff-Based Belief Distortion. Working Paper. Available on SSRN: <https://ssrn.com/abstract=2964289>
- Kaustia, M., & Knüpfer, S. (2008). Do investors overweight personal experience? Evidence from IPO subscriptions. *The Journal of Finance*, 63(6), 2679-2702.
- Knüpfer, S., Rantapuska, E., & Sarvimäki, M. (2017). Formative experiences and portfolio choice: Evidence from the Finnish great depression. *The Journal of Finance*, 72(1), 133-166.
- Malmendier, U., & Nagel, S. (2011). Depression babies: do macroeconomic experiences affect risk taking? *The Quarterly Journal of Economics*, 126(1), 373-416.
- Malmendier, U., Tate, G., & Yan, J. (2011). Overconfidence and early-life experiences: the effect of managerial traits on corporate financial policies. *The Journal of finance*, 66(5), 1687-1733.

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**Title: Emotional reaction to tweets from Arts and Cultural Institutions****Supervisor: Rachel Pownall** ([r.pownall@maastrichtuniversity.nl](mailto:r.pownall@maastrichtuniversity.nl) )

**Short text:** This topic involves an empirical study into the evaluation of how sentiment influences share prices. In particular looking at periods of economic and financial crises. How do the creative and cultural industries respond to social media?

**References:**

- Fang, L., & Peress, J. (2009). Media coverage and the cross-section of stock returns. *The Journal of Finance*, 64(5), 2023-2052.
- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139-1168.

**Requirements:** Statistical proficiency, using R or Stata.

**Title: The Resilience of Socially Responsible Investment under the Outbreak of COVID-19****Supervisor: Bin Dong** ([b.dong@maastrichtuniversity.nl](mailto:b.dong@maastrichtuniversity.nl))

**Short text:** ESG (environmental, social, and governance) factors increasingly attract vast capital and investors' attention. But research in the field of the resilience of socially responsible investment (SRI) is limited. The literature almost focuses on the performance of this non-conventional approach to investment during the financial crisis. Nevertheless, a more systemic approach has been neglected. Times of instability can be originated from an economic system. Meanwhile, it can also stem from a non-economic system, such as wars and health emergencies, which can indirectly affect the economic system. The resilience of SRI should be evaluated under both economic and non-economic context. However, most research on the resilience of SRI is set under a background of the financial crisis, which would ignore the non-financial factors and leads to a vague understanding of SRI investment. This topic aims to compare the resilience between stocks with environmental, social and governance (ESG) integration and conventional (non-ESG) stocks, and to illustrate the role of ESG factors in the performance of stocks under the outbreak of emergency originated from non-financial departments, e.g., healthy emergency. We investigate the resilience of ESG stocks' performance during the period following the outbreak of COVID-19. Furthermore, over this timeframe, we also examine the rates of performances on environmental, social, and governance dimensions separately. By the comprehensive approach in bear market conditions resulting from an exogenous emergency, we shed light on SRI's resilience (ESG screening) in practice.

**References:**

- Auer, B. R. & Schuhmacher, F. (2016). Do socially (ir)responsible investments pay? New evidence from international ESG data. *The Quarterly Review of Economics and Finance*, 59 (2016), 51-62.
- Galbreath J. (2013). ESG in focus: the Australian evidence. *Journal of Business Ethics* 118(3): 529–541 (2013).
- Ortas, E., Moneva, J.M., Burritt, R. et al (2014). Does Sustainability Investment Provide Adaptive Resilience to Ethical Investors? Evidence from Spain. *J Bus Ethics* 124, 297–309.
- Erragragui, E.; Hassan, M.K.; Peillex, J.; Khan, A.N.F (2018). Does Ethics Improve Stock Market Resilience in Times of Instability? *Econ. Syst.*, 42, 450–469.
- Fiksel, J., (2006). Sustainability and resilience: toward a systems approach. *Sustainability: Science Practice and Policy*, 2 (2), 14–21.
- Nofsinger, J. R. and Varma, A. (2014) Socially responsible funds and market crises, *Journal of Banking & Finance*, 48, 180–93.
- D. Ashraf, N. Mohammad (2014). Matching perception with the reality - performance of Islamic equity investments. *Pac. Basin Finance J.*, 28 (2014), pp. 175-189.
- Daniel, K., M. Grinblatt, S. Titman, and R. Wermers. 1997. Measuring mutual fund performance with characteristic-based benchmarks. *Journal of Finance* 52:1035–58.
- Chen, H.; P. De; Y. Hu; and B. H. Hwang. "Wisdom of Crowds: The Value of Stock Opinions Transmitted Through Social Media." *Review of Financial Studies* 27 (2014): 1367– 403.
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**Title: Identifying anomalies in futures and options markets****Supervisor: Joost Pennings** ([joost.pennings@maastrichtuniversity.nl](mailto:joost.pennings@maastrichtuniversity.nl))

**Short Text:** Regulators are confronted with ever-increasing challenges as markets (market platforms) become faster, more complex, fragmented, interconnected and driven by computer algorithms that constantly interact, change and improve themselves over time.

Legal scholars note that these developments give rise to practices that could or should be qualified as market manipulation. However, these scholars typically refrain from providing an in-depth analysis of why and how these practices should be regarded as market manipulation. There is a knowledge gap in how (often) manipulation occurs, how it



evolves, how regulation affects the behaviour of manipulators and how the market microstructure can provide protection. Econometric and rule-based techniques do not take full advantage of the rich (message driven) data.

The project complements and extends current literature by providing new insights in market manipulation, developing new methodologies that take full advantage of the rich data available.

**References:**

Egginton, Jared F., Bonnie F. Van Ness, and Robert A. Van Ness (2016) "Quote Stuffing." *Financial Management* 45(3): pp. 583–608. <http://doi.wiley.com/10.1111/fima.12126>.

FSB (2017) "Artificial Intelligence and Machine Learning in Financial Services: Market Developments and Financial Stability Implications". <http://www.fsb.org/wp-content/uploads/P011117.pdf>.

Menkveld, A. J., & Yueshen, B. Z. (2019). The flash crash: A cautionary tale about highly fragmented markets. *Management Science*, 65(10), pp. 4470-4488.

O'Hara, M., Yao, C., & Ye, M. (2014). What's not there: Odd lots and market data. *The Journal of Finance*, 69(5), pp. 2199-2236.

Du, S., & Zhu, H. (2017). What is the optimal trading frequency in financial markets? *The Review of Economic Studies*, 84(4), pp. 1606-1651.

[http://www.mit.edu/~zhuh/DuZhu\\_frequency\\_Restud.pdf](http://www.mit.edu/~zhuh/DuZhu_frequency_Restud.pdf)

Myklebust, T. (2020) "Fairness and Integrity in High-Frequency Markets – A Critical Assessment of the European Regulatory Approach", *European Business Law Review*, 31 (1): pp. 33-76

O. Cosme Jr. (2019), "Regulating High-Frequency Trading: The Case for Individual Criminal Liability", 109 *Journal of Criminal Law and Criminology* p. 365

Aquilina, M., Budish, E. B., & O'Neill, P. (2020). Quantifying the High-Frequency Trading "Arms Race": A Simple New Methodology and Estimates. *SSRN Electronic Journal*.

<https://doi.org/10.2139/ssrn.3636323>

Brogaard, J., Carrion, A., Moyaert, T., Riordan, R., Shkilko, A., & Sokolov, K. (2018). "High frequency trading and extreme price movements." *Journal of Financial Economics*, 128(2), pp. 253–265.

Putniņš, T. J. (2012) "Market Manipulation: A Survey". *Journal of Economic Surveys*, 26(5), pp. 952–967. <https://doi.org/10.1111/j.1467-6419.2011.00692.x>

**Additional Information:**

This research project is part of the UM, WUR, and CERN collaboration on understanding market behavior in futures and options markets using high frequency (LOB) data. This project capitalizes on state-of-the-art methods developed in particle physics in cooperation with CERN. For more information on this research please visit:

<https://kt.cern/article/applying-physics-financial-markets>

<https://www.wur.nl/en/Research-Results/Research-Institutes/Economic-Research/show-wecr/WUR-CERN-and-CORMEC-join-forces-to-protect-commodity-and-financial-markets.htm>

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**Title: Financial Risk Management Innovations: Water Futures**

**Supervisor: Joost Pennings** (joost.pennings@maastrichtuniversity.nl)

**Short Text:** On September 17, 2020 the largest exchange in the World, the CME Group announced to launch CME First-Ever Water Futures Based on Nasdaq Veles California Water Index. In this research project we take a Marketing-Finance Approach to understand whether such an innovation will be successful. Both the demand side (modelling adoption process of potential users) as well as the "technical" side of the design process (specification of contract) will be examined.

**References:**

[https://www.cmegroup.com/media-room/press-releases/2020/9/17/cme\\_group\\_to\\_launchfirst-everwaterfuturesbasedonnasdaqvelescalif.html](https://www.cmegroup.com/media-room/press-releases/2020/9/17/cme_group_to_launchfirst-everwaterfuturesbasedonnasdaqvelescalif.html)

Pennings, J.M.E. (2004), "A Marketing-Finance Approach towards Industrial Channel Contract Relationships: A Model and Application," *Journal of Business Research*, 57 6(June): 601-609.

Pennings, J.M.E., M.J.J.M. Candel and T.M. Egelkraut (2003), "A Behavioral Decision Making-Modeling Approach Towards Hedging Services," *Journal of Behavioral Finance*, 4(2): 71-84.

Pennings, J.M.E. (2002), "Pulling the Trigger or Not: Factors Affecting Behavior of Initiating a Position in Derivatives Markets," *Journal of Economic Psychology*, 23(April): 263-278.

Pennings, J.M.E., M.G.M. Wetzels, and M.T.G. Meulenberg (1999), "The Marketing-Finance Interface Towards Financial Services: with Special Reference to New Services Provided by Futures Exchanges," *European Journal of Marketing*, 33(5/6): 531-547.

Pennings, J.M.E. (1998), "The Information Dissemination Process of Futures Exchange Innovations: A Note," *Journal of Business Research*, 43 (3): 141-145.

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**Title: Analyzing market liquidity in futures and options markets using an unique data set obtained from the Chicago Mercantile Exchange**

**Supervisor: Joost Pennings** (joost.pennings@maastrichtuniversity.nl)

**Short text:** Market liquidity is an important characteristic of markets as it drives amongst other execution costs and hedging effectiveness. Liquidity consists of four dimensions (Kyle, 1985): immediacy (i.e. the ability to trade quickly), tightness (i.e. the cost of a round-trip position), depth (i.e. the size of an order flow needed to change prices) and resiliency (i.e. the ability of the market to bounce back from price effects not related to fundamentals and the speed at which it does so) (Hasbrouck, 2017; Kyle, 1985).

The shift to electronic trading platforms fundamentally changed market dynamics and high frequency order book data allows for more comprehensive measurements. For example, previous liquidity measurements take into account only one or two dimensions of liquidity whereas Limited Order Book (LOB) data allows us to measure multiple liquidity dimensions simultaneously (Rösch & Kaserer, 2013). In this study we wish to review existing liquidity measures and empirically test how they relate (and capture the various dimensions) using LOB data.

**References:**

Brogaard, J., & Garriott, C. (2019). High-Frequency Trading Competition. *Journal of Financial and Quantitative Analysis*, 54(4), 1469-1497.

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**Title: Can Land Price Volatility in be Managed?****Supervisor: Joost Pennings** (joost.pennings@maastrichtuniversity.nl)**Short Text:** "I would rather own all the farmland in the US than all the gold in the world." Warren Buffett (Seeking Alpha, n.d.).

Physical land can be an attractive investment for retail and institutional investors. As a atypical and relative new investment class (alternative real asset), investing in land has gained a lot of attention from the financial industry and academics. Investing in land can be risky. This risks stems amongst others from *specific pricing characteristics of land* and the *structure of land markets*. During the last financial crises parties that invested in land (such as developers, local governments, private equity) have been exposed to high volatility in land values (see media coverage in FD and FT as examples). In this thesis the central question is: why has there not been an effective risk management instrument available to manage that risk? Studying the pricing of land and the land market structure may be a start to answer this question. The student is expected to: 1) study the rich literature on Land pricing and markets, 2) to engage with stakeholders in land markets, 3) and engage with new trading platforms such as IPSX, acretrader etc. that are changing the landscape of property markets and in particular land markets.

**Reference:**

Fabozzi, F.J., R.J. Shiller and R.S.Tunaru (2020), A 30 Years Perspective on Property Derivatives: What can be done to tame Property Price Risks? *Journal of Economic Perspectives*, Vol.34. nr. 4. 121-145.

Bruce Bjornson (1995), "The Impacts of Business Cycles on Returns to Farmland Investments," *American Journal of Agricultural Economics*, Vol. 77, No. 3. (Aug., 1995), pp. 566-577.

Patrick Lecomte and Will McIntosh (2006), "Designing Property Futures Contracts and Options Based on NCREIF Property Indices, *Journal of Real Estate Portfolio Management*; May-Aug 2006; 12, 2; ABI/INFORM Global pg. 119

Richard E. Just; John A. Miranowski, "Understanding Farmland Price Changes," *American Journal of Agricultural Economics*, Vol. 75, No. 1. (Feb., 1993), pp. 156-168.

**Title: Carbon Credit Finance Markets: What is the Future or Futures?****Supervisor: Joost Pennings** (joost.pennings@maastrichtuniversity.nl)**Short text:** "The future of carbon finance; Looking ahead, carbon finance is set to drive two main streams of innovation: 1) the decarbonization of financial assets relating to the transition of carbon-intensive economic activities to low-carbon alternatives, in line with climate scenarios well below a 2°C temperature rise; and 2) the design and functioning of a sustainable financial system where economic growth is compatible with the socioeconomic changes necessary to mitigate climate emergencies and enable a balanced cycle of production and consumption of natural resources." *PineBrigde investments* 2020.

"The financial sector is increasingly confident that you can put a market price on carbon emissions. The segment edged closer to the financial mainstream last week with the New York Stock Exchange debut of the KFA Global Carbon ETF, an exchange-traded fund that aims to track the performance of the world's three most liquid markets for carbon credits." *Financial Times* August 3, 2020.

In this thesis three questions will be answered: 1) how can one price carbon credits? 2) How is this related to the various carbon credit markets (market-micro structure) and the relationships between stakeholders in these markets? 3) can carbon credit markets be viable and an attractive (alternative) investment class? The student is expected to use the finance literature on market microstructure and asset pricing to gain a general understanding of pricing "credits" (work in this area is extensive) and subsequently apply and extent these frameworks to carbon credit markets. In addition the student is expected to engage with stakeholders in these markets.

**References:**

Robert Stavins 2020, "The Future of U.S. Carbon-Pricing Policy WORKING PAPER 25912 DOI 10.3386/w25912 ISSUE DATE May 2019, <https://www.nber.org/papers/w25912> EU Regulation 2019/631. (Effective 1 January 2020). CO2 emission performance

standards for new passenger cars and for new light commercial vehicles. Retrieved from: [https://ec.europa.eu/clima/policies/transport/vehicles/cars\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/cars_en)

EU Commission. (26 October 2018). Report From The Commission To The European Parliament And The Council. EU and the Paris Climate Agreement: Taking stock of progress at Katowice COP. Retrieved from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0716>

ICAP. (2019). Emissions Trading Worldwide: Status Report 2019. Berlin: ICAP

FOEN. (n.d). Linking the Swiss and EU emissions trading schemes. Retrieved from: [www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html](http://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html)

Zhang, Y., Harris, J., Li, J. (April 2018). China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions. GDAE Working Paper No. 18-01, Tufts University.

Quemin, S., Trotignon, R. (Jan. 2019). Intertemporal emissions trading and market design: an application to the EU ETS, Grantham Research Institute on Climate Change and the Environment Working Paper No. 316 ISSN 2515-5717 (Online).

World Bank Group. (2020). State and Trends of Carbon Pricing 2020. Washington, DC: World Bank.

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### **Thesis Topic: Stereotypes and beliefs about advisor quality**

**Supervisor: Marten Laudi** ([m.laudi@maastrichtuniversity.nl](mailto:m.laudi@maastrichtuniversity.nl))

**Short text:** A decision maker forms expectations about others based on stereotypes. Belief-formation based on stereotypes cause belief distortions. For example, Bordalo and colleagues (2016), beliefs about political groups are distorted in the direction of representative types.

In the context of finance, financial advisors form beliefs about clients based on stereotypes. For example, stereotypes based on gender are used by advisors to form expectations about financial literacy of a client. As a result, advisors charge different fees and recommend different products to men than to women. An interesting extension of this literature would be to investigate how individual investors form expectations about advisor quality and trustworthiness, based on stereotypes. This may influence how investors form beliefs about the future performance of assets selected by these advisors. Students are expected to design and run an experiment to isolate the effect of advisor stereotypes on clients' beliefs and expectations.

#### **References:**

Bhattacharya, U., Kumar, A., Visaria, S., & Zhao, J. (2020). Do women receive worse financial advice? Working Paper.

Bordalo, P., Coffman, K., Gennaioli, N., & Shleifer, A. (2016). Stereotypes. *The Quarterly Journal of Economics*, 131(4), 1753-1794.

Bucher-Koenen, T., Hackethal, A., Koenen, J., & Laudenbach, C. (2019). Do seemingly smarter people get better advice? Working Paper.

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### **Thesis Topic: Bayesian Adaptive Designs – Applications in Experimental Economics**

**Supervisor: Marten Laudi** ([m.laudi@maastrichtuniversity.nl](mailto:m.laudi@maastrichtuniversity.nl))

**Short text:** Bayesian adaptive designs (BADs) are an incredibly interesting innovation in medicine and psychology research to increase the efficiency of randomized control trials (RCTs). The main difference, compared to RCTs, is that in BADs newly sampled participants are not randomly allocated, but have a higher probability to be included into well-performing treatments. Economists have suggested some applications in experimental economics, for example in development economics. Students come up with concrete examples, where BADs may be used in experimental economics to generate benefits, for example by saving costs or by improving in-sample outcomes.

#### **References:**

Kasy, M., & Sautmann, A. (2021). Adaptive treatment assignment in experiments for policy choice. *Econometrica*, 89(1), 113-132.

