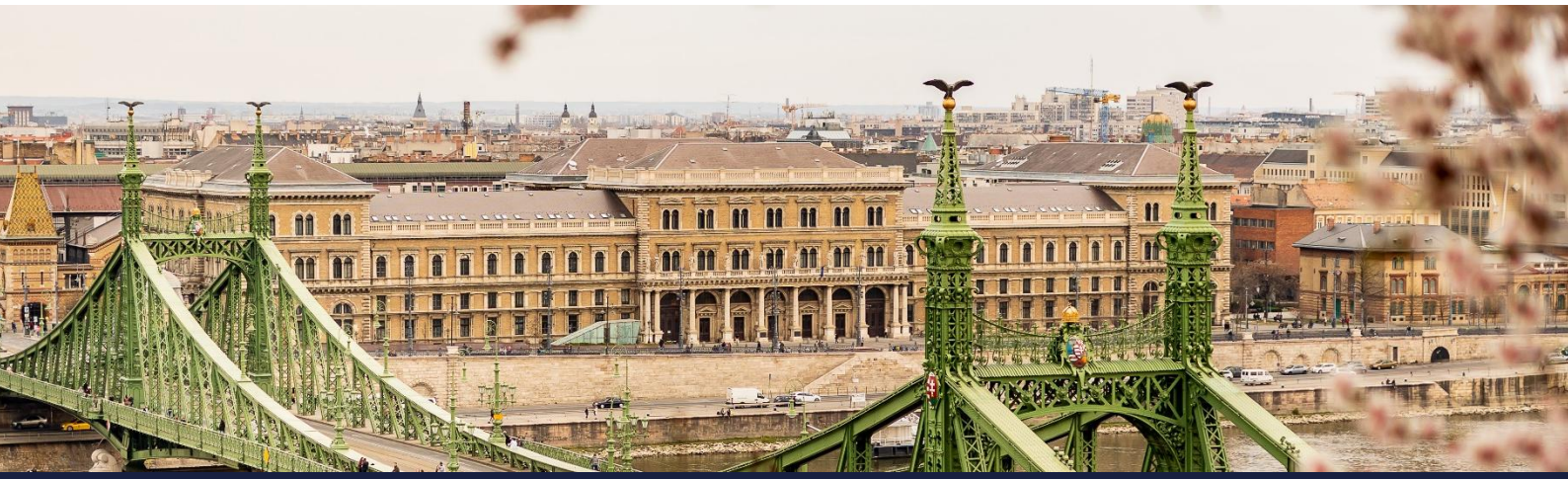
CORVINUS UNIVERSITY of BUDAPEST

16th Annual Financial Markets and Liquidity Conference

15th – 17th October, 2025

Budapest



BOOK OF ABSTRACTS

16th Annual Financial Markets and Liquidity Conference
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Editors: Gergely János Czupy and Emilia Németh-Durkó

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Welcome from the Organizing Committee

Dear Participants,

It is our pleasure to welcome you to the 16th Annual Financial Markets and Liquidity (AFML) Conference, hosted by the Institute of Finance at Corvinus University of Budapest.

We are especially delighted to gather in person once again this year and to mark the occasion with a new name: transitioning from "Financial Markets Liquidity" to "Financial Markets and Liquidity". This change signifies more than a shift in title, it reflects our continuing commitment to bringing together academics and practitioners to advance cutting-edge research in financial markets, the diverse dimensions of liquidity, and their broader societal implications, including sustainability.

This year's conference has attracted a record number of high-quality submissions across all fields of finance, enabling us to present a rich and wide-ranging program. Alongside the general sessions – organized into three parallel streams – we are pleased to host several distinguished special sessions, including those on AI and Machine Learning, Climate Finance, Household Finance, and Mathematical Finance with Game Theory.

The AFML Conference offers a unique opportunity to connect, expand, and strengthen our professional community. We are proud to welcome more than 200 participants, including many esteemed returning contributors. In addition to regular presentations, this year's program also introduces *Flash Talks* – dynamic sessions that highlight emerging themes, where researchers present concise and creative ideas to editors from leading journals.

We are deeply grateful to our distinguished keynote and invited speakers, presenters, participants, and session chairs for their invaluable contributions. Our sincere appreciation also goes to our sponsors for their continued support, with special thanks to the Scientific Mecenatura Grant of the National Research, Development and Innovation Office. We warmly thank to the members of the Scientific Committee and our colleagues at the Institute of Finance, including but not limited to those from the secretariat – Ildikó Beri and Margit Hajnal – for their tireless efforts, as well as our partners from the Game Theory Research Group at the ELTE Centre for Economic and Regional Studies, the Department of Finance at ESSEC Business School, and the Faculty of Economics at Eötvös Loránd University. Their dedication and commitment have been instrumental in ensuring the smooth organization of this conference.

We encourage all participants to engage fully, contributing to the open, productive, and interactive environment that has always defined AFML.

We wish you an inspiring and rewarding 16th Annual Financial Markets and Liquidity Conference, and we look forward to welcoming you again at the 17th AFML Conference in 2026.

Péter Csóka, Barbara Dömötör, András Fülöp, Zsuzsa Réka Huszár, Jiyuan (Justin) Huang, Lilla Judit Keresztúri, Anita Lovas, Helena Naffa, Emilia Németh-Durkó, and Admilson Veloso da Silva.

Organizing Committee, 16th AFML Conference

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Keynote Speakers

A Century of Market Reversals: Resurrecting Volatility

Jeffrey Pontiff

Inventory models posit that return autocorrelation is affected by collateral, volume, and expected volatility. Unlike previous literature, we document a strong role of volatility on market return autocorrelation, which is elevated on negative return days, consistent with collateral concerns. Anticipated volume, not volume shocks, drive reversals. Sparked by these findings, we construct a liquidity risk factor in accordance with Pastor-Stambaugh (2003) that is volatility, not volume, based. The volatility-based factor is more robust and has a higher risk premium than the volume-based factor.

Expectations in Asset Pricing

Andrea Vedolin

Prices in financial markets are shaped by investors' expectations, as the value of an asset today reflects expectations about its future payoffs and the price at which it can later be sold. This talk explores the role of expectations in asset pricing, emphasizing how different models of belief formation affect exchange rates, the term structure of interest rates, and other key asset prices.

Speakers

A Bayesian Gaussian Process Dynamic Factor Model

Tony Chernis, Niko Hauzenberger, Haroon Mumtaz, Michael Pfarrhofer

We propose a dynamic factor model (DFM) where the latent factors are linked to observed variables with unknown and potentially nonlinear functions. The key novelty and source of flexibility of our approach is a nonparametric observation equation, specified via Gaussian Process (GP) priors for each series. Factor dynamics are modeled with a standard vector autoregression (VAR), which facilitates computation and interpretation. We discuss a computationally efficient estimation algorithm and consider two empirical applications. First, we forecast key series from the FRED-QD dataset and show that the model yields improvements in predictive accuracy relative to linear benchmarks. Second, we extract driving factors of global inflation dynamics with the GP-DFM, which allows for capturing international asymmetries.

A Comprehensive Machine Learning Framework for Dynamic Portfolio Choice with Transaction Costs

Luca Gaegauf, Simon Scheidegger, Fabio Trojani

We propose a comprehensive machine learning framework for solving dynamic portfolio choice problems involving multiple risky assets, general transaction costs, and constraints on borrowing and short-selling. Our approach begins with a novel characterization of irregularly shaped no-trade regions, which we use in conjunction with Gaussian process regression and Bayesian active learning to efficiently approximate the value and policy functions. This combination enables us to tackle higher-dimensional portfolio problems - both in terms of the number of risky assets and the inclusion of conditional state variables - beyond the capabilities of existing methods, opening the bridge to a new generation of scalable portfolio optimization tools.

A Greenwashing Index

Elise Gourier, Hélène Mathurin

We construct a novel, news-based index that captures the salience of greenwashing in media coverage. The index reveals several episodes of heightened attention to greenwashing, with the most recent surge driven by growing skepticism toward the financial sector—particularly regarding sustainable assets. We show that this increase in greenwashing salience tends to follow a period of heightened confusion about how to measure corporate sustainability and evaluate the risk and returns of sustainable investments. Furthermore, this peak in greenwashing salience is followed by a rise in negative sentiment toward ESG-related issues. Finally, we examine mutual fund flow responses to changes in greenwashing salience and document differences in investor behavior: institutional investors increase allocations to funds with high sustainability ratings—consistent with elevated signaling concerns—while retail investors respond primarily to past fund performance.

A Parametric Approach to Real Estate Investing: Integrating Quality and Climate Risk

Massimo Guidolin, Milena Petrova

We construct optimal real estate portfolios using a parametric approach that directly models portfolio weights as functions of asset-level characteristics. This method avoids estimating the joint distribution of returns and accommodates the non-normal return patterns often observed in real estate markets. Our model conditions on characteristics including size, book-to-market, momentum, investment, profitability, dividend yield, and firm-level climate risk exposure. The results indicate that higher profitability, combined with lower levels of dividend yield, investment intensity, and climate risk, are significant predictors of superior risk-adjusted performance. These findings are robust across different levels of investor risk aversion and persist in out-of-sample tests, underscoring the importance of incorporating both quality and climate-related factors into real estate portfolio optimization.

AI Infrastructure, Firm Value and Expected Stock Returns

Yi Zhou

This paper examines the impact of AI infrastructure on asset prices. Using large language models (LLMs) to analyze earnings call transcripts of S&P 500 firms, we construct novel firm-level measures of AI infrastructure. Firms with higher AI infrastructure earn quarterly alphas of 0.4% to 0.9% relative to firms with low AI infrastructure, after controlling for standard risk factors and anomalies. These firms are generally larger, exhibit higher Tobin's Q and R&D spending, and maintain lower future leverage. Our findings suggest that markets systematically undervalue AI infrastructure, as the expensing of intangible investments suppresses short-term earnings while generating long-term-value-consistent with the productivity J-curve (Brynjolfsson et al. (2021)).

Asset (and Data) Managers

Marco Zanotti

This paper studies the direct impact of new technologies on the asset management industry. I show that recent innovations substantially improve fund managers' ability to target product demand and attract capital inflows, with implications for the industry's structure. Exploiting information from their websites' codes, I track when fund managers start collecting and analyzing customers' data using tools like Google Analytics or A/B testing. Funds adopting such technologies attract 1.5% higher annual flows and charge higher fees, with no improvement in performance. Additionally, they expand product offerings and the effects decrease with competition, as more funds within the same fund-category adopt similar technologies. Overall, these results show that fund managers extract more value from financial markets after adopting technologies aimed to analyze customers' data – without sharing it with their own investors. This evidence highlights that technological innovation in asset management extends beyond portfolio allocation decisions to impact how funds attract and retain capital.

Bagehot's Rule, Collateral, and Solvency

Lukas Voellmy

A core tenet of central banks' emergency liquidity assistance (ELA) states that ELA should be provided only to solvent banks against sound collateral. While this guiding principle—commonly referred to as "Bagehot's rule"—is widely accepted, it raises some conceptual issues. First, the question arises as to why such secured loans cannot be provided by private lenders, especially if the crisis is not systemic. Second, assessing the solvency of a bank that requests ELA may be difficult in practice. This paper addresses these apparent blind spots of Bagehot's rule by proposing a theory of ELA where (i) collateralized emergency loans can play a stabilizing role even if banks have access to private secured funding at all times, and (ii) valuing a bank's available collateral can in some cases be sufficient to implement Bagehot's rule.

Bank Diversification and Tail Risk

Priyank Gandhi, Darius Palia, Jasper Pan

We examine the relationship between bank business line diversification and tail risk by assessing diversification across 16 business lines using a unique entropy-based measure. The results reveal that a one standard deviation increase in diversification is associated with a 2.5% reduction in tail risk in the subsequent quarter. This effect lasts up to four quarters ahead and is present in both good and bad times. Furthermore, diversified banks exhibit higher future stock returns in the next three quarters, higher profitability, lower default risk, higher change in loan supply, and lending resilience during the Great Recession. Lastly, diversification of core business lines (related diversification) is associated with lower tail risk and higher returns while diversification of noncore business lines (unrelated diversification) is not. This paper emphasizes the crucial role of diversification across business lines in mitigating tail risk and enhancing overall bank performance particularly during periods of financial instability and documents that it is related diversification that benefits banks.