**Title: Externalities, compensations and demographics****Supervisor: Nicolas Duran** ([n.duran@maastrichtuniversity.nl](mailto:n.duran@maastrichtuniversity.nl))

**Short text:** Negative externalities from economic activity affect millions of individuals around the world, with households residing close to where these activities take place being disproportionately affected. As a consequence, people move away from the externality source, which drives housing prices down and encourages lower income households to move in instead. While granting compensations for these externalities can, in theory, have a mitigating effect, little is known about both, the migrating patterns that negative externalities kindle, and how compensations for those mediate these trends. With data from earthquakes induced by gas extraction and compensations granted by the gas extracting firm in the north of the Netherlands, this thesis will analyze the immigration patterns in terms of origin and income observed in the region during the period in which earthquakes were prevalent. Moreover, the analysis will pay special attention to how compensations that began to be granted at large to homeowners in the area in 2012 affected these trends.

**Data Sources:**

Earthquakes data from KNMI  
Compensations data from NAM  
Neighborhood data from CBS

**Requirements:**

Strong analytical and programming skills, preferably in R.

**References:**

Bakkensen, L. A., & Ma, L. (2020). Sorting over flood risk and implications for policy reform. *Journal of Environmental Economics and Management*

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**Title: Solar panel adoption and housing prices****Supervisor: Nicolas Duran** ([n.duran@maastrichtuniversity.nl](mailto:n.duran@maastrichtuniversity.nl))

**Short text:** As climate change looms as an existential threat, the decision to adopt renewable energy sources at the household level is fundamental going forward. However, there are only a few estimates of the capitalization of solar panels into housing prices, which constitutes a major drive in the decision. In general, the literature has struggled in disentangling the adoption of solar panels with other characteristics of the house or neighborhood that could correlate with the decision to adopt them. This thesis will look at the capitalization of installing solar panels on housing prices in the north of the Netherlands using a compensating mechanism over earthquakes as exogenous variation for the adoption decision.

Induced earthquakes from gas extraction have been a feature of the north of the Netherlands for decades. The firm that extracts the gas in the region has, for the most part, denied that damages appearing on houses in the area were a consequence of these earthquakes. This has made residents very skeptic of the firm and the Dutch Government (the gas exploitation is a joint venture between privates and the Government). Due to a strong earthquake impacting the region in 2012, the firm had to forcefully began granting compensations to homeowners claiming for damages to their houses or for the drop in its value. A good share of these compensations, aimed at restoring the firm's image, included the installation of solar panels on the house's roof. The thesis will look at the effect of this solar panels on the price of houses sold after having the panel installed due to the compensating mechanism.

**Data Sources:**

Earthquakes data from KNMI  
Compensations data from NAM  
Neighborhood data from CBS

**Requirements:**

Strong analytical and programming skills, preferably in R.

**References:**

Dastrup, S. R., Zivin, J. G., Costa, D. L., & Kahn, M. E. (2012). Understanding the Solar Home price premium: Electricity generation and "Green" social status. *European Economic Review*

**Title: Towards an Automated Valuation Model (AVM) for the Dutch Residential Market****Supervisors:** Nils Kok (n.kok@maastrichtuniversity.nl); Piet Eichholtz (p.eichholtz@maastrichtuniversity.nl); Alexander Carlo

(a.carlo@maastrichtuniversity.nl); Stefan Flagner (s.flagner@maastrichtuniversity.nl)

**Short text:** The notion of automated (predictive) valuation has taken a firm hold in the US residential real estate market. From Zillow to Opendoor, the market for automatically generated values, rather than manual assessments of value, allows for faster underwriting and better risk management. But of course, much depends on the quality of data, the extent of contextual data inputs, and the quality of the machine learning model. This thesis topic is for MSc students that have strong statistical skills and familiarity with predictive modeling algorithms (e.g. XGBoost). Some knowledge on GIS applications is useful.**Data Sources:**

- NVM data
- CBS data

**References** and background reading:

Kok et al. (2017). Big data in real estate? From manual appraisal to automated valuation.

**Requirements:**Understanding of machine-learning based predictive models.

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**Title: Sustainability and the Cost of Commercial Mortgage Debt****Supervisors:** Nils Kok (n.kok@maastrichtuniversity.nl); Piet Eichholtz (p.eichholtz@maastrichtuniversity.nl); Alexander Carlo

(a.carlo@maastrichtuniversity.nl); Stefan Flagner (s.flagner@maastrichtuniversity.nl)

**Short text:** There is abundant and convincing evidence that sustainable buildings perform well on a range of economic indicators, like value, rent level, occupancy rate, and risk. Recently, some research has also been performed that investigates the cost of capital to finance these buildings: see below for some references. However, this research is far less abundant, and there is lots of unexplored territory on this issue.

The central idea of this thesis proposal is to investigate this in a better way, using two datasets for the United States commercial real estate market: the RCA commercial real estate lending database to get information about loan pricing and default, and the LEED database to get information about the environmental performance of the buildings that serve as collateral to the mortgage loans. Empirically, the trick is to link these datasets, and to estimate a potential sustainability discount in the loan rates, as well as effects on subsequent loan default. Since the data is already at hand, this is a low-risk thesis. On the other hand, the empirical analysis requires excellent statistical skills.

**Data Sources:**

- RCA
- USGBC

**References** and background reading:

Green Buildings in Commercial-Mortgage Backed Securities, Xudong An and Gary Pivo, Real estate Economics, 2020.

Environmental Performance and the Cost of Capital: Evidence from Commercial Mortgages and REIT Bonds, P. Eichholtz, N. Kok, R. Holtermans and E. Yönder, Journal of Banking and Finance, 2019.

REIT Environmental Performance and the Cost of Equity, P. Barron, P. Eichholtz and E. Yönder, in The Routledge REITs Research Handbook 1st Edition, Ed. David Parker, 2018.

**Requirements:**Statistical proficiency, using R or Stata.

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**Title: Explaining International Home Ownership****Supervisors: Nils Kok** (n.kok@maastrichtuniversity.nl); **Piet Eichholtz**(p.eichholtz@maastrichtuniversity.nl); **Alexander Carlo**(a.carlo@maastrichtuniversity.nl); **Stefan Flagner** (s.flagner@maastrichtuniversity.nl)

**Short text:** The housing market is the world's largest asset market, and private home ownership differs strongly across countries. That that has not received much attention in the academic literature, and it is not clear at all what causes these differences. The literature on home ownership focuses mostly on explaining home ownership differences within countries across households. The general conclusion is that rich households are likely to own their home, while poor households are more likely to rent. On the country level, we do not see this at all: Switzerland and Germany, both rich, have low home ownership, while Greece and Morocco, not so rich, both have very high home ownership. The purpose of this thesis/research project is to do an analysis on the country level, to try and explain this phenomenon.

Theoretically, the likely trade-off that people make when they decide to rent or own their own home is between the risk of renting (inflation risk) and the risk of owning (volatility of house prices). For this thesis, a student needs to look at house price risk for a large sample of countries, using existing data from the Bank for International Settlements, as well as inflation risk for these same countries, using data from the IMF or other sources. These can then be used as explanatory variables to explain home ownership. The main challenge in data collection is to get the home ownership data from national statistics bureaus, but these data are available, so this is mostly a matter of perseverance. Since changes in home ownership are very gradual, the thesis should go as far back in time as possible, probably to the 1970s.

**Data Sources:**

- BISS Data (Open Data)

**References** and background reading:

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**Requirements:**

Statistical proficiency, using R or Stata.

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**Title: Moving to Productivity II****Supervisors: Nils Kok** (n.kok@maastrichtuniversity.nl); **Piet Eichholtz**(p.eichholtz@maastrichtuniversity.nl); **Alexander Carlo**(a.carlo@maastrichtuniversity.nl); **Stefan Flagner** (s.flagner@maastrichtuniversity.nl)

**Short text:** Real estate sustainability has mostly been framed in terms of energy efficiency, but has other dimension as well, such as occupant health and productivity. Maastricht University works together with the city of Venlo in a number of studies concerning the relationship between indoor climate and worker productivity. The first of these is entitled "Moving to Productivity", which involved an extensive survey among office workers in Venlo before and after they moved from a conventional office building to a building that was designed for an optimal indoor climate. All these four surveys took place before the Covid-19 crisis.

The idea for this thesis is to do a fifth survey that specifically compares the office work experience – using the data from the previous surveys – with the working-from-home experience. On top of that, we want to investigate sub-questions relating to the decision to come back to the office to work there (between June and September). The fifth survey will be based on the four previous ones, with some new questions added about the work environment as home. The survey infrastructure that we used before can be employed again for this study.

**Data Sources:**

- Gemeente Venlo

**References** and background reading:

Palacios et al. (2020). "Moving to productivity: The benefits of healthy buildings." PLOS One.

**Requirements:**

- Statistical proficiency, using R or Stata.
  - Speaking Dutch is very useful.
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**Title: Explaining Air Quality: A Global Study****Supervisors:** Nils Kok (n.kok@maastrichtuniversity.nl); Piet Eichholtz

(p.eichholtz@maastrichtuniversity.nl); Alexander Carlo

(a.carlo@maastrichtuniversity.nl); Stefan Flagner (s.flagner@maastrichtuniversity.nl)

**Short text:** Air quality has emerged as a hot topic (literally) not just in emerging economies like India and China, but also in developed nations such as the UK, the Netherlands, and the U.S. The air that we breath has implications for physical development and cognitive performance, and the body of evidence on this topic is increasing rapidly.

Most studies use satellite data to gain an understanding of local levels of air pollution, but such measures are not necessarily precise or accurate. Alternatively, most countries have local air quality measurement systems, but these are typically spread across large distances.

This thesis aims to use the data gathered by the network of installed sensors provided by PurpleAir, which has an "opt out" policy for each outdoor sensor that they sell to a customer (see the the PurpleAir website). With global data on air quality in hand, the question is what determines the cross-sectional variation in air quality, building a model that includes metrics such as local GDP, industry concentration, and urban development.

**Data Sources:**

- PurpleAir
- Local Census bureaus/agencies

**References** and background reading:

Air pollution lowers Chinese urbanites' expressed happiness on social media (link)

Real estate valuation and cross-boundary air pollution externalities: evidence from Chinese cities (link)

Self-protection investment exacerbates air pollution exposure inequality in urban China (link)

**Requirements:**

Statistical proficiency, using R or Stata.

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**Title: Global investment performance in Infrastructure****Supervisors:** Nils Kok (n.kok@maastrichtuniversity.nl); Piet Eichholtz

(p.eichholtz@maastrichtuniversity.nl); Alexander Carlo

(a.carlo@maastrichtuniversity.nl)

**Short text:** Pension funds and other institutional investors all over the world are increasingly investing in real assets, and infrastructure is one of the asset classes they look at. They mostly build up exposure to that asset class through unlisted vehicles, like private funds and funds-of-funds. However, there also is a growing group of listed infrastructure companies that provide an alternative, which may be cheaper and easier to access. Recently, these listed infra companies have bundled forces in an organization called GLIO, the Global Listed Infrastructure Organization. GLIO has also begun tracking the stock performance of these companies in an index. However, that index does not have a lot of history, so not much is known about the investment performance of these listed infrastructure companies in the medium to long term.

The purpose of the thesis is to study the performance of listed infrastructure companies over the longer term, for example the last 20 years, using the GLIO index as a basis, and creating an index that goes back further. Also, this thesis should look at the different type of infrastructure companies (energy, water, internet infra, roads, railroads and harbors, ...) and study performance differences. Data is from GLIO and FactSet.

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**Title: Explaining Indoor Air Quality: A Behavioral Study****Supervisor:** Xudong Sun ([x.sun@maastrichtuniversity.nl](mailto:x.sun@maastrichtuniversity.nl))



**Short text:** The air that we breathe inside and outside buildings has implications for physical development, cognitive performance, and overall productivity, and the body of evidence on this topic is increasing rapidly. Intuitively, indoor air quality (IAQ) is more likely to be immediately affected by various occupant behaviors such as entering/leaving the room, opening/closing windows, using air conditioning, working on various work types/workloads, and more possible activities we might find in the future. Meanwhile, such behaviors are affected by both indoor and outdoor environment quality. A better understanding of the dynamics between occupant behavior and IAQ could help us develop a holistic view on green building topics.

This thesis aims to examine the relationship between occupant behavior and indoor air quality by combining data analytics and field studies. We use sensor-based data for IAQ measurements, and use a combination of motion sensors and field studies to collect behavioral data. We plan to firstly establish a mapping between certain behaviors and IAQ measurement patterns, then quantify the correlation between them.

**References** and background reading:

Lin, Beiyu, et al. "Analyzing the relationship between human behavior and indoor air quality." *Journal of Sensor and Actuator Networks* 6.3 (2017): 13.

Hua, Ying, Özgür Göçer, and Kenan Göçer. "Spatial mapping of occupant satisfaction and indoor environment quality in a LEED platinum campus building." *Building and Environment* 79 (2014): 124-137.

**Requirements:**

1. Statistical proficiency;
  2.
    - a. Experience of field study in the Netherlands preferred, or,
    - b. Programming-based workflow preferred (R, Python, Matlab, or Julia)
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**Title: Open the Black Box: Interpretable Deep Learning Methods for Indoor Environment Quality Studies**

**Supervisor: Xudong Sun** ([x.sun@maastrichtuniversity.nl](mailto:x.sun@maastrichtuniversity.nl))

**Short text:** Deep learning has gained promising results in many fields. However, most neural network-based algorithms lack interpretability, which limits most deep learning methods to "applied" methods instead of insights or theories. Recent findings on interpretable convolutional neural networks (CNN) has shed light on the question of what neural networks learn by matching network layers with image patterns.

In this thesis, we will build a series of forecast models for sensor-based indoor air quality (IAQ) measurement data using Temporal Convolutional Networks (TCN), which is a special 1-dimensional form of CNN. In this process, we will test network structures that can be interpreted as patterns, which will be matched with occupant behaviors. A better understanding of the dynamics between occupant behavior and IAQ could help us develop a holistic view on green building topics.

**References:**

Pantiskas, Leonardos, Kees Verstoep, and Henri Bal. "Interpretable Multivariate Time Series Forecasting with Temporal Attention Convolutional Neural Networks." *2020 IEEE Symposium Series on Computational Intelligence (SSCI)*. IEEE, 2020.

Zhang, Quanshi, Ying Nian Wu, and Song-Chun Zhu. "Interpretable convolutional neural networks." *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2018.

Shih, Shun-Yao, Fan-Keng Sun, and Hung-yi Lee. "Temporal pattern attention for multivariate time series forecasting." *Machine Learning* 108.8 (2019): 1421-1441.

**Requirements:**

Knowledge in deep learning (especially convolutional neural networks)  
Experience in at least one deep learning platform (TensorFlow/Keras preferred)  
Programming-based workflow required (Python, or something better), **or**,  
Your motivation and capability that makes you learn all above in 2 months.

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**Title: Evaluating the Effect of Indoor Air Quality on Commercial Office Markets**

**Supervisor: Xudong Sun** ([x.sun@maastrichtuniversity.nl](mailto:x.sun@maastrichtuniversity.nl))

**Short text:** Does indoor environment quality (IAQ) affect commercial real estate value? There is convincing evidence that there is a premium in rental rates and sales price for green office buildings with eco-labeling such as Energy Star or LEED. Meanwhile, studies show that occupant productivity/performance is significantly affected by indoor air quality (IAQ) and other environmental features. Does the premium of green office buildings a result of better occupant productivity, eco-labels, or a combination of the two? This thesis aims to quantitatively evaluate the relationship between IAQ and the market value of office real estate.

**References:**

Eichholtz, Piet, Nils Kok, and John M. Quigley. "The economics of green building." *Review of Economics and Statistics* 95.1 (2013): 50-63. Self-protection  
Fuerst, Franz, and Pat McAllister. "Eco-labeling in commercial office markets: Do LEED and Energy Star offices obtain multiple premiums?." *Ecological Economics* 70.6 (2011): 1220-1230.  
Al Horr, Yousef, et al. "Occupant productivity and office indoor environment quality: A review of the literature." *Building and environment* 105 (2016): 369-389.  
Thermal and IAQ effects on performance (<https://www.researchgate.net/project/Thermal-and-IAQ-effects-on-performance>)

**Requirements:**

Knowledge in real estate asset pricing; Statistical proficiency; Experience in data collection and analytics

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**Title: Ethics and the Financial Sector**

**Supervisor: Janek Kretschmer** ([j.kretschmer@maastrichtuniversity.nl](mailto:j.kretschmer@maastrichtuniversity.nl))

**Short Text:** At the very latest since the financial crisis, the morals of financial markets became a highly relevant topic in society. This event stressed the pervasive feature of market interaction to impose costs on uninvolved third parties. Producing and trading goods often creates negative externalities, such as detrimental working conditions for workers, possibly associated with reduced life expectancy, child labor, suffering of animals, or environmental damage.

Thus, the actions and investment decisions of all market participants have an ethical aspect. As decision makers are subject to various biases and cognitive dissonance their behavior largely depends on how they perceive the situation. The main focus therefore is analyzing the choice architecture that individuals in the financial sector face to explain unethical behavior and to find methods to encourage prosocial acts.

Note, this topic is very broad in terms of research view, methods and data. The student will have the opportunity to create an own survey and/or experiment subsequent to a literature review to test their hypotheses.

**References**

Bartling, B., Weber, R. A., & Yao, L. (2014). Do markets erode social responsibility?. *The Quarterly Journal of Economics*, 130(1), 219-266.  
Cohn, A., Fehr, E., & Maréchal, M. A. (2014). Business culture and dishonesty in the banking industry. *Nature*, 516(7529), 86.  
Falk, A., & Szech, N. (2013). Morals and markets. *Science*, 340(6133), 707-711.  
Prentice, R. A. (2007). Ethical decision making: More needed than good intentions. *Financial Analysts Journal*, 63(6), 17-30.  
Riedl, A., & Smeets, P. (2017). Why do investors hold socially responsible mutual funds?. *The Journal of Finance*, 72(6), 2505-2550.  
Zingales, L. (2015). Presidential address: Does finance benefit society?. *The Journal of Finance*, 70(4), 1327-1363.

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**Title: Encouraging Effective Donations**

**Supervisor: Janek Kretschmer** ([j.kretschmer@maastrichtuniversity.nl](mailto:j.kretschmer@maastrichtuniversity.nl))

**Short text:** Charitable giving plays a prominent role in society, with donations amounting to more than 87.5 billion euro per year in Europe alone.

While concerns about cost-effectiveness is prevalent in everyday life, such thinking seems to be far less common in the context of altruistic decisions - or more specifically, charitable giving. Nevertheless, the question of charities' cost-effectiveness is addressed by NGOs, such as "GiveWell" or "GivingWhatWeCan", conducting independent and scientific charity evaluation. These organizations have shown that some charities can offer interventions that outperform comparable charities in terms of cost-effectiveness by a factor of up to one thousand. The lack of adequate prioritization and donors' inability to evaluate cost-effectiveness information impedes donations to the most effective causes. On the other hand, a recent study suggests that donors feel happiest when they make a clear impact with their donation. New methods to overcome behavioral biases in charitable giving can direct more donations to the most effective interventions. Therefore, this research topic has the potential to help high effective charities to raise funding, increase donors' happiness and the well-being of society as a whole.

The student will have the opportunity to create an own survey and/or experiment subsequent to a literature review to test their hypotheses.

**References:**

Aknin, L. B., Dunn, E. W., Whillans, A. V., Grant, A. M., & Norton, M. I. (2013). Making a difference matters: Impact unlocks the emotional benefits of prosocial spending. *Journal of Economic Behavior & Organization*, 88, 90-95.

Baron, J., & Szymanska, E. (2011). Heuristics and biases in charity. *The science of giving: Experimental approaches to the study of charity*, 215-235.

Berman, J. Z., Barasch, A., Levine, E. E., & Small, D. A. (2018). Impediments to Effective Altruism: The Role of Subjective Preferences in Charitable Giving. *Psychological science*, 29(5), 834-844.

Caviola, L., Faulmüller, N., Everett, J. A., Savulescu, J., & Kahane, G. (2014). The evaluability bias in charitable giving: Saving administration costs or saving lives?. *Judgment and decision making*, 9(4), 303.

Gneezy, U., Keenan, E. A., & Gneezy, A. (2014). Avoiding overhead aversion in charity. *Science*, 346(6209), 632-635.

Karlan, D., & Wood, D. H. (2017). The effect of effectiveness: Donor response to aid effectiveness in a direct mail fundraising experiment. *Journal of behavioral and experimental economics*, 66, 1-8.

Yörük, B. K. (2016). Charity ratings. *Journal of Economics & Management Strategy*, 25(1), 195-219.

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**Title: Income inequality**

**Supervisor: Robin Aarts** (r.aarts@maastrichtuniversity.nl)

**Short text:** Reducing inequalities is a requirement for human rights and justice, and is essential for success in other global priority areas, such as environmental sustainability, conflict resolution and migration (UNESCO, 2016). Trends on inequality are not one-way; in recent years, some countries have succeeded in reducing or at least halting rising inequalities, but in some cases these trends are being reversed (Cornia and Martorano, 2012). Income inequality affects many other aspects in life, such as economic growth, nutrition and health, inequalities in voice and power, and the prevalence of conflict and political polarisation. In order to narrow down the research focus, students can choose one specific factor with which they want to link income inequality and analyse how that factor affects or is affected by income inequality. Students could first do a quantitative analysis with regression analyses for a certain geographical area, measuring the effect of income inequality on the factor of their choice or vice versa. They then can go more in depth with a qualitative design, such as a case study of one particular country, to investigate elements that might have an impact on this relation.

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**Title: Corporate Governance and Sustainability in Companies**

**Supervisor: Tereza Bauer** (t.bauer@maastrichtuniversity.nl)

**Short text:** The importance of engaging in *sustainable* and *socially responsible* practices has been recognized by most companies, as well as their shareholders and other stakeholders who have come to expect demonstrated efforts and reporting on

sustainability (often abbreviated to 'ESG' - environmental, social, governance) - particularly from large, publicly listed companies. There is however no single best-practice model for managing and embedding sustainability within a company's governance, and different companies follow different approaches.

The aim of this thesis project will be to conduct a comparative analysis of sustainability governance strategies and practices among companies in a market of the student's choice. The goal will be to identify, describe and compare practices of including sustainability within a company's purpose & culture, organizational structure, board and shareholder involvement, reporting, education and remuneration policies, etc.

**Data:**

(Mostly) qualitative comparative research of academic and practitioner literature on the topic of sustainability governance (company reports, sustainability reports, existing academic literature).

In addition, the student will be encouraged to also gather primary data in the forms of original interviews or surveys of company representatives (subject to the student's initiative), to gather real-life evidence of how sustainability is managed within a business. Here, the focus can also be on small and medium-sized companies, not only large ones.

**Number of students:** 1-2 (they should focus on different countries or segments)

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**Title: Determinants of climate related voluntary disclosure**

**Supervisor:** Andrea Perić ([a.peric@maastrichtuniversity.nl](mailto:a.peric@maastrichtuniversity.nl))

**Short text:** Reliable climate related financial information is necessary for pricing climate related risk (Task Force on Climate related disclosures, 2017). The aim of this topic is to expand existing research on the determinants of voluntary climate related disclosure. Examples of determinants can be found in the area of corporate governance (f.e. board composition, institutional ownership). The thesis can focus on (comparisons between) specific regions, sets of countries and/or different industries.

**References:**

<https://www.fsb-tcfd.org/>

Zhang, Y. J., & Liu, J. Y. (2020). Overview of research on carbon information disclosure. *Frontiers of Engineering Management*, 7(1), 47-62.

Ben-Amar, W., & McIlkenny, P. (2015). Board effectiveness and the voluntary disclosure of climate change information. *Business Strategy and the Environment*, 24(8), 704-719.

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**Title: Relationship between voluntary disclosure of carbon risk and financial performance**

**Supervisor:** Andrea Perić ([a.peric@maastrichtuniversity.nl](mailto:a.peric@maastrichtuniversity.nl))

**Short text:** This topic allows students to expand existing research in the field of relationships between carbon performance, disclosure, governance and financial performance. The thesis can focus on determinants, (comparisons between) specific regions, sets of countries and/or different industries.

**References:**

Velte, P., Stawinoga, M., & Lueg, R. (2020). Carbon performance and disclosure: A systematic review of governance-related determinants and financial consequences. *Journal of Cleaner Production*, 254, 120063.

Alsaifi, K., Elnahass, M., & Salama, A. (2020). Carbon disclosure and financial performance: UK environmental policy. *Business Strategy and the Environment*, 29(2), 711-726.

Zhang, Y. J., & Liu, J. Y. (2020). Overview of research on carbon information disclosure. *Frontiers of Engineering Management*, 7(1), 47-62.

Hahn, R., Reimsbach, D., & Schiemann, F. (2015). Organizations, climate change, and transparency: Reviewing the literature on carbon disclosure. *Organization & Environment*, 28(1), 80-102.

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**Title: Measuring cultural regeneration in Maastricht**

**Supervisor: Rachel Pownall** ([r.pownall@maastrichtuniversity.nl](mailto:r.pownall@maastrichtuniversity.nl))

**Short text:** This topic involves a local perspective of the city of Maastricht and is supported by the municipality. The city of Maastricht has provided financial stimulus to the cultural industries, which is one of the fastest growing areas of the economy. The thesis student has the possibility to conduct an economic impact study on the influence of the regeneration of the local economy on the number of cultural institutions, as well as media and software companies, which also fall under the definition of the creative industries, employees and on consumer demand.

**References:** [www.made2measure.com](http://www.made2measure.com)

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**Title: How small businesses are coping financially with the current coronavirus pandemic**

**Supervisor: Rachel Pownall** ([r.pownall@maastrichtuniversity.nl](mailto:r.pownall@maastrichtuniversity.nl))

**Short text:** The current pandemic is having a serious impact on small business. Which schemes are available for different areas of the economy, across different countries, and which businesses are managing to weather the storm of the corona crisis best is worthy of deeper investigation?

**References:**

Brady, A, Michalska, J. and R. A. J. Pownall (2020) "Galleries worldwide face 70% income crash due to coronavirus". The Art Newspaper, 27 April 2020.

Gormsen, N. and Koijen, R. (2020) "Coronavirus: Impact on Stock Prices and Growth Expectations". University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2020-22

**Requirements:** Statistical proficiency, using R or Stata.

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**Title: Inequality Preferences**

**Supervisor: Dr. P. Smeets** (<mailto:pm.smeets@maastrichtuniversity.nl>)

**Short text:** Income inequality was mentioned as one of the major challenges for the US and many other countries by Barrack Obama in his speech when he left office. It is therefore essential to understand people's preferences for inequality and redistribution. Students will work on developing an experiment or survey to measure preferences for redistribution and link these preferences to real world outcomes.

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**Title: Effective Altruism**

**Supervisor: Dr. P. Smeets** (<mailto:pm.smeets@maastrichtuniversity.nl>)

**Short text:** Providing malaria nets, deworming pills and simply giving poor people cash are the three most effective ways of saving lives, according to large scale academic research. Yet, most people are unaware of the most effective ways for helping the poor. Effective altruism strives to have maximum impact with donation money. Students will develop an experiment or survey to investigate how to convince people to be more effective in their altruism.

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**Title: Carbon Credit Finance Markets: What is the Future or Futures?**

**Supervisor: Joost Pennings** ([joost.pennings@maastrichtuniversity.nl](mailto:joost.pennings@maastrichtuniversity.nl))

**Short text:** "The future of carbon finance; Looking ahead, carbon finance is set to drive two main streams of innovation: 1) the decarbonization of financial assets relating to the transition of carbon-intensive economic activities to low-carbon alternatives, in line with climate scenarios well below a 2°C temperature rise; and 2) the design and functioning of a sustainable financial system where economic growth is compatible with the socioeconomic changes necessary to mitigate climate emergencies and enable a balanced cycle of production and consumption of natural resources." *PineBrigde investments* 2020. "The financial sector is increasingly confident that you can put a market price on carbon emissions. The segment edged closer to the financial mainstream last week with the New

York Stock Exchange debut of the KFA Global Carbon ETF, an exchange-traded fund that aims to track the performance of the world's three most liquid markets for carbon credits." *Financial Times* August 3, 2020.

In this thesis three questions will be answered: 1) how can one price carbon credits? 2) How is this related to the various carbon credit markets (market-micro structure) and the relationships between stakeholders in these markets? 3) can carbon credit markets be viable and an attractive (alternative) investment class? The student is expected to use the finance literature on market microstructure and asset pricing to gain a general understanding of pricing "credits" (work in this area is extensive) and subsequently apply and extend these frameworks to carbon credit markets. In addition the student is expected to engage with stakeholders in these markets.

**References:**

Robert Stavins 2020, "The Future of U.S. Carbon-Pricing Policy WORKING PAPER 25912 DOI 10.3386/w25912 ISSUE DATE May 2019, <https://www.nber.org/papers/w25912>  
EU Regulation 2019/631. (Effective 1 January 2020). CO2 emission performance standards for new passenger cars and for new light commercial vehicles. Retrieved from: [https://ec.europa.eu/clima/policies/transport/vehicles/cars\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/cars_en)

EU Commission. (26 October 2018). Report From The Commission To The European Parliament And The Council. EU and the Paris Climate Agreement: Taking stock of progress at Katowice COP. Retrieved from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0716>

ICAP. (2019). Emissions Trading Worldwide: Status Report 2019. Berlin: ICAP

FOEN. (n.d). Linking the Swiss and EU emissions trading schemes. Retrieved from: [www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html](http://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html)

Zhang, Y., Harris, J., Li, J. (April 2018). China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions. GDAE Working Paper No. 18-01, Tufts University.

Quemin, S., Trotignon, R. (Jan. 2019). Intertemporal emissions trading and market design: an application to the EU ETS, Grantham Research Institute on Climate Change and the Environment Working Paper No. 316 ISSN 2515-5717 (Online).

World Bank Group. (2020). State and Trends of Carbon Pricing 2020. Washington, DC: World Bank.

**Thesis Topic: Immoral Dividends**

**Supervisor: Marten Laudi** ([m.laudi@maastrichtuniversity.nl](mailto:m.laudi@maastrichtuniversity.nl))

**Short text:** Among a sample of German retail investors, we have found an interesting pattern: Dividends are spent differently when they come from scandalous companies that have been covered negatively in the news. The question is: Why is this the case? Students come up with a mechanism that they then test using primary or secondary data.

**References:**

Barkan, R., Ayal, S., & Ariely, D. (2015). Ethical dissonance, justifications, and moral behavior. *Current Opinion in Psychology*, 6(DEC), 157-161.

Bräuer, K., Hackethal, A., & Hanspal, T. (2020). Consuming dividends. Working Paper.

**Thesis topic: The costs and benefits of Performance Fees for Institutional Investors**

**Supervisor: Roger Otten** ([r.otten@maastrichtuniversity.nl](mailto:r.otten@maastrichtuniversity.nl))

**Short text:** Most investment funds charge fixed fees (% of Net Asset Value). Some funds charge performance fees on top of that. The idea is align the interests of investors and portfolio managers. Performance fees are however controversial and both regulators and financial media publish about them regularly. Some argue it leads to more risk-taking in order to outperform a certain threshold (benchmark). In this thesis you examine the role of performance fees for institutional investors. Many of these also have Responsible Investing beliefs. How do performance fees solely based on financial performance stack up

with for instance achieving societal impact via the SDG's? How to align the interests from a broader stakeholder approach?

**References:**

Servaes & Sigurdson (2022), The costs and performance fees of Mutual Funds

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**Title: #MeToo - Ripple down effects for corporations**

**Supervisor: Marco Ceccarelli** ([m.ceccarelli@maastrichtuniversity.nl](mailto:m.ceccarelli@maastrichtuniversity.nl))

**Short text:** The #MeToo movement gained global attention following the arrest of Harvey Weinstein in 2018. Lins et al. (2022) show how firms with a less sexist culture experienced positive abnormal returns. In other words, investors rewarded such firms. What is less clear is whether other stakeholder also exhibit such a behavior. You will start by replicating the findings of Lins et al. (2022) and then assess to what extent their findings hold in longer horizons. In a second step you will assess the spillover effects of corporate sexism, e.g., on the financing opportunities of firms. For this topic a working knowledge of a statistical software (Stata or R) is advantageous.

**References:**

- Lins, Karl V. and Roth, Lukas and Servaes, Henri and Tamayo, Ane Miren, Sexism, Culture, and Firm Value: Evidence from the Harvey Weinstein Scandal and the #MeToo Movement (November 14, 2021). University of Alberta School of Business Research Paper No. 2019-509 , European Corporate Governance Institute – Finance Working Paper No. 679/2020, Available at SSRN: <https://ssrn.com/abstract=3458312> or <http://dx.doi.org/10.2139/ssrn.3458312>
  - Adhikari, Binay K. & Agrawal, Anup & Malm, James, 2019. "Do women managers keep firms out of trouble? Evidence from corporate litigation and policies," *Journal of Accounting and Economics*, Elsevier, vol. 67(1), pages 202-225.
  - Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of financial economics*, 94(2), 291-309.
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**Title: Using survey narratives to measure sustainability preferences**

**Supervisor: Rob Bauer** ([r.bauer@maastrichtuniversity.nl](mailto:r.bauer@maastrichtuniversity.nl))

**Reference:** Get Real paper Bauer, Smeets, *Review Financial Studies* (2021)

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**Title: (Female) Entrepreneurship in the FinTech era**

**Supervisor: Pomme Theunissen** ([p.theunissen@maastrichtuniversity.nl](mailto:p.theunissen@maastrichtuniversity.nl))

**Short text:** This thesis topic builds on the possibilities offered by FinTech and other new digital technologies as a contribution to (female) entrepreneurship research. To entrepreneurs, access to finance is often the main hurdle that impedes the growth of their business (Block et al., 2018; Cumming et al., 2019) . In this thesis topic, the student is requested to investigate the potential opportunities and drawbacks offered by FinTech and other digital technologies in enhancing the access to finance, and the related impact on their business (Bollaert et al., 2021; Kavuri & Milne, 2019). Digital technologies are recognized as disruptive (von Briel et al., 2018) and are an important source of transformation of the entrepreneurial environment (Bi et al., 2017; Giones & Brem, 2017). They therewith offer a broader set of opportunities particularly salient for start-ups and prospective entrepreneurs (Dholakia & Kshetri, 2004; Kolokas et al., 2020).

The scope of this topic may be aimed at startups and entrepreneurship in general; Alternatively, the topic can focus on female entrepreneurship (Ughetto et al., 2019).

**References:**

- Bi, R., Davison, R. M., & Smyrniotis, K. X. (2017). E-business and fast growth SMEs. *Small Business Economics*, 48(3), 559–576.
- Block, J. H., Colombo, M. G., Cumming, D. J., & Vismara, S. (2018). New players in

entrepreneurial finance and why they are there. *Small Business Economics*, 50(2), 239–250.

Bollaert, H., de Silanes, F. L., & Schwienbacher, A. (2021). Fintech and access to finance. *Journal of Corporate Finance*, 101941.

Cumming, D., Deloof, M., Manigart, S., & Wright, M. (2019). New directions in entrepreneurial finance. *Journal of Banking and Finance*, 100, 252–260.

Dholakia, R. R., & Kshetri, N. (2004). Factors impacting the adoption of the Internet among SMEs. *Small Business Economics*, 23(4), 311–322.

Giones, F., & Brem, A. (2017). Digital technology entrepreneurship: A definition and research agenda. *Technology Innovation Management Review*, 7(5).

Kavuri, A. S., & Milne, A. (2019). FinTech and the future of financial services: What are the research gaps?

Kolokas, D., Vanacker, T., Veredas, D., & Zahra, S. A. (2020). Venture Capital, Credit, and FinTech Start-Up Formation: A Cross-Country Study. *Entrepreneurship Theory and Practice*.

Ughetto, E., Rossi, M., Audretsch, D., & Lehmann, E. E. (2019). Female entrepreneurship in the digital era. *Small Business Economics*.

von Briel, F., Davidsson, P., & Recker, J. (2018). Digital technologies as external enablers of new venture creation in the IT hardware sector. *Entrepreneurship Theory and Practice*, 42(1), 47–69.