Bank Runs in Large Experimental Banks

Hubert Kiss, Ismael Rodriguez-Lara, Alfonso Rosa-Garcia

We study experimentally depositor behavior during bank runs in a large bank set up. We recruited 1,500 participants to simulate bank runs in groups of 3, 30, and 750 depositors. By addressing the external validity concerns of prior research based on student samples and small groups, we uncover that panic behavior—marked by surging withdrawal rates following early withdrawals—is present across all bank sizes. Although individual withdrawal rates are consistent, outcome variability diminishes as bank size increases, with larger banks showing more deterministic behavior. Additionally, our results indicate that men and younger depositors are slightly more inclined to withdraw. These findings provide critical insights into depositor dynamics and offer valuable implications for mitigating systemic financial risk.

Bank Stability, Asset Prices, and Liquidity Regulation

Monika Bucher, Diemo Dietrich, Mich Tvede

We introduce interbank asset markets into a canonical model of bank failures driven by self-fulfilling beliefs. Such trading opportunities render the value of bank assets endogenous and dependent on the occurrence of sunspots. Interbank asset markets can facilitate the first-best allocation. However, there are also other equilibria where the first-best allocation does not obtain; occasionally (some) banks may even fail. The asset market is a potential source of multiplicity of equilibria, as beliefs about asset prices influence banks' portfolio choices, which in turn determine equilibrium asset prices. Regulation of bank liquidity can address a pecuniary externality arising from the interaction of banks' portfolio choices and equilibrium asset prices.

Biodiversity Physical and Transition Risk: the Relationship with Firm Financial Performance

Xinglin Li, Helena Naffa

This study investigates the relationship between firms' financial performance and biodiversity-related physical and transition risks over the period 2000–2023, utilizing a comprehensive dataset of all U.S. exchange-listed firms. Biodiversity physical risk is proxied by dependency ratings, while transition risk is captured through pressure ratings, both sourced from the ENCORE database. Our findings reveal that the negative association between biodiversity risk and financial performance is particularly pronounced among firms with high pressure ratings, suggesting that transition risk may materialize through increased production costs and heightened stakeholder scrutiny. Furthermore, by categorizing biodiversity dependency into three ecosystem service groups, we find that firms highly dependent on regulating and maintenance services are especially vulnerable, exhibiting a stronger negative nexus between biodiversity risk and financial outcomes. These results are robust across multiple specifications and sensitivity checks. Overall, our study contributes to the growing literature on nature-related financial risks by providing empirical evidence on how biodiversity dependencies and pressures affect firm-level performance, using one of the most comprehensive datasets to date in this field.

Credit Scoring Technology and Regime Transitions in the Non-Prime Mortgage Market

Jaime Luque

We develop an equilibrium model in which credit scoring technology (CST) reshapes the structure of the non-prime mortgage market. The model features two lending channels -- portfolio lenders (PLs), which use soft information and hold loans, and originate-to-distribute (OTD) lenders, which rely on hard information and sell loans to secondary markets. As CST precision improves, the market transitions across three regimes: PL dominance, coexistence, and OTD dominance. These shifts arise endogenously through belief updating and borrower sorting. We illustrate the model's implications using a

numerical example that maps regime transitions to stylized periods of the subprime boom. The example shows how higher approval rates and expanded credit access can result from technological change alone, even when all agents behave rationally and underwriting criteria are unchanged. The model provides a theoretical explanation for how financial innovation can mimic lax screening without requiring misreporting, manipulation, reputation or agency distortions.

Debt Maturity Choice and Aggregate Growth

Orit Milo, Jacob Sagi

We find that a measure of aggregate corporate debt maturity choices strongly predicts real GDP growth. The new measure compares well with recently explored predictors of GDP, is no less robust/stable, and is distinct from spread-related variables. We develop a novel theory of firm debt maturity choice explaining these findings: In anticipation of inefficient firm operations during non-contractible negative expected profitability states, long-term lenders charge more interest. When choosing debt maturity, firms balance this against the higher cost of refinancing short-term debt. Maturity choices are more sensitive to profit anticipation whereas default spreads are more sensitive to profit dispersion.

Eyes on ESG: Unlocking the Power of CEO Letters

Igor Lončarski, Katarina Sitar Šuštar, Aljoša Valentinčič

We examine CEO letters as an underused source of environmental, social, and governance (ESG) information for retail investors. In a controlled experiment, participants assessed the ESG standing of two firms after reading their CEO letters and, consistent with expectations, shifted their evaluations in line with the letters' characteristically optimistic tone. Individual traits mattered, as respondents with more adaptive cognitive styles and, on average, women, were better at separating strong from weak ESG performers. Attention also followed the content. When the letters included substantive ESG detail, readers concentrated on the ESG-specific sections. In its absence, they defaulted to the top opening paragraphs. Taken together, the evidence indicates that CEO letters can serve as an accessible and informative ESG signal for retail investors. We add to the ESG literature and complement prior work on CEO communication and cognitive styles.

Evaluating the Impact of Climate Risk Measures on Firm Value: A Cross-country Study Using Machine Learning Models

Seungho Lee, Christophe Schalck, Meryem Yankol-Schalck

This study examines the impact of climate risk-related scores on firm value across seven key global stock markets in the U.S., Europe, Canada, Japan, and China. Utilizing sustainability data from the London Stock Exchange Group's DataStream, we applied machine learning techniques such as Ridge Regression, Lasso Regression, XGBoost, ElasticNet, Random Forest Regressor, and LGBM Regressor. Our results indicate that the Random Forest Regressor outperforms the other models according to the performance

metrics. Additionally, SHAP (SHapley Additive exPlanations) values are used to analyze the outputs, which allows to interpret the contribution of each feature to the predictions. These findings reveal that CO2 emissions significantly influence firm value, while other sustainability factors are less impactful. This underscores the importance of standardized environmental ESG datasets and their critical role in determining firm value, further highlighting the dominant role of CO2 emissions.

Exchange-Traded Liquidity

Lars C. Larsen, Gyuri Venter, Paul Whelan

We show that depth in E-mini equity index futures, the largest futures market, is highly time varying and has seen an 80% reduction in recent years. Decomposing depth into the number of dealers offering quotes and the quote sizes they supply, we trace the reduction back to a decline in the number of active dealers. Studying this channel, we propose a model of liquidity provision where dealers are subject to participation costs and a balance sheet constraint. In line with model predictions, we show empirically that fewer active dealers implies higher absolute returns, larger price reversals, and higher volatility. Additionally, we show that dealer numbers provide information about market conditions not contained in commonly used liquidity measures.

Geopolitics Meets Monetary Policy: Decoding Their Impact on Cross-Border Bank Lending

Swapan-Kumar Pradhan, Viktors Stebunovs, Előd Takáts, Judit Temesvary

We use bilateral cross-border bank claims by nationality to assess the effects of geopolitics on cross-border bank flows. We show that a rise in geopolitical tensions between countries - disagreements in UN voting, broad sanctions, or sentiments captured by geopolitical risk indices - significantly dampens cross-border bank lending. Elevated geopolitical tensions also amplify the international transmission of monetary policies of major central banks, especially when geopolitical tensions coincide with monetary policy tightening. Overall, our results suggest that geopolitics is roughly as important as monetary policy in driving cross-border lending.

How Can a Fed Chair not be an Actor?

László Kiss Marcell, Milán Csaba Badics

This paper investigates how different verbal and non-verbal dimensions of Federal Open Market Committee (FOMC) communication affect asset prices in narrow windows on policy announcement days. We develop a novel framework based on large language models to construct four textual tone indices from FOMC statements and press conference transcripts, capturing the Fed's hawkish-dovish stance, Fed's economic sentiment, and monetary policy and economic uncertainty conveyed in the texts. In addition, we extract emotional tone from the Fed Chair's voice during press conferences using state-of-the-art Speech Emotion Recognition models. With event study regressions controlling for monetary policy stance and macroeconomic conditions, we present three main findings.

First, a more hawkish tone than expected raises equity prices, and this effect operates through a decrease in discount rate risk premia. Second, a better-than-expected economic sentiment in statements has broad expansionary effects across asset classes, driven by a lowered hedging risk premia. Third, a more positive voice tone by the Fed Chair at press conferences has effects similar to a monetary easing: it raises stock prices, lowers Treasury yields, and also helps predict future policy rate cuts. The results suggest that the central bank tone conveys additional information beyond standard numerical data releases and policy

International Financial Integration, Economic Growth and Threshold Effects: Some Panel Evidence for Europe

Guglielmo Maria Caporale, Anamaria Diana Sova, Robert Sova

This paper applies the Seo and Shin (2016) method for estimating dynamic panels with endogenous threshold effects to obtain new, robust evidence on nonlinearities in the relationship between international financial integration (IFI) and economic growth. This approach is based on a first-differenced GMM estimator which allows both the threshold variable and the regressors to be endogenous. More specifically, the present study analyses yearly data for 40 European countries from 1996 to 2021, this European focus yielding novel insights into a region with a diverse economic landscape. The IFI–growth nexus is examined using various IFI measures and thresholds reflecting country-specific characteristics, and then the analysis is extended by comparing the impact of the 2007-2009 global financial crisis (GFC) and of the Covid-19 pandemic respectively on the relationship of interest. The results provide clear evidence of nonlinearities and suggest that the effects of financial integration on economic growth vary depending on factors such as the level of financial development, trade openness, institutional quality, political and economic uncertainty, initial income, and financial openness. Further, the 2007-2009 GFC appears to have had a more significant impact than the Covid-19 pandemic.

Impeded flights in the European Sovereign Debt Crisis

Yuanyuan Gao, Per Östberg, Thomas Richter

An extensive theoretical literature and persuasive empirical evidence highlights the pervasiveness of flights in crisis times. However, this paper finds that in the European sovereign bond market, following shocks, flights are impeded and trading volume is significantly reduced by 30% relative to the previous trading week. The impediment of flights is due to decreased liquidity provision by market makers, as evidenced by increased bid-ask spreads and reduced quoted quantities. To show this, we use the fact that the same bond may be traded on both the EuroMTS market and a domestic market, where domestic markets risk bearing capacity are more affected by the shock. We find that compared to their international market counterparties, domestic market makers increase bid-ask spread more on the day of the shock and provide less depth over the next trading week, leading to the impeded flights.

Inferring the Trade Direction in Option Auctions

Leander Gayda

This study introduces a new approach for inferring the trade direction in option auctions by incorporating minimum price improvement requirements. Using a matched dataset of intraday transactions, this study shows that trades executed at a one-cent quoted spread involving fewer than 50 contracts, which are subject to a minimum price improvement of one cent, systematically buy at the bid and sell at the ask. The commonly applied quote rule misclassifies 95% of these trades. Accounting for this pattern increases the overall classification accuracy from 62% to 76%, and for options with less than one week to expiration from 56% to 81%.

Institutional Investors' Monitoring Incentives in Corporate Bonds

Itay Kedmi, Guy Lakan

We analyze the effects of a regulatory reform in Israel that mandated institutional investors to actively monitor their corporate bond investments. Using a difference-in-differences methodology, we analyze changes in institutional bond holdings across firms with varying risk profiles before and after the regulation. We uncover two main effects. First, institutional investors, on average, reduce their exposure to corporate bonds following the regulation, where monitoring is more costly. Second, conditional on choosing to invest in a bond, institutional investors tend to increase their stake in order to better capitalize on the benefits of their monitoring efforts. Both effects are more pronounced in high-risk firms, where monitoring costs are higher and the value of information is greater, making these bonds more sensitive to monitoring efforts. Importantly, we find that these patterns reverse when the regulation is suspended, reinforcing the view that institutional investors lack sufficient incentives to monitor when they hold only a small share of a bond.

Institutional Entrepreneurship at the First Joint Stock Bank in England and the Strategy of Controlling the Narrative

Plamen Ivanov, Richard Werner

The role of central banks in providing liquidity – even underpinning global financial infrastructure through their ability to provide vast liquidity at short notice – is a pivotal one in finance and international economics. In this paper we consider the creation of the first major such central bank, a landmark development in global institutional design, and the question how this happened. The Bank of England was founded in 1694 as the first joint stock bank in England with limited liability for the directors, with privileges established by law as banker to the government. Substantial resources were mobilised by institutional entrepreneurs to establish this lucrative privately-owned franchise. We critically examine the official narrative of William Paterson as the main 'founder' or 'brain' behind the establishment of the bank. Upon closer examination this narrative is revealed as a marketing strategy diverting attention from the true founders, for strategic reasons. We argue that 'controlling the narrative' was an important component of the successful

strategy by the original institutional entrepreneurs. This has implications for the business history of this firm, and for the application of institutional entrepreneurship theory in founder research. By casting new light on the origins of the pillars of liquidity provision – the central banks – we argue that further research on institutional development of financial markets is called for.