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**Title: International evidence on the time varying propensity to pay-out Dividends; Revisiting the lifecycle theory**

**Supervisor: Carl Vandenboorn** ([c.vandenboorn@maastrichtuniversity.nl](mailto:c.vandenboorn@maastrichtuniversity.nl))

**Short text:** Pay-out policy has changed over time. Determinants of dividend policy other than earnings changes through crisis-periods & bubbles seem to have caused this. This update study re-examines for a pre- and within crisis timeframe the change in propensity to use dividends as a pay-out tool for different industries.

**References:**

Banyi, M. L., & Kahle, K. M. (2014). Declining propensity to pay? A re-examination of the lifecycle theory. *Journal of Corporate Finance*, 27, 345-366.

Brav, Alon, John R. Graham, Campbell R. Harvey, and Roni Michaely, 2005, Payout policy in the 21st century, *Journal of Financial Economics* 77, 483-527.

DeAngelo, Harry, Linda DeAngelo, and Douglas J. Skinner, 2004, Are dividends disappearing? Dividend concentration and the consolidation of earnings, *Journal of Financial Economics* 72, 425-456.

DeAngelo, Harry, Linda DeAngelo, and Rene M. Stulz, 2006, Dividend policy and the earned/contributed capital mix: A test of the lifecycle theory, *Journal of Financial Economics* 81, 227-254.

Denis, D. J., & Osobov, I. (2008). Why do firms pay dividends? International evidence on the determinants of dividend policy. *Journal of Financial Economics*, 89(1), 62-82.

Denis, D. J., & Osobov, I. (2005). Disappearing Dividends, Catering Incentives and Agency Costs: International Evidence. *Catering Incentives and Agency Costs: International Evidence* (July 2005).

Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics* 60, 3-43.

Floyd, E., Li, N., & Skinner, D. J. (2015). Payout policy through the financial crisis: The growth of repurchases and the resilience of dividends. *Journal of Financial Economics*, 118(2), 299-316.

Hauser, R. P. (2012). The firm "life-cycle" hypothesis and dividend policy: Tests on propensity to pay, dividend initiation, and dividend growth rates (Doctoral dissertation, Kent State University).

Ihejirika, P. O., & Nwakanma, P. C. (2012). An empirical analysis of the propensity to pay or not to pay dividends: A test of the life cycle theory with Nigerian data. *Oman Chapter of Arabian Journal of Business and Management Review*, 34(969), 1-14.

Kuo, J. M., Philip, D., & Zhang, Q. (2013). What drives the disappearing dividends



phenomenon?. *Journal of Banking & Finance*, 37(9), 3499-3514.

Payout Policy Through the Financial Crisis: The Growth of Repurchases and the Resilience of Dividends Eric Floyd, Nan Li and Douglas J. Skinner Chicago Booth Research Paper No. 12-01

**Starting date:** Beginning February 2021

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**Title: Media and the Stock Market**

**Supervisor: Dr. Peiran Jiao** ([p.jiao@maastrichtuniversity.nl](mailto:p.jiao@maastrichtuniversity.nl))

**Short text:** Many papers suggest that market reactions to news in media can deviate from Bayesian prescriptions. For instance, investors are prone to react to "stale news" which merely repeat previous revelations (Tetlock, 2011), and to focus on "attention-grabbing" stocks in the media rather than considering all available information (Barber and Odean, 2008). More generally, sentiments in news and online searches predict stock returns and trading volumes (Tetlock, 2007), stocks with low coverage have higher returns (Fang and Peress, 2009). Beyond traditional news media, activity in specialist chat rooms (e.g. *RagingBull*) predicts high volatility and trading volume (Antweiler and Frank, 2004), and sentiment indicators extracted from online forums and searches can predict returns (Chen et al., 2014). A growing economic literature also compares online and offline news (Gentzkow, 2011). Open questions remain in this field regarding social media: How is social media content processed? Is it processed differently from traditional online and offline news? Which models best describe the role of information from different sources? This project relies on proprietary data of media content (quantity of coverage and sentiments) to analyse the differential impacts of social and traditional news media on financial markets.

**References:**

Antweiler, W., & Frank, M. Z. (2004). Is all that talk just noise? The information content of internet stock message boards. *The Journal of Finance*, 59(3), 1259-1294.

Barber, B. M., & Odean, T. (2007). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *The Review of Financial Studies*, 21(2), 785-818.

Chen, H., De, P., Hu, Y., & Hwang, B. H. (2014). Wisdom of crowds: The value of stock opinions transmitted through social media. *The Review of Financial Studies*, 27(5), 1367-1403.

Fang, L., & Peress, J. (2009). Media coverage and the cross-section of stock returns. *The Journal of Finance*, 64(5), 2023-2052.

Gentzkow, M., & Shapiro, J. M. (2011). Ideological segregation online and offline. *The Quarterly Journal of Economics*, 126(4), 1799-1839.

Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139-1168.

Tetlock, P. C. (2011). All the news that's fit to reprint: Do investors react to stale information?. *The Review of Financial Studies*, 24(5), 1481-1512.

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**Thesis topic: Profitable trading strategies using statistical learning algorithms**

**Supervisor: Peter Schotman** ([p.schotman@maastrichtuniversity.nl](mailto:p.schotman@maastrichtuniversity.nl))

**Short text:** Once asset pricing and portfolio selection were simple. An optimal portfolio was a combination of the riskfree asset and the market portfolio, and its risk and expected returns were given by the CAPM beta. Nowadays hundreds of profitable trading strategies have been discovered that appear to outperform the market. With the advance of sophisticated statistical learning algorithms the pace of new discoveries increases.

Many strategies share common characteristics. Therefore investors have become interested in summarising the multitude of trading strategies in a few

factors.

Constructing factors has also benefited from learning techniques. Seeking exposure to particular factors is called factor investing.

Many promising trading strategies fail to deliver, however, after being discovered. This could be because many investors implement the strategy, and thereby arbitrage it away, or because the strategy was a statistical illusion from the start. The latter are called false discoveries.

These are three areas for thesis topics: (i) prediction methods for returns, (ii) factor and portfolio construction, (iii) performance evaluation. Each offers many opportunities for a thesis. Both the academic as well as the practitioner literature has abundant suggestions for new techniques and new promising strategies. Possibilities seem endless. For this you need your own creativity. For a finance thesis, the emphasis must be on the finance application, not on mathematical or statistical proofs. How useful are techniques for finance?

Two things are important for a feasible project. First, it must be possible to obtain the necessary data. Through the library the school has access to many databases. In addition the Ken French Data Library is a rich, freely available, online database on asset returns. Second, working with statistical learning techniques requires some programming skills.

Most methods are available as packages in the statistical language R. An alternative is Matlab, which also has many useful packages. When packages are available, you don't need to program the algorithms, but you must be able to use the packages. Relying solely on Excel will not be sufficient.

**References:** Below are a few recent examples of academic studies that offer some background.

DeMiguel, V., A. Martín-Utrera, F.J. Nogales and R. Uppal (2018) A Portfolio Perspective on the Multitude of Firm Characteristics, SSRN working paper 2912819.

Gu, S., B. Kelly and D. Xiu (2020) Empirical Asset Pricing via Machine Learning, *Review of Financial Studies* 33, 2223–2273.

Harvey, C. R., (2017) The Scientific Outlook in Financial Economics, *Journal of Finance* 72, 1399-1440.

Hodges, P.H., K.E. Hogan, J.R. Peterson and A. Ang (2017) Factor Timing with Cross-Sectional and Time-Series Predictors, *Journal of Portfolio Management* Fall 2017, 30-43

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**Title: Trading volume and equity prices**

**Supervisor: Sjoke Merk** ([j.merk@maastrichtuniversity.nl](mailto:j.merk@maastrichtuniversity.nl))

**Short text:** Fundamental shocks to the economy drive both the supply and demand of financial assets and their prices. Thus, any asset-pricing model that attempts that to establish links between prices and quantities such as trading volume. In fact, asset-pricing models link the joint behavior of prices and quantities with economic fundamentals such as the preferences of investors and the future payoffs of the assets. Therefore, the construction and empirical implementation of any asset-pricing model should involve both price and quantities as its key elements. Even from a purely empirical perspective, the joint behavior of price and quantities reveals more information about the relation between asset prices and economic factors than prices alone. Yet the asset-pricing literature has centered more on prices and much less on quantities. For example, empirical investigations of well-known asset-pricing models such as the capital asset pricing model

(CAPM) and its intertemporal extensions (ICAPM) have focused exclusively on prices and returns, completely ignoring the information contained in quantities. This thesis proposal aims at uncovering valuable information about price dynamics from trading volume.

**References:**

Lo and Wang (JFE2000), Lo and Wang (JF2006), Cremers and Mei (RF2008)

**Title: The Role of Ego in Investor Behavior**

**Supervisor: Katrin Gödker** (k.godker@maastrichtuniversity.nl)

**Short text:** The process of how people form beliefs is not exclusively guided by a desire for accuracy. Instead, the literature on motivated reasoning argues that desires to hold a positive self-view or to maintain a certain conviction constitute strong motives to manipulate own beliefs in a self-serving way. One of the most prominent consequences of such motives is overconfidence, i.e., the systematic overestimation of one's skills and abilities. People want to believe that they are able or skilled, for instance, due to motivational reasons (Bénabou and Tirole, 2002) or ego-utility (Köszegi, 2006), and thus deceive themselves in order to reach such beliefs. Why is this relevant? Overconfidence is an important feature in financial markets. Aggregate investor overconfidence increases market trading volume and volatility (Odean 1998). Overconfidence can also lead investors to make greater use of leverage (Barber, Huang, Ko, and Odean 2019) and has been shown to affect corporate decision making (Gervais, Heaton, and Odean, 2011, Malmendier and Tate, 2005, 2008, 2015).

Promising areas for thesis projects:

i) The "supply side" of motivated beliefs in investment settings: How do investors manage, or at least attempt to, hold such beliefs even though they obtain conflicting feedback. For example, it has been shown that a vast majority of day traders are unprofitable, and many persist despite an extensive experience of losses (Barber, Lee, Liu, Odean, and Zhang, 2020).

ii) Motives versus heuristics: When are deviations from accurate beliefs rather driven by motivation than by the more purely mechanical mistakes in inference associated to the "heuristics and biases" view (Tversky and Kahneman, 1974)?

Students will design an experiment or survey to address questions related to these two areas.

**References:**

- Barber, B. M., Huang, X., Ko, K. J., & Odean, T. (2019). Leveraging Overconfidence. Available at SSRN 3445660.
- Barber, B. M., Lee, Y. T., Liu, Y. J., Odean, T., & Zhang, K. (2020). Learning, Fast or Slow. *Review of Asset Pricing Studies*, 10(1), 61-93.
- Bénabou, R., & Tirole, J. (2002). Self-Confidence and Personal Motivation. *Quarterly Journal of Economics*, 117(3), 871-915.
- Gervais, S., Heaton, J. B., & Odean, T. (2011). Overconfidence, Compensation Contracts, and Capital Budgeting. *Journal of Finance*, 66(5), 1735-1777.
- Köszegi, B. (2006). Ego Utility, Overconfidence, and Task Choice. *Journal of the European Economic Association*, 4(4), 673-707.
- Malmendier, U., & Tate, G. (2005). CEO Overconfidence and Corporate Investment. *Journal of Finance*, 60(6), 2661-2700.
- (2008). Who Makes Acquisitions? CEO Overconfidence and the Market's Reaction. *Journal of Financial Economics*, 89(1), 20-43.
- (2015). Behavioral CEOs: The Role of Managerial Overconfidence. *Journal of Economic Perspectives*, 29(4), 37-60.
- Odean, T. (1998). Volume, Volatility, Price, and Profit When All Traders Are Above Average. *Journal of Finance*, 53(6), 1887-1934.
- Tversky, A., & Kahneman, D. (1974). Judgment Under Uncertainty: Heuristics and Biases. *Science*, 185(4157), 1124-1131.

**Title: Narrative Economics: How Investment Ideas Spread**

**Supervisor: Katrin Gödker** ([k.godker@maastrichtuniversity.nl](mailto:k.godker@maastrichtuniversity.nl))

**Short text:** Robert Shiller, Nobel laureate: "The human brain has always been highly tuned towards narratives, whether factual or not, to justify ongoing actions, even such basic actions as spending and investing. Stories motivate and connect activities to deeply felt values and needs. Narratives 'go viral' and spread far, even worldwide, with economic impact. The 1920-21 Depression, the Great Depression of the 1930s, the so-called 'Great Recession' of 2007-9 and the contentious political-economic situation of today, are considered as the results of the popular narratives of their respective times. Though these narratives are deeply human phenomena that are difficult to study in a scientific manner, quantitative analysis may help us gain a better understanding of these epidemics in the future."

Promising areas for thesis projects:

i) What kind of stories do investors tell? Exploratory analysis of common narratives used by private investors.

ii) Peer effects: How do social networks determine the types of stories told by individual investors?

Students will design an experiment or survey to address questions related to these two areas. In addition, students will have the opportunity to work with textual data already collected, using textual analysis.

**References:**

Shiller, R. J. (2017). Narrative economics. *American Economic Review*, 107(4), 967-1004.

Further readings:

Bursztyrn, L., Ederer, F., Ferman, B., & Yuchtman, N. (2014). Understanding Mechanisms Underlying Peer Effects: Evidence from a Field Experiment on Financial Decisions. *Econometrica*, 82(4), 1273-1301.

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**Title: Impact of Covid-19 on Risk-Neutral Distributions**

**Supervisor: Paulo Rodrigues** ([p.rodrigues@maastrichtuniversity.nl](mailto:p.rodrigues@maastrichtuniversity.nl))

**Short text:** The Coronavirus outbreak caused not only severe health problems but also major economic disruptions. Derivative markets allow us to estimate market implied expectations of the size of economic disruptions. One such paper that does this is "Coronavirus: Impact on Stock Prices and Growth Expectations". In this project you are asked to use the method proposed by Breeden and Litzenberger (1978) to get option implied estimations of risk-neutral distributions of major stock market indices on days before and after the implementations of lockdowns and stimulus packages. Students that want to take this topic are expected to have a basic knowledge of option pricing, be willing to do extensive data work, and be familiar with a programming language like, e.g., Matlab, R, Python.

**References:**

Douglas T. Breeden and Robert H. Litzenberger (1978): "Prices of State-Contingent Claims Implicit in Option Prices". *The Journal of Business* Vol. 51, No. 4, pp. 621-651.

Niels Joachim Gormsen and Ralph S. J. Koijen (2020): "Coronavirus: Impact on Stock Prices and Growth Expectations". University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2020-22

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**Title: Profitable trading strategies using statistical learning algorithms**

**Supervisor: Peter Schotman** ([p.schotman@maastrichtuniversity.nl](mailto:p.schotman@maastrichtuniversity.nl))

**Short text:** Once asset pricing and portfolio selection were simple. An optimal portfolio was a combination of the riskfree asset and the market portfolio, and its risk and expected returns were given by the CAPM beta. Nowadays hundreds of profitable trading strategies have been discovered that appear to outperform the market. With the advance of sophisticated statistical learning algorithms the pace of new discoveries increases. Many strategies share common characteristics. Therefore investors have become interested in summarising the multitude of trading strategies in a few factors.

Constructing factors has also benefited from learning techniques. Seeking exposure to particular factors is called factor investing.

Many promising trading strategies fail to deliver, however, after being discovered. This could be because many investors implement the strategy, and thereby arbitrage it away, or because the strategy was a statistical illusion from the start. The latter are called false discoveries.

These are three areas for thesis topics: (i) prediction methods for returns, (ii) factor and portfolio construction, (iii) performance evaluation. Each offers many opportunities for a thesis. Both the academic as well as the practitioner literature has abundant suggestions for new techniques and new promising strategies. Possibilities seem endless. For this you need your own creativity. For a finance thesis, the emphasis must be on the finance application, not on mathematical or statistical proofs. How useful are techniques for finance?

Two things are important for a feasible project. First, it must be possible to obtain the necessary data. Through the library the school has access to many databases. In addition the [Ken French Data Library](#) is a rich, freely available, online database on asset returns. Second, working with statistical learning techniques requires some programming skills. Most methods are available as packages in the statistical language R. An alternative is Matlab, which also has many useful packages. When packages are available, you don't need to program the algorithms, but you must be able to use the packages. Relying solely on Excel will not be sufficient.

**References:**

Below are a few recent examples of academic studies that offer some background:

DeMiguel, V., A. Martín-Utrera, F.J. Nogales and R. Uppal (2018) A Portfolio Perspective on the Multitude of Firm Characteristics, [SSRN working paper 2912819](#).

Gu, S., B. Kelly and D. Xiu (2020) Empirical Asset Pricing via Machine Learning, *Review of Financial Studies* 33, 2223-2273.

Harvey, C. R., (2017) The Scientific Outlook in Financial Economics, *Journal of Finance* 72, 1399-1440.

Hodges, P.H., K.E. Hogan, J.R. Peterson and A. Ang (2017) Factor Timing with Cross-Sectional and Time-Series Predictors, *Journal of Portfolio Management* Fall 2017, 30-43

**Title: Tracking portfolios**

**Supervisor: Peter Schotman** ([p.schotman@maastrichtuniversity.nl](mailto:p.schotman@maastrichtuniversity.nl))

**Short text:** A recurring question in finance research is which macroeconomic factors represent the systematic risk in stock returns. Macro variables are the ultimate sources of systematic risk. But in finance we often take a shortcut, stating that a well-diversified portfolio contains only systematic risk. But what is this systematic risk? Risks that may be of interest are economic growth, inflation, interest rates and others. We think of stock prices as the present value of future dividends. Since dividends must be related to production and consumption, returns should say something about the real economy. Unfortunately, empirical finance research usually concludes that the correlation between financial returns and macroeconomic risks is very low. One of the problems is that macroeconomic variables are subject to large measurement errors, and often only available at low frequencies such as quarterly. Early work in this area is the classic study by Chen, Roll and Ross (1986). They look at typical macroeconomic factors such as inflation, term spread, default spread, production growth and similar variables. The focus of this thesis topic is methodologically very different. The idea is to construct tracking portfolios, also called mimicking portfolios. From a time series perspective we look at how well the return on a portfolio of assets can explain the shocks in a macro variable. Which portfolio of stocks is most highly correlated with a particular macro variable? The concept of mimicking portfolios goes back to Huberman, Kandel and Stambaugh (1987). The methodology is very well documented in Lamont (2001). New applications for tracking portfolios have been explored by Lönn and Schotman (2018). What is still missing in this research is a detailed empirical analysis.