Integrating Credit and Equity Markets: A Novel Benefit of Convertible Bonds

Alexey Ivashchenko, Rex Wang Renjie

We show empirically that convertible bonds act as a bridging mechanism, facilitating the integration between a firm's debt and equity markets. While theoretical models predict a strong co-movement between corporate bond and stock returns, empirical evidence offers little support for this prediction, suggesting substantial segmentation between the two markets. We find that the issuance of new convertible bonds improves cross-market integration, whereas the pre-determined maturity of non-callable convertible bonds increases segmentation, above and beyond what can be explained by changes in default risk and other firm characteristics. Consistent with the idea that convertible bonds attract investors who seek exposure to both markets, we provide evidence that convertible bond investors are more likely to hold other securities from the same issuing firm. This suggests an increased presence of cross-market arbitrageurs, and aligns with the limits-to-arbitrage explanation for the initial segmentation between debt and equity markets.

Is the ECB's Monetary Policy Doomed to Overshoot? Consequences of Omitting Owner-occupied Housing from the HICP

Sofie Waltl

The European Union has been debating for over 20 years how to bring owner-occupied housing (OOH) into the Harmonized Index of Consumer Prices (HICP) -- the flagship measure of inflation used by the European Central Bank (ECB) to set monetary policy. We provide a solution to this problem based on a smoothed version of the user-cost method that has desirable properties and does not destabilize the HICP. We then show how our extended HICP would have helped the ECB better anticipate shocks such as the 2022 inflation by causing measured inflation to rise above the 2% target sooner. Also, our measure aligns better with the inflation experienced by households.

Knowledge and Influence: Mapping the Research Landscape across the Most Prominent Central Banks

Dalma Fekete, Eszter Baranyai, Gábor Neszveda

Understanding central bank research priorities is key to interpreting policy direction and assessing their broader influence on academic and policy agendas. Using web scraping and database integration, we construct two original datasets of 20,000 and 28,000 research papers (2000–2024) from 15 prominent central banks, selected based on research output or economic size. Text analysis and descriptive statistics reveal thematic shifts, including a decline in modelling-focused research and a rise in the focus on data.

Western central banks emphasize social issues, housing, and labour markets, while non-Western banks focus more on digitalisation and regional analysis. Central banks account for 10–20%, and in some cases up to 40%, of publications in key journals, with the Federal Reserve leading in research volume and resources. Collaboration has weakened over the past decade. These patterns reflect responsiveness to policy challenges but also highlight asymmetries in research capacity and priorities, potentially limiting global coherence and coordination.

Liquidity Risk and Labor Market via Heterogeneous Investors

Xiaoji Lin, Lin Xie, Runhuan Wang, Yucheng Yang

We study how corporate bond market liquidity shocks affect firm-level employment, and how the composition of bondholders amplifies this effect. Using panel data on U.S. firms and their bond investor base, we show that declines in bond market liquidity lead to significantly lower employment growth. The adverse effect is notably stronger for firms whose bonds are disproportionately held by mutual funds, consistent with higher investor redemption sensitivity and procyclical outflows. To interpret these findings, we develop a heterogeneous firm model with defaultable debt and investor heterogeneity. Mutual funds, with higher outflow elasticity, amplify the real effects of liquidity shocks, while insurers and pension funds act as more stable bondholders. We solve the model using deep learning techniques and use it to quantify the labor market consequences of liquidity-driven financial stress.

Liquidity Supply, Frequent Trading, and Stock Returns

Sergey Isaenko

This paper analyzes a dynamic equilibrium in a competitive economy where liquidity traders frequently trade stock shares with liquidity providers. Liquidity traders outnumber liquidity providers while facing small bid-ask spreads modeled as transaction costs. I show that differences in trading technologies between liquidity traders and liquidity providers can account for historically observed moments of stock returns. The presence of bid-ask spreads causes liquidity traders to significantly reduce their trading demand, making liquidity providers marginal investors-consequently, the stock market's conditional risk premium increases with the liquidity providers' longer stock holdings. This feedback effect leads to significantly longer average stock allocations of the liquidity providers, which incites them to demand a major decline in stock prices. This causes a multiple increase in the volatility and the risk premium of the rates of stock returns. The feedback effect between the liquidity providers' stock allocations and the conditional risk premium leads to a short-term reversal of stock returns and a positive comovement between daily changes of liquidity providers' inventory and daily stock returns. Finally, the model explains the conditional covariance between the aggregate consumption and the stock returns, the volatility of the stock returns, and the conditional Sharpe ratio.

Long-Term Implications of a Digital Euro on Liquidity and Funding Costs in the German Banking System

Ulrich Krüger, Lui-Hsian Wong

The digital euro (D€) would allow euro area residents to exchange bank deposits for digital currency, potentially causing liquidity outflows from banks and impacting financial stability. To mitigate these risks, the European Commission's legislative proposal permits the ECB to impose limits on the use of the D€ as a store of value. This study contributes to the calibration of appropriate holding limits for a D€. We examine how banks adjust their liquidity buffers and funding structures in response to the D€. We explore banks' strategies to minimise funding costs, including raising deposit rates and expanding wholesale funding, and approximate a market equilibrium. Applying our model to the German banking system, we find that with a €3,000 holding limit, the return on equity decreases by around 0.3 percentage points, and the aggregate Liquidity Coverage Ratio declines by approximately 5 percentage points in the most adverse scenario, indicating that long-term effects appear to be limited.

Mandatory CSR Spending and Stock Price Crash Risk

Simona Mateut, Shiwani Varal

We investigate the impact of mandated corporate social responsibility (CSR) expenditure on firms' stock price crash risk. Leveraging the passage of India's CSR law - requiring qualifying firms to allocate minimum 2% of their average net profits to prescribed CSR activities - as a quasi-natural experiment, we employ a difference-in-difference approach to establish causal effects. Our findings indicate an increase in crash risk for eligible firms in the post-mandate period. This result is robust to regression discontinuity design analysis and various sensitivity tests. The effects are more pronounced among financially weaker firms, those with concentrated ownership, firms located in poorer states, and those facing lower enforcement costs. Further analysis identifies heightened information opacity and bad news hoarding as key channels driving the increased crash risk.

Market Fragmentation: A Cushion Against Exchange Outages?

Hans Degryse, Björn Hagströmer, Niklas Landsberg

When disruptions are costly, engineers use redundancy to enhance resiliency. In financial markets where many exchanges compete for order flow in the same security, such redundancy may emerge as a positive side effect. We test this conjecture in a large sample of primary exchange outages in the European equity markets. Although trading remains technically possible during outages, the markets turn illiquid. The effective spread increases 7-fold and turnover drops by 96%. We find that fragmentation does not mitigate the illiquidity during outages, neither does it make for a faster recovery afterwards. This implies a missed opportunity for European financial regulation.

Maturity Choice, Debt Rollover, and Asymmetric Information

Christian Hilpert, Stefan Hirth, Jan Pape, Alexander Szimayer

This paper investigates debt maturity choices under default risk and feedback effects on competitive debt markets. Debt market investors face asymmetric information about the true asset value of the firm. In the unique Bayesian price-taking debt market equilibrium, the firm strategically delays default to signal credit quality backed by high true asset value. Subsequently, surviving apparent distress carries value: debt market investors, observing non-default, offer improved financing conditions once the firm refinances its debt. Consistent with empirical evidence, asymmetric information implies a finite optimal maturity. Higher uncertainty about its asset value leads firms to roll over debt faster.

Memory and Beliefs in Financial Markets: A Machine Learning Approach

Zhongtian Chen, Jiyuan Huang

This paper explores the role of memory in shaping belief formation of financial market participants. We estimate a structural machine learning model of memory-based belief formation applied to consensus earnings forecasts of sell-side stock analysts. The estimated model reveals significant recall distortions compared to a benchmark model trained to fit realized earnings revisions. Specifically, analysts over-recall distant historical episodes most of the time, when recent events are more useful for forming forecasts than those in the distant past, but under-recall them during crisis times, when history helps to interpret unusual events. We document two potential driving forces behind these distortions. First, analyst memory overweights the importance of past earnings and forecasts. Second, analysts are more likely to selectively forget past positive events. Our model of analyst recalls strongly predicts their earnings forecast revisions and errors, as well as stock returns, which suggests that distorted recalls might contribute to mispricing of assets in financial markets.

Modelling Contagious Bank Runs

Luitgard Veraart, Luitgard Anna Maria

We develop a modelling framework for contagion in financial networks arising from bank runs. We show how interacting channels of contagion, namely funding withdrawals in the interbank network and price-mediated contagion arising from fire sales can turn a bank run on one institution into a systemic crisis. Furthermore, we also model how contagion effects can lead to additional bank runs. Our model allows for a wide range of withdrawal mechanisms both by banks and by external depositors. It can be used for financial stress testing and particularly for analysing implications of different withdrawal mechanisms for systemic risk. We illustrate this in stylised examples and an empirical case study. We find that the extent of systemic risk is highly sensitive to the choices of withdrawal strategies used by the market participants. We also discuss policy implications.

Momentum at Long Holding Periods

Paul Calluzzo, Fabio Moneta, Selim Topaloglu

This paper examines how a unique feature of the academic definition of momentum, which is constructed with a one-month lag, can help infer which stocks will exhibit momentum in the future. We use this information to develop portfolio formation rules that maintain high exposure to momentum over long horizons. Relative to established methodologies for momentum, our proposed strategies can: (1) reduce turnover; (2) lower risk; (3) boost capacity; and (4) increase returns. Using conservative assumptions on the relation between portfolio turnover and trading costs, we estimate that these portfolio formation rules can increase the net (of trading costs) annual returns of momentum strategies by up to five percentage points and increase the resilience of momentum to post-publication return decay.

On the Core of Tree Enterprise Games

Tamás Solymosi

We introduce tree enterprise games that model multi-agent situations where cooperation is constrained by a rooted tree hierarchy. The root symbolizes a vital resource essential for the profitability of coalitions. The other nodes represent individual agents with a specific profit-making potential that may be negative. This potential can only be realized if all agents along the path to the root also participate. Accessing the vital resource incurs a fixed cost. The value of a coalition is determined by the total potential profit of its members connected to the root within the coalition, minus the fixed cost of the vital resource. Although a tree enterprise game is not necessarily superadditive, we constructively prove that, under reasonable assumptions, the core is non-empty and can be described by a linear-sized subsystem of the core constraints defined by the structure of the rooted tree. We give necessary and sufficient conditions for the underlying situation such that the core of the induced tree enterprise game is full-dimensional. We show that if all individual potential benefits are non-negative, the game is a convex game. Additionally, we demonstrate that peer group games and bankruptcy games are special non-negative tree enterprise games.

Pieces of the Index Option Return Puzzle: Some New Evidence

Rainer Baule, Florian Borchard

Returns of OTM-index-options are negative on average and do not match expectations when only the observed equity risk premium is considered. Some studies argue that either jump or volatility risk premiums provide a sufficient explanation for the puzzle. We investigate replicability of earlier conflicting results and cover new aspects, including the impact of volatility, an alternative model for jumps, and the term structure of returns, based on weekly options. Model predictions for the impact of volatility match evidence for equity options and alternative jumps do not enhance the explanation. With constant relative risk aversion adopted from previous literature, newer data and weekly options enable rejection of both jump risk and volatility risk premiums for the cross section of returns.

Private Credit: Risks and Benefits of a Maturity Wall

Rui Albuquerque, Adam Zawadowski

A maturity wall occurs in private credit funds when the fund reaches its maturity date, where it can no longer roll over its loans. Unlike banks, which are not bound by a maturity wall, private credit funds can better incentivize borrowers, albeit at the cost of inefficient liquidation. Using a model, we show that private credit not only expands access to credit but also takes business away from banks. By stealing business, it removes riskier loans from banks' balance sheets. At the aggregate level, expected payoff increases but tail events become more severe due to the potential for excessive liquidation by private creditors.