Let  $y_{it}$  be the excess returns on stock  $i$  in period  $t$ , and let  $z_t$  be shocks to some macro variable. As an approximation of such shocks we use the residuals from regressing the macro variable on a few lags. A tracking portfolio is defined by the regression

$$z_t = w_0 + \sum_i w_i y_{it} + e_{it}$$

The coefficients  $w_i$  can be interpreted as portfolio weights. They define the tracking portfolio  $Y_t = \sum_i w_i y_{it}$ . The risk premium of the factor portfolio is then the risk premium of the macroeconomic factor.

Interesting questions are:

- How much of the variance of the macroeconomic news can be explained by returns?
  - Which systematic return factors capture important macroeconomic risk?
- Systematic return factors are the risk factors identified in much of the empirical finance literature. Examples are the 5 Fama-French factors, momentum, liquidity, and volatility. Many more are listed in Harvey, Liu and Zhu (2016).
- Which macroeconomic factors are priced?
  - Most likely the portfolio weights will vary over time, and different stocks or portfolios of stocks will be important in different periods.

Methodologically this topic involves regressions with potentially many explanatory variables and time varying coefficients. It will require some machine learning techniques to do model selection in order to identify the most relevant financial market information related to macro data.

**References:**

Chen, N., R. Roll and S. Ross (1986) Economic Forces and the Stock Market, *Journal of Business* 59, 383–403.  
 Harvey, C. R., Y. Liu and H. Zhu (2016) ... and the cross-section of expected returns, *Review of Financial Studies* 29, 5-68.  
 Huberman, G., S. Kandel and R.F. Stambaugh (1987) Mimicking portfolios and exact arbitrage pricing, *Journal of Finance* 42, 1-9.  
 Lamont, O.A., (2001) Economic Tracking Portfolios, *Journal of Econometrics* 105, 161-184.  
 Lönn, R. and P.C. Schotman (2022) Empirical asset pricing with many assets and short time series, [SSRN working paper 3278229](#).

**Title: Real Estate as an Inflation Hedge**

**Supervisors:** Nils Kok ([n.kok@maastrichtuniversity.nl](mailto:n.kok@maastrichtuniversity.nl)); Piet Eichholtz ([p.eichholtz@maastrichtuniversity.nl](mailto:p.eichholtz@maastrichtuniversity.nl)); Alexander Carlo ([a.carlo@maastrichtuniversity.nl](mailto:a.carlo@maastrichtuniversity.nl)); Stefan Flagner ([s.flagner@maastrichtuniversity.nl](mailto:s.flagner@maastrichtuniversity.nl))

**Short text:** The extent to which an asset provides a hedge against inflation is an important consideration for institutional investors with indexed liabilities (i.e. defined-benefit pension funds). There are quite a few studies that investigate how stocks, bonds and real estate can provide such hedge, but most studies took place when inflation rates were still (very) high. Over the past 20 years, inflation rates have been moderate, and some would even say "inflation is dead." The question is how hedging capabilities of assets have changed over the past decades, and in particular, how that has evolved for real estate. Because even though inflation may be dead, there are many investors that fear the beast will come alive again, after the current crisis. This thesis topic studies the inflation hedging capabilities of different types of real estate, with a focus on developed economies, including REITs, commercial real estate, and the housing market. Some of the data is readily available, but some of the data will still need to be collected.

**Data Sources:**

- Housing: BIS, Case Shiller, NCREIF.
- Commercial: NCREI, MSCI/IPD.
- REITs: FTSE EPRA Nareit, GPR.

**References and background reading:**

- See "Brounen et al. 2014. Inflation Protection from Homeownership: Long-Run Evidence, 1814–2008. Real Estate Economics." for an overview and references to other relevant papers.

**Requirements:**

- Strong statistical proficiency, using R or Stata.
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**Title: Predictive regressions and extreme signals (Asset pricing)**

**Supervisor: Stefan Straetmans** ([s.straetmans@maastrichtuniversity.nl](mailto:s.straetmans@maastrichtuniversity.nl))

**Short text:** The classic approach in asset pricing towards testing return predictability is to regress (excess) returns on past returns or other publically available information (financial or macroeconomic variables, see e.g. Goyal and Welch (2008) for predictors of stock returns). In this project we would like to investigate return predictability when predictors (i.e. the 'signal') take on extreme values (spikes). For example, in foreign exchange markets Purchasing Power Parity (PPP) and Uncovered Interest Parity (UIP) constitute cornerstones of short-run and long-run exchange rate determination. However, the empirical evidence on both conditions is relatively weak. There is some long-run evidence for relative PPP (regressing nominal bilateral exchange rate changes on inflation differentials for multiyear periods). But absolute and relative PPP are characterized by serious deviations (swings in the real exchange rate) when considering higher frequency data (the short run). Empirical evidence on UIP is also relatively weak: regressing nominal bilateral changes of the spot exchange rate on lagged cross-country interest differentials typically render a negative relation instead of the expected positive relation according to the theory. We would like to investigate the empirical validity of the parity conditions above when the inflation differential or interest differential is large in absolute value (extreme). Goods (interest) arbitrage might be more worthwhile to undertake when these cross country differentials are large.

The same question can be asked about other risky asset classes like stocks, bonds, housing etc. Do extreme swings in fundamentals transfer to returns? And if so, what does it imply for return predictability? Obviously, given that regressions are by definition average relations between dependent and independent variables, one needs to resort to other methodologies. In this project, one could focus on quantile regressions or tail dependence measures like the Marginal Expected Shortfall (MES) which has been widely used to measure systemic risk of financial institutions, see e.g. Brownlees and Engle

**References:**

- Brownlees, C.T., Engle R. , 2017. SRISK: A Conditional Capital Shortfall Measure of Systemic Risk. The Review of Financial Studies 30(1), 48-79.
  - Cumparayat, P., de Vries, Casper G., 2017. Linking Large Currency Swings to Fundamentals' Shocks. Working paper.
  - Hartmann P, Straetmans S, Vries CG de., 2004. Asset market linkages in crisis periods. Review of Economics and Statistics 86 (1):313-326.
  - Welch, I., Goyal, A., 2008. A comprehensive look at the empirical performance of Equity Premium Prediction. The Review of Financial Studies 21(4), 1455-1508.
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**Title: Macro stress tests and disaster risk**

**Supervisor: Stefan Straetmans** ([s.straetmans@maastrichtuniversity.nl](mailto:s.straetmans@maastrichtuniversity.nl))

**Short text:** The aim of this project would be to assess the marginal and joint likelihood of sharp downfalls in macro variables. It is well known that financial returns and losses are nonnormally distributed. However, the frequency of sharp falls in macrovariables remains underinvestigated as to date. Very little empirical research has been done on the tail risk and the tail dependence of real variables, partly because the data frequency of these series is much lower. This implies that it is harder to make estimation and inference in the tails. This project aims to fill this gap by assessing the tail risk and the tail dependence (spillovers) of variables like GDP growth, changes in unemployment, inflation or money growth. A scant literature looks into volatility clustering of real variables (see e.g. Engle

(1982)) which is a sufficient condition for the heavy tailness of the corresponding variables. Correctly assessing the marginal and joint (spillover) likelihood of extreme downfalls in macro variables may be relevant for e.g. the asset pricing or disaster risk literature, the literature on business cycle synchronisation or for stress testing.

**References:**

- Janssen, D., de Vries, C.G., 1991. On the frequency of large stock returns: putting booms and busts into perspective. *Review of Economics and Statistics* 73, 19-24.
- Engle, R.J., 1982. Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of UK Inflation, *Econometrica*, 50 (4), pp. 987-1007.
- R.J. Barro, 2006. Rare Disasters and Asset Markets in the Twentieth Century. *121(3)*, 823-866.

**Title: Pricing of default risk in the cross-section of European stocks**

**Supervisor: Alexander Lee** ([a.lee@maastrichtuniversity.nl](mailto:a.lee@maastrichtuniversity.nl))

**Short text:** The Merton model (1974) is useful in its incorporation of market information and volatility for the prediction of financial distress and bankruptcy of exchange-listed firms unlike backward looking models like the Altman-Z or Ohlson-O scores (2014) or (1980). In this thesis-topic we are interested in finding out whether distress risk is priced in the cross-section of European stocks by looking at whether excess distress risk is rewarded by higher returns. We do so similarly to Vassalou and Xing (2004). Data acquisition can be started at a smaller scale using Factset. Background knowledge of Empirical or Mathematical Finance will help but is not a prerequisite. I am currently performing similar research on the cross-section of US stocks.

**References:**

- Merton, R. C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *The Journal of finance*, 29(2), 449-470.
- Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2014). Distressed firm and bankruptcy prediction in an international context: A review and empirical analysis of Altman's Z-score model. Available at SSRN 2536340.
- Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of accounting research*, 109-131.
- Vassalou, M., & Xing, Y. (2004). Default risk in equity returns. *The journal of finance*, 59(2), 831-868.

**Title: Can Land Price Volatility in be Managed?**

**Supervisor: Joost Pennings** ([joost.pennings@maastrichtuniversity.nl](mailto:joost.pennings@maastrichtuniversity.nl))

**Short Text:** "I would rather own all the farmland in the US than all the gold in the world." Warren Buffett (Seeking Alpha, n.d.).

Physical land can be an attractive investment for retail and institutional investors. As a atypical and relative new investment class (alternative real asset), investing in land has gained a lot of attention from the financial industry and academics. Investing in land can be risky. This risks stems amongst others from *specific pricing characteristics of land* and the *structure of land markets*. During the last financial crises parties that invested in land (such as developers, local governments, private equity) have been exposed to high volatility in land values (see media coverage in FD and FT as examples). In this thesis the central question is: why has there not been an effective risk management instrument available to manage that risk? Studying the pricing of land and the land market structure may be a start to answer this question. The student is expected to: 1) study the rich literature on Land pricing and markets, 2) to engage with stakeholders in land markets, 3) and engage with new trading platforms such as IPSX, acretrader etc. that are changing the landscape of property markets and in particular land markets.

**Reference:**

- Fabozzi, F.J., R.J. Shiller and R.S.Tunaru (2020), A 30 Years Perspective on Property Derivatives: What can be done to tame Property Price Risks? *Journal of Economic Perspectives*, Vol.34. nr. 4. 121-145.
- Bruce Bjornson (1995), "The Impacts of Business Cycles on Returns to Farmland



Investments," *American Journal of Agricultural Economics*, Vol. 77, No. 3. (Aug., 1995), pp. 566-577.

Patrick Lecomte and Will McIntosh (2006), "Designing Property Futures Contracts and Options Based on NCREIF Property Indices, *Journal of Real Estate Portfolio Management*; May-Aug 2006; 12, 2; ABI/INFORM Global pg. 119

Richard E. Just; John A. Miranowski, "Understanding Farmland Price Changes," *American Journal of Agricultural Economics*, Vol. 75, No. 1. (Feb., 1993), pp. 156-168.

**Title: Carbon Credit Finance Markets: What is the Future or Futures?**

**Supervisor: Joost Pennings** (joost.pennings@maastrichtuniversity.nl)

**Short text:** "The future of carbon finance; Looking ahead, carbon finance is set to drive two main streams of innovation: 1) the decarbonization of financial assets relating to the transition of carbon-intensive economic activities to low-carbon alternatives, in line with climate scenarios well below a 2°C temperature rise; and 2) the design and functioning of a sustainable financial system where economic growth is compatible with the socioeconomic changes necessary to mitigate climate emergencies and enable a balanced cycle of production and consumption of natural resources." *PineBrigde investments* 2020. "The financial sector is increasingly confident that you can put a market price on carbon emissions. The segment edged closer to the financial mainstream last week with the New York Stock Exchange debut of the KFA Global Carbon ETF, an exchange-traded fund that aims to track the performance of the world's three most liquid markets for carbon credits." *Financial Times* August 3, 2020.

In this thesis three questions will be answered: 1) how can one price carbon credits? 2) How is this related to the various carbon credit markets (market-micro structure) and the relationships between stakeholders in these markets? 3) can carbon credit markets be viable and an attractive (alternative) investment class? The student is expected to use the finance literature on market microstructure and asset pricing to gain a general understanding of pricing "credits" (work in this area is extensive) and subsequently apply and extent these frameworks to carbon credit markets. In addition the student is expected to engage with stakeholders in these markets.

**References:**

Robert Stavins 2020, "The Future of U.S. Carbon-Pricing Policy WORKING PAPER 25912 DOI 10.3386/w25912 ISSUE DATE May 2019, <https://www.nber.org/papers/w25912> EU Regulation 2019/631. (Effective 1 January 2020). CO2 emission performance standards for new passenger cars and for new light commercial vehicles. Retrieved from: [https://ec.europa.eu/clima/policies/transport/vehicles/cars\\_en](https://ec.europa.eu/clima/policies/transport/vehicles/cars_en)

EU Commission. (26 October 2018). Report From The Commission To The European Parliament And The Council. EU and the Paris Climate Agreement: Taking stock of progress at Katowice COP. Retrieved from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0716>

ICAP. (2019). Emissions Trading Worldwide: Status Report 2019. Berlin: ICAP FOEN. (n.d). Linking the Swiss and EU emissions trading schemes. Retrieved from: [www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html](http://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/emissions-trading/linking-the-swiss-and-eu-emissions-trading-schemes.html)

Zhang, Y., Harris, J., Li, J. (April 2018). China's Carbon Market: Accelerating a Green Economy in China and Reducing Global Emissions. GDAE Working Paper No. 18-01, Tufts University.

Quemin, S., Trotignon, R. (Jan. 2019). Intertemporal emissions trading and market design: an application to the EU ETS, Grantham Research Institute on Climate Change and the Environment Working Paper No. 316 ISSN 2515-5717 (Online).

World Bank Group. (2020). State and Trends of Carbon Pricing 2020. Washington, DC: World Bank.

**Title: Do inflation expectations respond to sentiment in central bank speeches**

**Supervisor: Dirk Broeders** ([d.broeders@maastrichtuniversity.nl](mailto:d.broeders@maastrichtuniversity.nl))

**Short text:** The goal of this thesis is to empirically analyze how inflation expectations

responds to speeches by members of the Governing Council and the ECB Board of Directors. Consensus inflation forecast can be used as well as market implied inflation expectations that can be derived from inflation linked bonds. You can also look at inflation linked swaps or inflation linked options although these two are traded only over-the-counter and data might not be easily accessible. The study uses Natural Language Processing (NLP) analysis. The ECB has published all speeches in an easy accessible csv format since the beginning of the ECB:

<https://www.ecb.europa.eu/press/key/html/downloads.en.html>.

**References:** Warin, T. and W. Sanger (2020), The speeches of the european central bank's presidents: An nlp study, *Global Economy Journal*, 20(2): 1-31.

**Title: An empirical assessment of the relationship between the cost of equity and realized equity returns**

**Supervisor:** Dennis Bams ([w.bams@maastrichtuniversity.nl](mailto:w.bams@maastrichtuniversity.nl)) and Alexander Lee ([a.lee@maastrichtuniversity.nl](mailto:a.lee@maastrichtuniversity.nl))

**Short text:** The Dividend Discount model, according to conventional finance theory, relates the present value of a company's equity to the discounted value of future dividend payments. The discount rate, or formally the cost of equity, represents a risk-adjustment of expected future dividends and it makes intuitive sense that the discount rate is positively related to expected future equity returns from a risk-return perspective. In this research topic we are interested in empirically assessing the relationship between the implied cost of equity and realized future returns by following the refined approach of estimating the cost of equity proposed by Hou et. al (2012), based on earlier approaches introduced by Gordon and Gordon (1997) and Gebhardt et. al (2001). Data acquisition will be done using CRSP and Compustat. Main points of interest are the robustness of the Earnings forecasts to slight model adjustments, robustness of the cost of equity estimation to different Dividend Discount model assumptions and finally how the relationship between realized returns and cost of equity can be interpreted for different approaches for estimating the earnings forecasts, Dividend Discount model assumptions and return holding periods. Data acquisition will be done using CRSP and Compustat. Knowledge of Empirical or Mathematical Finance will help but is not a prerequisite.

**References:**

Hou, K., Van Dijk, M. A., & Zhang, Y. (2012). The implied cost of capital: A new approach. *Journal of Accounting and Economics*, 53(3), 504-526.

Gebhardt, W. R., Lee, C. M., & Swaminathan, B. (2001). Toward an implied cost of capital. *Journal of Accounting Research*, 39(1), 135-176.

Gordon, J. R., & Gordon, M. J. (1997). The finite horizon expected return model. *Financial Analysts Journal*, 53(3), 52-61.

**Title: Discrimination in lending: taste-based versus statistical discrimination**

**Supervisor:** Jaap Bos ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** When banks make lending decisions, are they pricing risk ... or basing their decisions on a biased, discriminatory view? And ... how can we distinguish between the two? In this project, you look at discrimination in lending decisions. This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Ferguson, M. F. and S. R. Peters (1995). What constitutes evidence of discrimination in lending? *The Journal of Finance* 50(2), 739-748.

- Shaffer, S. (1996). Evidence of discrimination in lending: An extension. *The Journal of Finance* 51(4), 1551-1554.

**Title: Discrimination in lending: an AIgorithmic approach**

**Supervisor:** Jaap Bos ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** Fintech has changed the way we make lending decisions. But ... has it lowered discrimination in lending? Can algorithms discriminate? And if so, how do they do

it? This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Bartlett, R., A. Morse, R. Stanton, and N. Wallace (2019). Consumer-lending discrimination in the fintech era. Technical report, National Bureau of Economic Research.
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**Title: Discrimination in lending: Redlining ... or silver lining?****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** What is true of the individual, is not necessarily true of the group that individual belongs to. And ... vice versa. But how does that 'simple' wisdom affect lending decisions? In this project, you look at the impact of redlining in banking. This project requires an above average interest in banking, and in quantitative methods.

**References:**

- Tootell, G. M. (1996). Redlining in Boston: Do mortgage lenders discriminate against neighborhoods? *The Quarterly Journal of Economics* 111(4), 1049– 1079.
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**Title: Finding your banking market****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** In many empirical analyses, especially when we are measuring competition, we need to define the market in which firms operate. Are banks active nationally, in a certain city or in a state. In this project, you will research cross-elasticities, and think creatively of empirical methods to delineate markets. Great project for a student who likes microeconomics and banking.

**References:**

- Bikker, J.A. and J.W.B. Bos (2008). *Bank Performance: a theoretical and empirical framework for the analysis of profitability, competition and efficiency*, <https://www.routledge.com/Bank-Performance-A-Theoretical-and-Empirical-Framework-for-the-Analysis/Bikker-Bos/p/book/9780415569613>.
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**Title: What can we learn from simulating treatment effects?****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** Identifying the causal effect of a certain (policy) change in an empirical (regression) analysis is far from easy. All kinds of problems can appear that make things difficult: endogeneity, omitted variables, multicollinearity, etc. In this project, we want to investigate how we can assess the bias in treatment effects by simulating processes where we know that treatment cannot be properly identified.

**References:**

- <https://www.mostlyharmlesseconometrics.com>
- 

**Title: Efficient Justice for All****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** As part of a large EU project, we are conducting comparative analyses of the efficiency of courts in the EU. For this thesis, you will contribute to this analysis, by analyzing an existing EU database with the aim of estimating efficiency. The project requires above average affinity with programming.

**References:**

- <https://www.cost.eu/actions/CA20131/>
- 

**Title: Scope for Scope, Product Mix Economies in Banking****Supervisor: Jaap Bos** ([j.bos@maastrichtuniversity.nl](mailto:j.bos@maastrichtuniversity.nl))

**Short text:** Scope Economies are the missing element in most productivity analyses in

banking (and in many other sectors). In practice, however, there is plenty of evidence that the importance of scope economies is growing. For this project, you will first compare existing approaches to measuring scope economies in banking and then perform your own analysis on a large data set of US banks.

**References:**

- <https://usfi-new.wp.hum.uu.nl/wp-content/uploads/sites/232/2015/09/Boot-The-Future-of-Banking-European-Economy-2017.pdf>
  - <https://www.sciencedirect.com/science/article/pii/0304393284900412>
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**Title: Is it really not about the money? Belief elicitation in the domain of socially responsible investment****Supervisor:** Bin Dong ([b.dong@maastrichtuniversity.nl](mailto:b.dong@maastrichtuniversity.nl))**Short text** (explaining the topic or extra information about the topic):

Trillions of dollars are invested in socially responsible businesses. However, the true underlying mechanism for investors' socially responsible investment is yet unknown. Students can investigate investors' beliefs towards an ESG (environmental, social, governance) fund in an incentivized lab experiment or a field experiment or a survey. Novel methods can be designed to formally evaluate their beliefs about the fund's return and risk for, for example, both short-run (1 year) and long-run (3 years), updating of belief in the face of positive and negative return information, and perception of the level of ambiguity. The findings will contribute to the understanding of why investors hold high ESG investments and to the design of relevant policies.

**References:**

- Agrawal, A. and Hockerts, K. (2021). 'Impact investing: review and research agenda', *Journal of Small Business & Entrepreneurship*, vol. 33(2), pp. 153–181.
- Bauer, R. and Smeets, P. (2015). 'Social identification and investment decisions', *Journal of Economic Behavior & Organization*, vol. 117, pp. 121–134.
- Hong, H. and Kacperczyk, M. (2009). 'The price of sin: The effects of social norms on markets', *Journal of financial economics*, vol. 93(1), pp. 15–36.
- Kahneman, D. and Miller, D.T. (1986). 'Norm theory: Comparing reality to its alternatives.', *Psychological review*, vol. 93(2), p. 136.
- Ellsberg, D. (1961). 'Risk, ambiguity, and the savage axioms', *The quarterly journal of economics*, pp. 643–669.
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**Title: Housing markets and loss aversion in the long run****Supervisor:** Piet Eichholtz ([p.eichholtz@maastrichtuniversity.nl](mailto:p.eichholtz@maastrichtuniversity.nl))

**Short text:** Housing has historically been a dominant component of overall private wealth, but its effects on economic decision-making and outcomes is not yet fully understood. Specifically, there are three research questions that urgently need attention, and for which the data that is required to help get to an answer has become available. That implies there are three theses to be written about this. Kahneman and Tversky have introduced the concept of loss aversion. Subsequent researchers have found that this – beside other aspects of behavioral economics – plays an important role in stock and option trading, as well as in housing markets. However, that research invariably looks at short-term historic data. The purpose of the second thesis topic is to look at loss aversion and the disposition effect in housing transaction in the very long run, based on a large set of data for Amsterdam. This is a rather ambitious topic. Looking evidence of loss aversion is not very difficult in itself, but the idea is to link different datasets, allowing for an analysis of issues that may affect loss aversion, like age, gender, capital losses or gains in other segments of the investment portfolio, economic experience, and the question whether house sellers bought or inherited the home. This topic requires quite a bit of analytical skill.

**References:** Eichholtz & Lindenthal, 2019. Kahneman & Tversky, 1974, 1979. Bokhari, Sheharyar, & Geltner. 2011. Crane & Hartzell. 2010. Genesove & Mayer. 2001.

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**Title: Risicobereidheid en investeringsgedrag in de sociale woningbouw****Supervisor: Piet Eichholtz** ([p.eichholtz@maastrichtuniversity.nl](mailto:p.eichholtz@maastrichtuniversity.nl))

**Short tekst:** Woningcorporaties zijn cruciaal om de Nederlandse woningmarkt nog enigszins betaalbaar te houden. Maar hun businessmodel staat onder druk. Ze zijn door de gestegen woningprijzen steeds vermogender geworden, maar door de lage huren die ze ontvangen hebben ze niet genoeg investeringsruimte om al hun doelstellingen te realiseren. Aanzienlijke investeringen in nieuwbouw, renovatie en duurzaamheid zijn nodig. Dit zet de financiële continuïteit onder druk. De financiële bewegingsruimte van woningcorporaties is een belangrijke factor voor de investeringen die nodig zijn om aan de maatschappelijke doelstellingen te blijven voldoen. Hoeveel risico is een corporatie bereid te nemen om die doelstellingen te realiseren? De risicobereidheid van de bestuurders is daarbij cruciaal.

In de wetenschappelijke literatuur omtrent risicobereidheid zijn verschillende technieken uitgewerkt om voorkeuren op het gebied van risico inzichtelijk te maken (Becker et al., 2020, May; Dohmen et al., 2005; Dohmen et al., 2011). Deze techniek maakt een kwalitatief onderwerp – de risicobereidheid van individuen – inzichtelijk en meetbaar. De doelstelling van dit onderzoeksproject is daarop voort te bouwen en een tool te ontwikkelen om dit meer systematisch aan te pakken. De onderzoeksmethode is kwalitatief-kwantitatief: door middel van een gevalideerde enquête op basis van de wetenschappelijke literatuur kan de student de risicobereidheid van bestuurders gestandaardiseerd meten en vergelijken. Finance Ideas heeft hier al ervaring mee en heeft een zeer sterk netwerk binnen de sociale woningsector. Dat zorgt voor een goede response op de enquête. Met de uitkomsten van deze enquête kan worden bepaald welke woningcorporaties bereid zijn om meer risico te nemen. En op welke doelstellingen nemen zij het meeste risico? Ook kan worden getest of risicobereidheid zich vertaalt in ander investeringsgedrag en/of financiële prestaties. Daarvoor kan gebruik worden gemaakt van databases die al in eigendom zijn van Finance Ideas, dus toegang tot excellente data is gegarandeerd.

**Literatuur:** Becker, A., Enke, B., & Falk, A. (2020, May). AEA Papers and Proceedings (Vol. 110, pp. 319-23). Dohmen, T. J., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2005). Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Journal of the European economic association, 9(3), 522-550.

**Title: The inflation protection from rental housing****Supervisor: Piet Eichholtz** ([p.eichholtz@maastrichtuniversity.nl](mailto:p.eichholtz@maastrichtuniversity.nl))

**Short text:** Institutional investors all over the world are increasingly looking at residential real estate as an investment opportunity, triggered by the recent performance of these assets, but also increasingly by the reappearance of inflation risk. However, it is not clear whether rental housing has been a good performer over the longer run, and its performance as an inflation risk is also unclear. Much of the research on housing market performance involves owner-occupied homes, not rental homes.

It is possible to create a total return series for Dutch housing going back to the beginning of the 20th century. This series can then be compared with long-run series for government bonds and stocks (already created at Maastricht University) to perform a solid inflation-hedging analysis over different time periods, investment horizons, and for expected and unexpected inflation. This project does involve some data grunge work: the archive consists of typed lists with rent, price, taxes/costs and address / lot size + sale types for all properties. Students will first have to digitize the data for part of the later decades of the 20th century and the two decades of the 21st. Total returns for 1900-1973 are already available, and students can use these too, to create a 120-year-long index. Given the solid empirical foundation of the research, this project has the potential for a very strong thesis.

**Literature:** Brounen, Eichholtz, Straetmans, Theebe, Real Estate Economics, 2014.

**Title: Inflation protection from your own home**

**Supervisor: Piet Eichholtz** ([p.eichholtz@maastrichtuniversity.nl](mailto:p.eichholtz@maastrichtuniversity.nl))

**Short text:** Inflation is picking up all over the world, and it seems here to stay. The question is what that means for the real value of income and wealth. For many households, the main store of wealth is their own home, so a key question is whether that value is protected in real terms. The thesis research would use house price data from the bank for International Settlements, and combine it with inflation data from the IMF or from national statistics bureaus to investigate whether changes in house prices are related to inflation, both expected and unexpected, and both over the short term and the longer term. This is a straightforward empirical thesis for which the data is easily available and the level of the required quantitative depth is limited.

**Literature:** Brounen, Eichholtz, Straetmans, Theebe, Real Estate Economics, 2014.

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**Title: Extracting meaningful information out of machine learning techniques**

**Supervisor: Hugo Schyns** ([h.schyns@maastrichtuniversity.nl](mailto:h.schyns@maastrichtuniversity.nl))

**Short text:** Machine learning techniques have gained a lot of attention in the last few years, due to the increasing importance of big dataset and cloud computing, among other reasons. These methods, despite being very powerful, are often referred to as "black boxes", because of the lack of interpretability provided by their output. The thesis will consist in picking a Machine Learning application to a Financial problem of your choice and to uncover the behaviour of the ML method.

For example, in a portfolio theory application, the results obtained via a ML technique might be quite similar to those obtained with more common and traditional methods such as momentum, high/low B/M ratio...

I am also willing to supervise students that are interested in the field of Financial Econometrics and Machine Learning (with a finance focus, obviously).

**References:**

Basturk, N., Schotman, P. C., & Schyns, H. (2021). A Neural Network with Shared Dynamics for Multi-Step Prediction of Value-at-Risk and Volatility. Available at SSRN 3871096.

Fischer, T., & Krauss, C. (2018). Deep learning with long short-term memory networks for financial market predictions. *European Journal of Operational Research*, 270(2), 654-669.

Gu, S., Kelly, B., & Xiu, D. (2020). Empirical asset pricing via machine learning. *The Review of Financial Studies*, 33(5), 2223-2273.

Kelly, B. T., & Xiu, D. (2021). Factor Models, Machine Learning, and Asset Pricing. *Machine Learning, and Asset Pricing* (October 15, 2021).

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**Title: Time-varying betas: methods and implications**

**Supervisor: Hugo Schyns** ([h.schyns@maastrichtuniversity.nl](mailto:h.schyns@maastrichtuniversity.nl))

**Short text:** Stock betas are often assumed, for the sake of simplicity, to be constant over time. However, empirical evidence has shown that the market risk exposure of individual stocks tends to vary over time. That is where time-varying betas come into play. The goal of the thesis will be to investigate the different methods used to estimate time-varying betas and see whether the relaxation of the constant market exposure assumption provides any benefits or not.

Existing methods together with potential fresh ideas (using Machine Learning techniques?) will be compared and analysed. Reasonable coding skills will be necessary for this project (in R, preferably).

**References:**

Andersen, T. G., Bollerslev, T., Diebold, F. X., & Wu, G. (2006). Realized beta: Persistence and predictability. In *Econometric Analysis of Financial and Economic Time Series*. Emerald Group Publishing Limited.

Bollerslev, T., Engle, R. F., & Wooldridge, J. M. (1988). A capital asset pricing model with time-varying covariances. *Journal of political Economy*, 96(1), 116-131.

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**Title: What is the impact of climate related disasters on investment decisions?**

**Investment portfolios? (Sustainable Finance)****Supervisor: Flavio De Carolis** ([f.decarolis@maastrichtuniversity.nl](mailto:f.decarolis@maastrichtuniversity.nl))

**Short Text:** Nowadays, the impact of climate change is impacting 85% of the world population. Rare disasters related to climate change are increasing in frequency and magnitude and there is an enhanced interest towards their impact on investments decisions. How do companies and managers which are hit by disasters react to these events? To pursue a master thesis in this field you can either approach the topic purely empirically or more qualitatively. If you decide for the former, you can retrieve your data using for instance text analysis (on CEO's speeches, Annual Reports etc.) or GIS software (using satellite images or maps) and complement this with other financial and non-financial data. You are free to decide which method to apply depending on the data you will work with (Panel data, Time series or Cross section data). If you are interested in the topic and want to go for a more qualitative approach, you might investigate your research question for instance leveraging on several Annual reports, CEO's speeches etc.

**Sources:**

Alok, S. Kumar, N. Wermers, R. 2020 Do Fund Managers Misestimate Climatic Disaster Risk? The Review of Financial Studies Vol. 33No. 3March DOI: <https://doi.org/10.2139/ssrn.3427903>

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**Title: To which extent do ESG patents impact firms' fundamentals? (Sustainable Finance)****Supervisor: Flavio De Carolis** ([f.decarolis@maastrichtuniversity.nl](mailto:f.decarolis@maastrichtuniversity.nl))

**Short Text:** One of the ways we can tackle climate change is through innovation. Many technologies which are currently under development aim at capturing carbon emissions, developing climate friendly fuels or at storing energy which is generated using renewable resources etc. What is the impact of these innovations on asset prices? Are they generating profits? Do they impact asset prices? To pursue a master thesis in this field you can either approach the topic purely empirically or more qualitatively. You are free to decide which method to apply depending on the data you will work with (Panel data, Time series or Cross section data). If you are interested in the topic and want to go for a more qualitative approach, I am glad to hear your proposal.

**Sources:**

Cohen, L. Gurun, U. Nguyen Quoc,. 2022 ESG-Innovation Disconnect: Evidence from Green Patenting, NBER Working Papers

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**Title: (Un)equal access to housing wealth****Supervisor: Jonas Wogh** ([j.woogh@maastrichtuniversity.nl](mailto:j.woogh@maastrichtuniversity.nl))

**Short text:** Homeownership is the most important source of wealth accumulation for households. However, a growing body of evidence suggests that different groups of society earn different returns on their real estate, which leads to significant wealth gaps. The reasons for these disparities can be widespread, ranging from differences in bargaining skills over differences in location choice to outright discrimination. In this project, you will investigate inequalities in real estate markets and their significance for wealth accumulation. This topic can be approached from many different angles and you will be given sufficient flexibility in choosing your preferred one.

**References:**

- Avenancio-Leon, C., & Howard, T. (2019). The assessment gap: Racial inequalities in property taxation. Available at SSRN 3465010.
  - Goldsmith-Pinkham, P., & Shue, K. (2020). The gender gap in housing returns (No. w26914). National Bureau of Economic Research.
  - Kermani, A., & Wong, F. (2021). Racial Disparities in Housing Returns (No. w29306). National Bureau of Economic Research.
  - Bhutta, N., & Hizmo, A. (2021). Do minorities pay more for mortgages?. The Review of Financial Studies, 34(2), 763-789.
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**Title: House prices – fundamentals or bubble?****Supervisor: Jonas Wogh** ([j.woogh@maastrichtuniversity.nl](mailto:j.woogh@maastrichtuniversity.nl))

**Short text:** The development of residential real estate prices – especially their rapid increase in some urban markets – has been far up on the political agenda in recent years. It has also evoked bleak memories from the run-up to the global financial crisis, which was preceded by rapidly surging house prices. This raises the important question of whether the current trend reflects another (credit-driven) bubble or whether it is instead driven by economic fundamentals, such as geographic supply constraints or growing labour demand in urban regions.

In this project, you will begin by reviewing the literature on house price fundamentals and their historic importance. Then, you will engage in an empirical analysis of median house prices in different regional (sub-)markets, in order to identify whether unequal trends can be explained by certain economic fundamentals.

**References:**

- Saiz, A. (2010). The geographic determinants of housing supply. *The Quarterly Journal of Economics*, 125(3), 1253-1296.
  - Chodorow-Reich, G., Guren, A. M., & McQuade, T. J. (2021). The 2000s housing cycle with 2020 hindsight: A neo-kindlebergerian view (No. w29140). National Bureau of Economic Research.
  - Favara, G., & Imbs, J. (2015). Credit supply and the price of housing. *American Economic Review*, 105(3), 958-92.
  - Black, A., Fraser, P., & Hoesli, M. (2006). House prices, fundamentals and bubbles. *Journal of Business Finance & Accounting*, 33(9-10), 1535-1555.
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**Title: Energy Poverty****Supervisor: Linde Kattenberg** ([l.kattenberg@maastrichtuniversity.nl](mailto:l.kattenberg@maastrichtuniversity.nl))

**Short text:** Energy prices are currently rising at a fast pace. Although the current shock was unexpected, we know that energy prices will rise in the future due to governmental policy aimed at reducing fossil fuel use. For households, this means that their energy bill can become an ever-larger burden. Especially households living in homes with low energy-efficiency are vulnerable to energy price fluctuations, and 'energy poverty' is becoming a more prominent problem. In this thesis, you will identify households that are living in energy poverty. You can make use of survey results of a representative sample of Dutch households that include questions on living conditions, and on demographic characteristics of the tenants. What are the characteristics of households living in energy poverty and how are they affected by future changes in energy prices? You will also investigate their barriers towards energy efficiency investment, and how these barriers can be lifted in order to make them more resilient to future energy price fluctuations.