Proximity Peril: The Effects of Neighbouring Firms' Biodiversity Risk on Firm Value

Chenhao Guo, Rui Zhong

Geographically proximate firms operate in the local biosphere and rely on common ecosystem services. By constructing a new measure of biodiversity risk based on biodiversity disclosure in 10-K files, biodiversity incidents, and geographical distance, we document about 1.01% decline in a focal firm value on average upon a one-standard-deviation increase in neighboring firm's biodiversity risk measure. We confirm the causal relationship by using the Deepwater Horizon oil spill in 2010 as a natural experiment, and our results remain robust across a series of sensitivity checks. Moreover, we find that proximate firm's biodiversity risk leads to significant declines in individual-level and sector-wide value components. Additionally, the negative effects are more pronounced in industries with high dependence on local ecosystems, those invested by socially responsible investors, and those along supply chains. Our findings underscore the effect of the geographical interconnectedness of biodiversity risks on corporate value.

Redemption Fees and Gates in the Lab

Hubert Janos Kiss, Alfonso Rosa Garcia, Lukas Voellmy

Liquidity management tools—such as redemption fees (which impose a cost on withdrawals) or gates (which suspend withdrawals when they become excessive)—are commonly used in the fund industry with the aim of mitigating run behavior and reducing fund fragility. Recent attention has been paid to the fact that these tools may give rise to preemptive runs, where investors withdraw preemptively to avoid the risk of being affected by temporary redemption restrictions. Since real-market testing is not feasible, we use laboratory experiments to evaluate the effectiveness of redemption fees and gates in reducing money market fund runs, in a setting where investors may withdraw preemptively. We find that fees significantly reduce the propensity to run compared to the baseline without liquidity management tools, while gates do not lower the propensity to run. However, the effect of fees on withdrawal behavior is relatively small and takes some time to materialize. Overall, our experimental results indicate that preemptive runs are a real concern, and that liquidity

management tools are unlikely to eliminate fund fragility, which is consistent with the experience of the 2020 money market fund turmoil.

Same Same but Different: The Risk Profile of Corporate Bond ETFs

Johannes Dinger, Marcel Müller, Aleksandra Rzéznik, Marliese Uhrig-Homburg

We show that, while corporate bond ETFs systematically exhibit lower liquidity risk than the bonds they hold, they also face heightened intermediary risk. This effect is more pronounced for high-yield ETFs, for those with less liquid portfolios, and for funds reliant on weaker Authorized Participants. A stylized model reveals how partial segmentation between ETF and bond markets drives these diverging exposures. Overall, investors of corporate bond ETFs effectively trade reduced liquidity risk for increased intermediary risk, highlighting a fundamental trade-off embedded in the ETF structure.

Soft Negotiators or Modest Builders? Why Women Earn Lower Real Estate Returns

Laurent Bach

Using repeat-sales data on apartments in Sweden, we estimate the gender gap in housing returns. Transactions earn 2pp lower returns gross of renovations when executed by women rather than men; this narrows down to less than 0.5pp once returns are measured net of renovations. The residual gender gap is fully explained by the fact that women are less likely to self-select into real-estate-relevant occupations and are less able to time their moves due to old age. We cannot confirm that the gender gap stems from men's higher ability to either time the market or negotiate aggressively.

The Biggest Short: Duration in the Shadows

Ljubica Georgievska, Anthony Saunders

We uncover a fundamental dislocation in US Treasury markets arising from the Treasury's systematic failure to internalize the economic cost of its substantial short position in duration risk. This non-internalization creates little incentive for the Treasury to strategically manage duration risk despite having access to various tools including maturity choice, floating rate notes, and interest rate swaps. The problem is amplified by a fundamental asset-liability mismatch: while tax revenues exhibit floating-rate characteristics through their correlation with economic activity, the government issues predominantly fixed-rate debt, creating an unhedged duration gap. We develop a novel framework that extends existing preferred-habitat models by explicitly incorporating the US Treasury's objective function in supplying debt alongside traditional demand-side factors and arbitrageur behavior. We model how duration and refinancing risks directly influence Treasury's debt management decisions, revealing how these institutional supply elements create persistent pricing distortions that arbitrageurs cannot eliminate beyond those explained by documented habitat factors. Our framework also captures a critical asymmetry: during QE, the Treasury benefits from remittances of coupon payments on Fed-held securities (effectively receiving "interest-free borrowing"), yet

faces no corresponding penalty when rates rise and bond values decline, as the Fed absorbs these losses through deferred asset accounting. Using cross-country variation in institutional practices and Treasury bond supply quasi-experiments, we demonstrate that constrained duration risk management results in suboptimal issuance patterns and limited alternative risk transfer mechanisms. The Treasury could reduce borrowing costs by approximately 15.8 basis points through improved duration management, with benefits increasing to 22.5 basis points during stressed periods. This one-sided duration risk transfer creates asymmetric risk-return profiles in government bond markets, manifesting in systematic bond return predictability that spills over into swap markets. Our findings have important implications for Treasury debt management and financial stability amid high debt levels and rate uncertainty, as evidenced by the recent dramatic rise in long-term Treasury yields that has further magnified the economic impact of this unmanaged duration exposure.

The Influence of Manager Characteristics on Mutual Fund Performance: Does Gender Play a Role?

Anna Zsofia Csiky, Stefan Pichler

We investigate the impact of manager characteristics, particularly gender, on mutual fund performance. We find that controlling for only such attributes suggests the underperformance of female managers. However, accounting also for fund-specific variables reveals no statistically significant difference in mutual fund excess returns across genders. Our analysis shows that having a graduate degree from an Ivy League university and possessing an MBA both imply enhanced mutual fund performance. Furthermore, we provide evidence on how the performance of female fund managers compares to their male counterparts during the four recent recession periods and amid various market conditions, as well as an analysis of their risk-taking behavior and investment styles.