**Data sources:** - Household survey data, for example Housing section of LISS panel.

**References:**

- Allcott, H., Knittel, C., & Taubinsky, D. (2015). Tagging and targeting of energy efficiency subsidies. *American Economic Review*, 105(5), 187-91.
  - Borenstein, S., & Davis, L. W. (2016). The distributional effects of US clean energy tax credits. *Tax Policy and the Economy*, 30(1), 191-234.
- Requirements: Statistical proficiency, using R or Stata.
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**Title: Benchmark shopping behavior for global pension funds in alternative asset classes (i.e., private equity, hedge funds, real assets, private debt)****Supervisor: Alexander Carlo** ([a.carlo@maastrichtuniversity.nl](mailto:a.carlo@maastrichtuniversity.nl)), **Piet Eichholtz, Nils Kok**

**Short text:** Maastricht University's Finance Department works with CEM, the leading global database regarding pension fund investments. CEM has shared its entire investment database, mapping the investments of about 1,000 pension funds worldwide for the last 30 years. This database is a research treasure, and CEM allows a selected group of students to do research with it under the guidance of Maastricht University



professors Eichholtz, Kok, and Ph.D. candidate Alexander Carlo. This topic focuses on whether global pension funds engage in benchmark shopping behavior when reporting the benchmark-adjusted performance of their investments in alternative asset classes. Performance measurement of less-liquid, non-traded assets is challenging, especially at the point of benchmark selection. This implies that managers have much more discretion in the benchmark selection procedure, which opens the door for agency problems. Previous studies by Ludovic Phalippou have documented that private equity buyout funds engage in strategic benchmark selection by selecting and switching between benchmarks to claim outperformance. If you choose this thesis topic, you will study whether this behavior can also be observed for one of the following asset classes: private equity, hedge funds, real assets, and private debt. The first step is to map all the benchmarks of the global pension funds used in the CEM database. Towards this end, we have already extracted the benchmarks for each asset class to ensure you can get started immediately. Finally, you will apply empirical models to analyze determinants of engaging in this benchmark shopping behavior. For example, consider variables like plan type (public vs. private), country of origin, investment cost levels, investment style, pension fund size, etc. Data sources: - CEM data.

**References and background reading:**

These studies have extensively used the CEM database before:

- Andonov, Eichholtz & Kok (2015, Journal of Financial Markets) and Andonov, Eichholtz & Kok (2013, Journal of Portfolio Management).
- Phalippou, L., An Inconvenient Fact: Private Equity Returns & The Billionaire Factory (2020). University of Oxford, Saïd Business School, Working Paper, Available at SRN: <https://ssrn.com/abstract=3623820>
- Phalippou, L., 2014, Performance of buyout funds revisited?, Review of Finance 18, 189– 218. Requirements: - Statistical proficiency, using R.

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**Title: Benchmark shopping behavior for global pension fund public equity/fixed income investments**

**Supervisor: Alexander Carlo** (a.carlo@maastrichtuniversity.nl), **Piet Eichholtz, Nils Kok**

**Short text:** Maastricht University's Finance Department works with CEM, the leading global database regarding pension fund investments. CEM has shared its entire investment database, mapping the investments of about 1,000 pension funds worldwide for the last 30 years. This database is a research treasure, and CEM allows a selected group of students to do research with it under the guidance of Maastricht University professors Eichholtz, Kok, and Ph.D. candidate Alexander Carlo. This topic focuses on whether global pension funds engage in benchmark shopping behavior when reporting the benchmark-adjusted performance of their investments in traditional asset classes. Performance measurement of less-liquid, non-traded assets is challenging, especially at the point of benchmark selection. This implies that managers have much more discretion in the benchmark selection procedure, which opens the door for agency problems. Previous studies by Ludovic Phalippou have documented that private equity buyout funds engage in strategic benchmark selection by selecting and switching between benchmarks to claim outperformance. However, no studies look at benchmark selection behavior in the traditional asset classes (i.e., stocks and fixed income). If you choose this thesis topic, you will study whether this behavior can also be observed for one of the traditional asset classes. The first step is to map all the benchmarks of the global pension funds used in the CEM database. Towards this end, we have already extracted the benchmarks for each asset class to ensure you can get started immediately. Finally, you will apply empirical models to analyze determinants of engaging in this benchmark shopping behavior. For example, consider variables like plan type (public vs. private), country of origin, investment cost levels, investment style, pension fund size, etc. Data sources: - CEM data.

**References and background reading:**

These studies have extensively used the CEM database before:

- Andonov, Eichholtz & Kok (2015, Journal of Financial Markets) and Andonov,

Eichholtz & Kok (2013, Journal of Portfolio Management).

- Phalippou, L., An Inconvenient Fact: Private Equity Returns & The Billionaire Factory (2020). University of Oxford, Saïd Business School, Working Paper, Available at SRN: <https://ssrn.com/abstract=3623820>
  - Phalippou, L., 2014, Performance of buyout funds revisited?, Review of Finance 18, 189– 218. Requirements: - Statistical proficiency, using R.
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**Title: Climate risk and commercial real estate market**

**Supervisor: Dongxiao Niu** ([dongxiao.niu@maastrichtuniversity.nl](mailto:dongxiao.niu@maastrichtuniversity.nl))

**Short text:** Climate risks are rapidly emerging as a factor relevant not just to policymakers, but also to the investment community and financial markets. Due to the immobility of assets, (commercial) real estate markets are especially vulnerable to climate risks. Natural disasters, including hurricanes, floods, storms, and wildfires, pose a significant risk to existing assets and the health of the local economy. With more frequent and severe climate events serving as a tangible reminder, investors are increasingly assessing the effects of climate risk on commercial real estate values. In this thesis, you will identify properties that are located in high-risk areas in terms of climate vulnerability. You can make use of commercial property transaction sample in the Netherlands to examine the pattern of commercial properties' market performance facing climate risks. What would be the change in property values in high-risk area with more frequent climate shocks? What are the major drivers of these changes? What are the characteristics of investors buying and selling commercial properties in high-risk area? You can also investigate the local economic vibrancy after climate shocks, and how these spillover effect can play a role in commercial real estate market evolution.

**References:**

- Addoum, J. M., Eichholtz, P. M. A., Steiner, E., & Yönder, E. (2021). Climate Change and Commercial Real Estate: Evidence from Hurricane Sandy. SSRN Electronic Journal.
- Fisher, J. D., & Rutledge, S. R. (2021). The impact of Hurricanes on the value of commercial real estate. *Business Economics*, 56(3), 129–145.
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**Title: Climate risk and housing affordability**

**Supervisor: Dongxiao Niu** ([dongxiao.niu@maastrichtuniversity.nl](mailto:dongxiao.niu@maastrichtuniversity.nl))

**Short text:** The presence of climate risk impacts housing market in a comprehensive way. Home owners and investors start to incorporate various strategies to price and manage climate risks. In this thesis, you will begin by conducting a literature review for climate change and housing market. Then you will identify houses that are located in high-risk areas in terms of climate vulnerability. You can make use of housing transaction sample in the Netherlands to examine the changes of housing price facing climate risks. How does the price of homes facing more climate risks or experiencing more frequent climate shocks compare to similar homes with lower risks? How do the price changes compare for homes of different sizes, energy efficiency, and location attributes? To the extent that housing prices are higher for climate-resilient homes, what would the impact of climate shocks have on the affordability of housing in the Netherlands? You can also investigate how housing prices and affordability differ between regions or submarkets, e.g., urban and rural area, strong and weak market.

**References:**

- Bernstein, A., Gustafson, M. T., & Lewis, R. (2019). Disaster on the horizon: The price effect of sea level rise. *Journal of Financial Economics*, 134(2), 253–272.
- Bosker, M., Garretsen, H., Marlet, G., & van Woerkens, C. (2019). Nether Lands: Evidence on the price and perception of rare natural disasters. *Journal of the European Economic Association*, 17(2), 413-453.
- Giglio, S., Maggiori, M., Rao, K., Stroebel, J., & Weber, A. (2021). Climate change and long-run discount rates: Evidence from real estate. *The Review of Financial Studies*, 34(8), 3527–3571.
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**Title: Does Culture Affect Outcomes in Finance and Banking?****Supervisor: Stefanie Kleimeier** ([s.kleimeier@maastrichtuniversity.nl](mailto:s.kleimeier@maastrichtuniversity.nl))**Short text:**

Today, societies, markets and companies are faced with globalization through the increasing interdependence between countries, economies and peoples. Regarding the consequences of this globalization process, proponents of convergence theory argue that globalization will lead to homogenization in individual decision-making and to transnational standardization of markets and economies. In contrast, proponents of divergence theory argue that regional differences have their roots in national culture, which has allowed these differences to persist over a long period of time and may continue to exist in the future despite the pressures of globalization. Thus, the theory of divergence predicts that economic, financial or business-related characteristics should continue to vary widely across countries even in a globalized economy, and that cultural characteristics can explain these unique national characteristics.

Guiso et al. (2006) describe the research area of "cultural economics" from the premise that for individuals - through religion or ethnicity - culture is largely a "given" and not easily changed. Culture, in turn, influences economic decision-making. For example: In cultures with high levels of trust, banks may be less likely to require collateral or guarantees from borrowers because they have confidence in the borrower's intention to repay the loan. Cross-border mergers may be more successful if the managers of the different business units are accustomed to the same corporate culture regarding power and hierarchy in management decision-making. Investors may have a strong preference for domestic stock and bond portfolios if they feel culturally very different from the foreign markets in which they might invest.

Reuter (2011) and Karolyi (2016) discuss different approaches to measuring culture and provide an overview of different areas of research. Their studies show that a wide variety of analysis is possible on this topic and that many questions remain unanswered. In a thesis, students can examine the impact of culture at different levels, ranging from (1) manager/investor decision-level analyses, (2) firm-level analyses, to (3) country-level analyses. Here are some examples of cultural studies in finance: Heuchemer et al. (2009) and Sander et al. (2016) are examples of country studies that show how cultural differences between countries affect cross-border banking. Note that the data used in these two studies are now publicly available in Table 6.2 of the BIS Locational Banking Statistics and may well be used by students in their own graduate research. - Costa et al. (2013) is an example of a country-level analysis and illustrates how national culture affects the underpricing of IPOs. - Orij (2010), Holderness (2016), and Díez-Esteban et al. (2019) and Choi (2020) are examples of firm-level analyses and illustrate how national culture affects the level of social disclosure, ownership structures, dividend payments, corporate risk-taking, and research and development (R&D) investment, respectively. Note that the aforementioned study by Holderness (2016) was published in a special issue of the Journal of Corporate Finance on the link between culture and finance. More related studies can be found in this special issue. It should also be noted that the Journal of Banking and Finance has published numerous articles on national culture and financial decision-making of investors, banks and corporations over the past few years. Go to <https://www.sciencedirect.com/journal/journal-of-banking-and-finance> and search "national culture" or simply "culture." For example, articles link national culture to trading in financial markets (Tan et al, 2019), firms' capital structure (Ghoul et al, 2019), their cost of debt capital (Chui et al, 2016), the maturity of debt capital (Zheng et al, 2012), or cash holdings (Chen et al, 2015).

Please note that during the last couple of years, several SBE students have investigated this topic with specific focus on the effect of cultural differences on the performance of cross-border M&A. Thus, new thesis proposals on this specific sub-topic will not be accepted.

**Sources for national-level cultural data:**

Hofstede's Cultural Dimensions: <https://geerthofstede.com/research-and-vsm/dimension-data-matrix/> or <http://globe.bus.sfu.ca/>

World Value Survey: [www.worldvaluessurvey.org](http://www.worldvaluessurvey.org)

European Values Study: <https://europeanvaluesstudy.eu/>

European Social Survey: <http://www.europeansocialsurvey.org/>

Sources for cross-border banking data at the national level:

BIS Locational Banking Statistics, Table 6.2:

<https://www.bis.org/statistics/bankstats.htm?m=6%7C31%7C69>

### Literature:

- Chang, M., Chang, B., & Dutta, S. (2020). National culture, firm characteristics, and dividend policy. *Emerging Markets Finance and Trade*, 56(1), 149-163.
- Chen, Y., Dou, P. Y., Rhee, S. G., Truong, C., & Veeraraghavan, M. (2015). National culture and corporate cash holdings around the world. *Journal of Banking & Finance*, 50, 1-18.
- Choi, K. S. (2020). National culture and R&D investments. *The European Journal of Finance*, 26(6), 500-531.
- Chui, A. C., Kwok, C. C., & Zhou, G. S. (2016). National culture and the cost of debt. *Journal of Banking & Finance*, 69, 1-19.
- Costa, B. A., Crawford, A., & Jakob, K. (2013). Does culture influence IPO underpricing?. *Journal of Multinational Financial Management*, 23(1), 113-123.
- Díez-Esteban, J. M., Farinha, J. B., & García-Gómez, C. D. (2019). How does national culture affect corporate risk-taking?. *Eurasian Business Review*, 9(1), 49-68.
- El Ghouli, S., Guedhami, O., Kwok, C. C., & Zheng, Y. (2019). Collectivism and the costs of high leverage. *Journal of Banking & Finance*, 106, 227-245.
- Guiso, L., Sapienza, P., & Zingales, L. (2006). Does culture affect economic outcomes?. *Journal of Economic Perspectives*, 20(2), 23-48.
- Heuchemer, S., Kleimeier, S., & Sander, H. (2009). The determinants of cross-border lending in the Euro Zone. *Comparative Economic Studies*, 51(4), 467-499.
- Holderness, C. G. (2017). Culture and the ownership concentration of public corporations around the world. *Journal of Corporate Finance*, 44, 469-486.
- Karolyi, G. A. (2016). The gravity of culture for finance. *Journal of Corporate Finance* 41, 610-625. Opening Article to Special Issue on Culture and Finance.
- Orij, R. (2010). Corporate social disclosures in the context of national cultures and stakeholder theory. *Accounting, Auditing & Accountability Journal*, 23(7), 868-889.
- Reuter, C. H. (2011). A survey of 'culture and finance'. *Finance*, 32(1), 75-152.
- Sander, H., Kleimeier, S., & Heuchemer, S. (2016). The resurgence of cultural borders during the financial crisis: The changing geography of Eurozone cross-border depositing. *Journal of Financial Stability*, 24, 12-26.
- Tan, G., Cheong, C. S., & Zurbrugg, R. (2019). National culture and individual trading behavior. *Journal of Banking & Finance*, 106, 357-370.

**Title: The role of sustainability in financial decision-making.**

**Supervisor: Frederique Bouwman** ([f.bouwman@maastrichtuniversity.nl](mailto:f.bouwman@maastrichtuniversity.nl))

**Short text:** Sustainability is becoming more important every day. Even in business, more standards regarding sustainable actions are emerging. There are many rules that must be followed, but many uncertainties remain about how exactly to follow them. Because measuring sustainability and thus monitoring sustainability is very difficult, it is important to gain better insight into sustainable choice behavior.

This thesis track focuses on investor preferences and considerations. This can be either the individual investor or individuals making investment choices within a company. The individual investor is the financier of business activities. Without financing, no business. Therefore, it is of strategic importance for the management of an organization to understand the consideration of the individual investor. That way, it can make a balanced choice in pursuing financial and sustainability goals. In addition, there is freedom within an organization for management to make certain investment choices. Also at this level, it

is important to identify how certain sustainability decisions are made, and what the drivers behind these choices are.

In this thesis track, you will explore why people choose sustainability, or why not.

Sustainability can manifest itself in the form of investments, but also in taking the train instead of the car or separating waste. Motivation for sustainable action can be interpreted from different perspectives. Both intrinsic and extrinsic motivation can move people to act sustainably. Extrinsic motivation can involve various forms of compensation. With intrinsic motivation you could consider personal characteristics, experiences, origin and background to have an influence.

An important question is what "price" people are willing to pay for acting sustainably. This price can be financial, social or personal. Does everyone see it as a price, and thus a negative utility, or would the price of acting unsustainably be perceived to be higher?

Methods: Since it is a broad topic, it can be researched in a variety of ways. Among the possibilities are: interviews, surveys, experiments but there are also data sets available online that can be analyzed. So you are free to choose between quantitative or qualitative research, and to what extent you want to proceed statistically and econometrically.

**Reference:**

Edmans, A., Gosling, T., & Jenter, D. (2022). CEO Compensation: Evidence From the Field (SSRN Scholarly Paper No. 3877391). <https://doi.org/10.2139/ssrn.3877391>

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**Title: Pricing options through a modified Black-Scholes model**

**Supervisor: Yixuan Ma** ([Yixuan.ma@maastrichtuniversity.nl](mailto:Yixuan.ma@maastrichtuniversity.nl))

**Short text:** It is known that the Black-Scholes model can be modified to obtain better approximation of the fair value of financial options. One of these modifications consists in adding a parameter and compute the prices in terms of this parameter. The goal of this project would be to calibrate this parameter from call prices from different stocks in the market.

**Reference:**

A Modified Black-Scholes-Merton Model for Option Pricing by Paula Morales-Bañuelos, Nelson Muriel, Guillermo Fernández-Anaya

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**Title: Social differentiation and exclusion caused by gentrification and its influence on residential choice**

**Supervisor: Haidong Fang** ([h.fang@maastrichtuniversity.nl](mailto:h.fang@maastrichtuniversity.nl))

**Short Text:** Gentrification can lead to population migration and displacement. Higher income families move into the neighborhood with lower economic conditions, which makes the neighborhood rise to the area with higher income and better economic conditions due to the improvement, renewal and improvement of housing and other facilities. As a result, the value of houses and land rose, some of the original residents had to move out, and the social level of residents changed. Besides, the poor are still victims of the gentrification. In this new sense, however, the term "victimization" does not mean a rise in rent or eviction. They are suffering from a kind of mental injury, social differentiation and exclusion. And this kind of social differentiation and exclusion will also affect residents' choice of address.

The resulting phenomenon of segregation of dwellings in different strata of society is becoming increasingly apparent. The gentrification of the central city and the marginalization of the living space of ordinary white-collar workers and inter-provincial immigrants have led to the differentiation of urban living space. At the same time, traditional communities have completely disintegrated, urban residents generally lack a sense of belonging and security, and social differentiation and social exclusion have quietly formed.

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**Title: Economic policy uncertainty and housing price**

**Supervisor: Haidong Fang** ([h.fang@maastrichtuniversity.nl](mailto:h.fang@maastrichtuniversity.nl))

**Short text:** Concerns about policy uncertainty have intensified in the wake of the global financial crisis. Baker(2016) develop a new index of economic policy uncertainty (EPU) based on newspaper coverage frequency. Based on a hedonic model, we try to understand how EPU affect housing prices. The impact of economic policy uncertainty on housing prices is not only reflected in the demand side, but also reflected in the supply side. This means that it will not only affect people's purchase behavior, but also affect the behavior of real estate developers. Therefore, we will study the impact of economic policy uncertainty on house prices from the perspective of supply and demand. The possible impact mechanism is that people have different expectations for the real estate market at different stages. For example, in the developing real estate market, when the economic policy is unstable, people may tend to invest in real estate, because the real estate market at this time may be a relatively stable market. In addition, the uncertainty of economic policy may also squeeze out the company's innovation investment, including increasing the difficulty of loans.

**Unique Data:** China provincial EPU index. Based on machine learning method, we used 3 million pieces of text data from more than 30 newspapers in China to build the China provincial EPU index. This index can better reflect the uncertainty of China's economic policy.

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**Title: Central bank capital**

**Supervisor: Dirk Broeders** ([d.broeders@maastrichtuniversity.nl](mailto:d.broeders@maastrichtuniversity.nl))

**Short text:** In contrast to commercial banks, there are no rules or clear guidelines for central banks' capital adequacy. Although central banks cannot default as long as they have the right to issue legal tender, capital adequacy is important to be a credible, independent monetary authority over a medium-term horizon. In the coming years, central bank capital adequacy will be key because central banks' profits are under pressure following rising interest rates in response to higher inflation. In this thesis you will research the importance of central bank capital in being a credible and independent monetary authority.

**References:**

- Adler, G., P. Castro and C.E. Tovar (2012), "Does central bank capital matter for monetary policy", IMF Working Paper WP/12/60
  - Ernhagen, T., M. Vesterlund and S. Viotti (2002), "How much equity does a central bank need?", Sveriges Riksbank Economic Review, 2002:2, pp. 5-18.
  - Wessels and Broeders (2022) "On the capitalisation of central banks," De Nederlandsche Bank, Occasional Studies, Volume 20 - 4.
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**Title: Determinants of solar panel adoption**

**Supervisor: Linde Kattenberg** ([l.kattenberg@maastrichtuniversity.nl](mailto:l.kattenberg@maastrichtuniversity.nl))

**Short text:** In an effort to reduce the reliance on fossil fuels and the resulting carbon externality, different energy generating technologies play a vital role. Public debate surrounds the question of how policy can be designed to stimulate the adoption of renewable energy technologies by households. One of the most important and widely used technologies is the installation of solar panels. In this thesis, you will use solar panel adoption data and link these to neighborhood characteristics. Your analysis will focus on the determinants of solar panel installation, and on identifying potential spillover effects on other households. The insights of this thesis can be used to draw conclusions on the dynamics of investment in renewable energy technologies. The conclusions can be relevant for the design of future policies aimed at stimulating the adoption of a similar technology, e.g. heatpumps.

**Data sources:**

Solar adoption data by energy network operators  
CBS neighborhood data

**References:**

Bollinger, B. and Gillingham, K. (2012). Peer effects in the diffusion of solar photovoltaic panels. *Marketing Science*, 31(6):900–912.

Crago, C. L. and Chernyakhovskiy, I. (2017). Are policy incentives for solar power effective? evidence from residential installations in the northeast. *Journal of Environmental Economics and Management*, 81:132–151.

De Groote, O., Pepermans, G., and Verboven, F. (2016). Heterogeneity in the adoption of photovoltaic systems in flanders. *Energy economics*, 59:45–57.

**Requirements:**

Statistical proficiency, using R or Stata.

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**Title: Incentivizing home sharing?**

**Supervisor: Linde Kattenberg** ([l.kattenberg@maastrichtuniversity.nl](mailto:l.kattenberg@maastrichtuniversity.nl))

**Short text:** The average person in the Netherlands lives on 65 m<sup>2</sup>, compared to e.g. 44 m<sup>2</sup> in the UK and 46 m<sup>2</sup> in Germany. Why do the Dutch live in relatively large homes in such a densely populated country? Finding out why this is the case, and how we can encourage people to share their space more can contribute to mitigating four of the most prominent issues in today's society: poverty, energy use, the housing shortage, and loneliness.

In this thesis you will develop a survey to investigate the potential of home sharing. Why would people currently do it, or not? What would it take to make home sharing more attractive?

**References:**

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspectives on psychological science*, 10(2), 227-237.

Eichholtz, P., L. Kattenberg en N. Kok (2022). Neem prikkels tegen samenwonen weg om het woningtekort te verkleinen. *Economische Statistische Berichten*, 107(4809S), 46-50(2)

**Requirements:** Statistical proficiency, using R or Stata. Speaking Dutch is very useful.

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**Title: Taste and investor's risk perception**

**Supervisor: Xinxin Zhu** ([x.zhu@maastrichtuniversity.nl](mailto:x.zhu@maastrichtuniversity.nl))

**Short text:** Beliefs are not independent from preference. Some psychological evidence indicates that affect heuristic, a bounded rational method of information processing, would cause an individual to perceive less risk and more benefit when facing an uncertainty event (Alhakami and Slovic, 1994; Finucane et al., 2000), which is also supported by a small number of economic studies (Kempf et al., 2014; Merkle, 2022). Growing financial literature has taken taste into account, and discovered that, on the one hand, they believe investors not only value the cash flow but also value non-cash activities, such as brand perception (Billett et al., 2014; Larkin, 2013), social impact (Heeb et al., 2022) and home bias (Graham et al., 2009), and so on; on another hand, taste could influence asset price, (Fama and French, 2007) propose that due to taste, CAPM fail to explain asset return. Under preference-based belief formation and updating, however, one of the most important unanswered questions in the financial field is how taste influences investors' risk perception, a crucial aspect of subjective belief distributions, as well as a fundamental question to understand individual choice behavior.

**Reference:**

Alhakami, A.S., Slovic, P., 1994. A Psychological Study of the Inverse Relationship Between Perceived Risk and Perceived Benefit. *Risk Analysis* 14, 1085–1096.

Billett, M.T., Jiang, Z., Rego, L.L., 2014. Glamour brands and glamour stocks. *Journal of Economic Behavior & Organization* 107, 744–759.

Fama, E.F., French, K.R., 2007. Disagreement, tastes, and asset prices. *Journal of Financial Economics* 83, 667–689.

Finucane, M.L., Alhakami, A., Slovic, P., Johnson, S.M., 2000. The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making* 13, 1–17.

Graham, J.R., Harvey, C.R., Huang, H., 2009. Investor Competence, Trading Frequency, and Home Bias. *Management Science* 55, 1094–1106.

Heeb, F., Kölbel, J.F., Paetzold, F., Zeisberger, S., 2022. Do Investors Care About Impact? Kempf, A., Merkle, C., Niessen-Ruenzi, A., 2014. Low Risk and High Return – Affective Attitudes and Stock Market Expectations. *European Financial Management* 20, 995–1030.

Larkin, Y., 2013. Brand perception, cash flow stability, and financial policy. *Journal of Financial Economics* 110, 232–253.

Merkle, C., 2022. The Affect Heuristic and Financial Expectations: Risk, Return, and ESG.

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**Title: Economics of the green data center****Supervisor: Minyi Hu** ([minyi.hu@maastrichtuniversity.nl](mailto:minyi.hu@maastrichtuniversity.nl))

**Short text:** High energy consumption has been a long-time headache for data centers. Reports by the Securities Exchange Commission (SEC), which plans to require public companies including data centers to disclose their annual greenhouse gas emissions and the climate risk their businesses face, have aroused awareness of the sustainability problem of the data center. Is adopting innovative green technologies able to help data centers meet the requirement for sustainability trends? According to a recent report by JLL, which survey their corporate leaders with data center property in their portfolio, 71% of them are willing to pay premiums for those properties with green credentials. In this thesis, you can make use of the most representative green certificate data from USGBC, and the micro-level property characteristics and financial performance data from the Costar database, to identify whether there are rental premiums and sales premiums for the data center that already acquire a green certificate. Is it still profitable to get a certificate nowadays? Is the financial performance of green data centers grow faster than their non-green counterparts? After writing this thesis you will have a deeper understanding of how the green certificate affects the financial performance of the data center.

**Data sources:**

- Costar database, USGBC green building certificate.

**References:**

- Eichholtz, P., Kok, N. and Quigley, J.M., 2010. Doing well by doing good? Green office buildings. *American Economic Review*, 100(5), pp.2492-2509.
- Eichholtz, P., Kok, N. and Quigley, J.M., 2013. The economics of green building. *Review of Economics and Statistics*, 95(1), pp.50-63.

**Requirements:**

Statistical proficiency, using R or Stata.

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**Title: Economics of the green shopping mall****Supervisor: Minyi Hu** ([minyi.hu@maastrichtuniversity.nl](mailto:minyi.hu@maastrichtuniversity.nl))

**Short text:** Retail buildings are usually the largest energy consumers in the real estate industry. The 40 largest shopping centers in the UK consume £40 million of energy every year. On average, reducing energy consumption by 20% will have an equivalent impact of a 5% increase in sales for the retail tenant. This means that owners might have huge benefits from energy savings through green leasing and adopting green technology. For example, escalators in shopping malls and automatic lighting in parking lots can save a lot of energy consumption every year. However, current evidence of the rent premium of environmentally-friendly buildings over brown buildings is only focused on the office sector, and research on the retail sector is still scant. Whether the initial green investment in retail properties can have a premium return is going to affect the owner and property management's sustainability adoption decision.

It is predictable that retail properties may also see the same rent gap between green properties and brown properties once the tenants are willing to pay a premium for the environmental attribute of the property. By making use of the green certificate data from USGBC, and the micro-level property characteristics and financial performance data from the Costar database, This thesis will study the following questions: How many shopping centers in the United States have already green certified? What characteristics do they



have? Will the green investment in shopping malls have a premium on leasing rents and trading prices and how much is it? This thesis can help you get a better understanding of the application of green labels in the U.S. retail industry.

**Data sources:**

- Costar database, USGBC green building certificate.

**References:**

- Eichholtz, P., Kok, N. and Quigley, J.M., 2010. Doing well by doing good? Green office buildings. *American Economic Review*, 100(5), pp.2492-2509.
- Eichholtz, P., Kok, N. and Quigley, J.M., 2013. The economics of green building. *Review of Economics and Statistics*, 95(1), pp.50-63.
- Kahn, M. E., & Kok, N. , 2014. Big-Box retailers and urban Carbon emissions: The case of Wal-Mart. *National Bureau of Economic Research*. (No. w19912)

**Requirements:**

Statistical proficiency, using R or Stata.

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**Thesis topic: Long-term volatility forecasts**

**Supervisor: Peter Schotman** ([p.schotman@maastrichtuniversity.nl](mailto:p.schotman@maastrichtuniversity.nl))

**Short text:** Many forecasting models are initially developed for short-term prediction. Taking volatility as an example, the most popular models predict one day ahead. But for many purposes, mostly risk management, we are more interested in longer term forecasts. The same problem occurs with other risk measures, for example Value-at-Risk. With daily data we estimate a model for the probability of a large downfall the next day, but financial regulations often call for risk assessments over a longer horizon.

Two main approaches exist to generate longer-term forecasts when the underlying data are available at a higher frequency. One, the indirect approach, takes the one-day model and derives longer-term forecasts from that model. The alternative is the direct approach, where a new model is developed for each new horizon. Both methods have their pro's and con's. See, for example, Ghysels et al. (2019) or Marcellino et al. (2006).

The thesis can take several perspectives. One approach could be to compare the different models for a few volatility series, updating the results in Ghysels et al. (2019). Another option relates to recent work in Baştürk et al. (2022). They use a Neural Network approach with multiple outputs, one for each forecast horizon, fed by hidden layers with neurons common to all horizons. For a thesis different data and different models can be compared. A third direction for a thesis on this topic is the search for predictive factors that are relevant for multiple horizons. The famous example is the HAR model of Corsi (2009), which takes the volatility of the last day, last week and last month as predictive variables for all forecast horizons.

Data are available for the Oxford-Man Institute and other sources.

This is a reasonably quantitative thesis topic which will require some familiarity with coding in R or related platforms.

**References:**

- Baştürk, N., P. Schotman, and H. Schyns (2022): "A Neural Network with Shared Dynamics for Multi-Step Prediction of Value-at-Risk and Volatility," SSRN WP 3871096.
  - Corsi, F. (2009): "A Simple Approximate Long Memory Model of Realized Volatility," *Journal of Financial Econometrics*, 7, 1-23.
  - Ghysels, E., A. Plazzi, R. Valkanov, A. Rubia, and A. Dossani (2019): "Direct Versus Iterated Multiperiod Volatility Forecasts," 11, 173-195.
  - Marcellino, M., J. Stock, and M. Watson (2006): "A comparison of direct and iterated multistep AR methods for forecasting macroeconomic time series," *Journal of Econometrics*, 135, 499-526.
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**Thesis topic: Inflation hedging**

**Supervisor: Peter Schotman** ([p.schotman@maastrichtuniversity.nl](mailto:p.schotman@maastrichtuniversity.nl))

**Short text:** After many years of low inflation, inflation is back as an important risk factor. Time to re- consider the hedging properties fo different financial instruments. More

specifically you will look at the relation between interest rates and inflation at different horizons. Starting point is the classic study by Fama and Schwert (1977). For interest rates the big question is what happens to the real interest rate in times of high inflation, or high inflation expectations.

More references are available depending on the specific research question to be developed for the thesis.

**References:**

Fama, E. and G. Schwert (1977): "Asset Returns and Inflation," Journal of Financial Economics, 5, 115–146.

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**Thesis topic: Is gold a safe haven?**

**Supervisor: Dirk Broeders** (d.broeders@maastrichtuniversity.nl)

**Short text:** Gold plays an important role in geopolitics, in financial markets and it is an important element of global monetary reserves for central banks. Gold is perceived to be a hedge for inflation risk and in times of crisis gold is conjectured to perform well as it forms a safe haven. Some claim that gold returns should be positively correlated with Bitcoin return as the latter can be seen as the new gold. Gold is however also a very risky investment as its price fluctuates significantly over time. In this thesis you will explore one or more of the alleged properties of gold.

**References:**

Baur, D. and Th. McDermott (2010) Is gold a safe haven? International evidence, Journal of Banking & Finance 34(8): 1886-1898.

Baur, D. and L. Hoang (2021) The Bitcoin gold correlation puzzle, Journal of Behavioral and Experimental Finance 32, 100561

Beckmann, J. and R. Czudaj (2013) Gold as an inflation hedge in a time-varying coefficient framework, The North American Journal of Economics and Finance, 24: 208-222

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**Thesis topic: New Insights into Shareholder Activism on Sustainability Issues**

**Supervisor: Jeroen Derwall** (j.derwall@maastrichtuniversity.nl)

**Short text:** Shareholder activism has a long history in the United States, especially focusing on corporate governance issues such as takeover defenses, board composition and compensation. Although activism on 'social policy' issues has existed since to 70s, it has recently gained substantial momentum (as seen through the numbers of shareholder proposals submitted to firms, the withdrawal rates, and voting outcomes). The impact of these "environmental and social" (ES) proposals on firms' environmental/social behavior and value drivers has been underexplored. This proposal addresses this gap. There are several types of research questions that currently attract attention:

1. How do firms perform financially (or behave socially or environmentally) after having been targeted by shareholder proposals / shareholder engagements?
2. What factors affect the likelihood that ES shareholder engagement is successful?

Thesis proposals could address a specific aspect of one of these research questions.

**References:**

Grewal, Serafein, Yoon (2016). Shareholder activism on sustainability issues. SSRN paper: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2805512](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2805512)

Wei, J. (2020). Environmental, Social and Governance Proposals Shareholder Activism. Journal of Portfolio Management. SSRN paper version:

[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2798943](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2798943)

Bauer, Derwall, Tissen (2021). Corporate Directors Learn from Environmental Shareholder Engagements. SSRN paper:

[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3981634](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3981634)

Tkac, P. (2006) One Proxy at a Time. Pursuing Social Change through Shareholder Proposals. Federal Reserve Bank of Atlanta Economic Review.

[https://fraser.stlouisfed.org/files/docs/publications/frbatreview/rev\\_frbatl\\_2006\\_v91no3](https://fraser.stlouisfed.org/files/docs/publications/frbatreview/rev_frbatl_2006_v91no3).

[pdf](#)

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**Thesis topic: Marketing Excellence Index Fund – A Marketing-Finance Approach**

**Supervisor: André Tomano** ([andre.tomano@maastrichtuniversity.nl](mailto:andre.tomano@maastrichtuniversity.nl))

**Short text:** Homburg et al. (2020) describe Marketing Excellence (MXC) as firm activities that shape the organization, market, and environment. They develop a 218 words MXC dictionary to identify firms with MXC in their respective letters to shareholders.

They use this approach to build portfolios to analyse firm value implications. They base their reasoning on the shareholder value concept (Srivastava et al., 1998) and argue that strategic marketing concepts such as MXC can drive firm value, as shareholders can assume that firms with MXC deliver sustainable quality and value to their customer on the long-term. Overall, the MXC portfolio reveals significant abnormal returns of up to 8.58% compared to benchmark portfolios, such as 'marketing capabilities' and 'market orientation' in the period from April 2000 through June 2018.

Similar to an Index Fund or ETF that tracks the MSCI WORLD ESG Index (e.g. iShares MSCI World ESG Screened UCITS, ISIN: ETFIE00BFNM3J75), the idea is to build an Index Fund or ETF based on MXC firms.

In this thesis, the following questions will be answered:

- 1) Definition of Investment Universe
- 2) Analyses of Competitive Landscape
- 3) Develop Portfolio Construction & Selection Methodology
- 4) Backtest Strategy Performance
- 5) Create Marketing Plan

**References:**

Homburg, C., Theel, M., Hohenberg, S. (2020), Marketing Excellence: Nature, Measurement, and Investor Valuations, *Journal of Marketing*, 84(4), 1-22.

Srivastava, R., Shervani, T., Fahey, L. (1998), Market-Based Assets and Shareholder Value: A Framework for Analysis, *Journal of Marketing*, 62, 2-18.

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