The Insurance Industry under COVID-19 Pandemics

Yaffa Machnes, Yochanan Shachmurorove, Roi d. Taussig

This study analyzes the impact of the Coronavirus Disease of 2019 (COVID-19) pandemic, on the insurance industry stocks, as compared with the performances of the aggregate financial market. The primary data source is the Center for Research in Securities Prices (CRSP), based at the University of Chicago. While COVID-19 increased morbidity and mortality, other pandemic-related factors that resulted benefited the industry. Using the State Space Model (SSM), the paper analyzes monthly stock prices and outstanding shares from 2001 until 2020, to assess how investor expectations shaped market behavior. In contrast to the structural downturn of the insurance industry in 2016, no such decline occurred in 2020. The surprising conclusion, and the novelty of this paper is the findings that, despite early predictions of severe underwriting losses, the insurance industry did not experience disproportionate negative impacts, relative to the broader market. Instead, this study reveals that the insurance industry has learned the lesson of the 2016, using risk-pooling mechanisms and regulations, in order to achieve financial stability.

This study contributes to the literature by providing a long-term perspective on industry resilience.

The Interoperability of Financial Data

Elif Cansu Akoguz, Tarik Roukny, Tamas Vadasz

This paper studies how data interoperability — third-party direct access to customers' financial information — affects competition and welfare in the finance sector. Our model reveals a trade-off: while sharing customer data improves competition in information intensive services like credit, it may increase prices of data-generating services like payments. We show that targeted data sharing regimes (e.g., Open Banking) preserve the ability of banks to extract surplus by shifting market power from credit to payment markets. Although some firms benefit in aggregate from increased competition, others are left worse off by changes in prices. Wider-reaching data-sharing initiatives (e.g., Open Finance) further level the playing field and diminish banks' capacity to monetize their data, reallocating surplus toward firms and alternative lenders. Our find ings underscore the need to account for cross-market spillovers when designing policies that regulate access to financial data.

The Modern Bond Market

Tomy Lee, Chaojun Wang, Adam Zawadowski

The bond market is severely fragmented. We identify a simple mechanism that counteracts this fragmentation. On modern bond trading platforms, traders can request quotes for many bonds simultaneously from dealers, then trade any subset of the requested bonds, possibly with different dealers. Such List requests comprise 73% of all requests on the largest platform. We develop a model in which traders submit Lists in order to resolve price uncertainty and choose among substitute bonds. Using requests for high-yield corporate bonds on the largest platform, we document that, in line with our model's predictions, (i) traders substitute among bonds within each List, (ii) a large fraction of unfilled bonds in Lists do not fill through other channels, (iii) substitution is stronger between bonds with similar maturities or ratings, and (iv) a List contains more close substitute bonds when their prices are more uncertain.

Through-the-Cycle PD Estimation Under Incomplete Data. A Single Risk Factor Approach

Barbara Dömötör, Ferenc Illés

Banks are required to use long-term default probabilities (PDs) of their portfolios when calculating credit risk capital under internal ratings-based (IRB) models. However, the calibration models and historical data typically reflect prevailing market conditions. According to Basel recommendations, averaging annual PDs over a full economic cycle should yield the longterm PD. In practice, the available data are often temporally incomplete – even for high-risk portfolios. In this paper, we present a method for the simultaneous calibration of long-term PDs across all sub-portfolios, based on the single

risk factor model embedded in the Basel framework. The method is suitable even for smaller, budget-constrained institutions, as it relies exclusively on the bank's own default data. A complete dataset is not required – not even for any individual sub-portfolio – as the only prerequisite is the presence of overlapping data before and after the missing values, a mild condition that is typically met in practical situations.

What is the Key Consideration in Households' Financial Decision Making in Hungary: Bargaining Position or Efficient Time Sharing?

Zsuzsa R. Huszár, Erzsébet T. Varga

Financial decisions in households can take many different forms. According to a 1990s Household Monitor survey, while the most dominant form of household decision-making in Hungary was shared decision-making, consistent with international trends, the second most common form of household financial decision-making was assigned to the wife in about 30 percent of the responses. This study revisits this important socioeconomic question using a nationwide Hungarian representative online survey conducted in December 2022, exploring various financial and social determinants beyond the usual age, education, and family status. We formally test the bargaining theory and efficient time/resource theory, the "unitary theory," and overall find that the bargaining power model is prevalent. We also find some evidence that women are less likely to assign the decision-making role to themselves on average. Interestingly, we also find some evidence of the child-centric family value, suggested by the higher likelihood of men designating the household financial decisions to their spouses when there are children in the household.

Flash Talks

A Natural Copula

Peter B. Lerner

Copulas are widely used in financial economics (Brigo 2010), (Cerubini 2016) as well as in other areas of applied mathematics. Yet, there is much arbitrariness in their choice. The author proposes "a natural copula" concept, which minimizes Wasserstein distance between distributions in some space, in which both these distributions are embedded. Transport properties and hydrodynamic interpretation are discussed with two examples of distributions of financial significance. In 2D, a natural copula can be parsimoniously estimated by linear programming methods. A discussion of the construction of multivariate copulas follows. Finally, the quality of the approximation of multivariate copula is investigated using Kolmogorov-Arnold neural network (KAN).

A New Approach to Measure Causal Network Connectedness

Milán Csaba Badics, Márton Espán

We propose a novel network representation based on the structural impulse response functions of a Structural Vector Autoregression (SVAR) model. Unlike the widely used Diebold–Yilmaz connectedness network, which is based on forecast error variance decompositions, our approach relies on causal measures derived from the structural impulse response functions. These functions capture the directional and dynamic effects of structural shocks, making the resulting network more informative. The identification of the SVAR model is performed using the LiNGAM (Linear Non-Gaussian Acyclic Model) algorithm, which enables data-driven estimation of the causal ordering among variables. Empirical comparisons show that the structural IRF-based network offers clearer, more interpretable directional relationships than the Diebold–Yilmaz approach.

An Empirical Analysis of the Impact of Natural Disasters on Financial Markets and Financial Stocks in Southeast Asia

Zsuzsa R. Huszar, Anita Lovas

In recent years, the increasing frequency of extreme weather conditions and natural disasters has given rise to a new business risk management consideration, climate risk management, which is particularly a concern in many developing economies. This study examines the impact of stock market reaction at the aggregate level and individual stock level for financial stocks in five Southeast Asian countries (ASEAN-5), Indonesia, Malaysia, the Philippines, Singapore, and Thailand, from 2000 to 2024. Event study results based on the US-listed ETFs tracking the five domestic exchanges reveal significant negative returns at the aggregate markets following natural disaster events. However, the individual stock return responses of the region's major financial and insurance firms are less clear. We document non-negative and positive returns on major financial stocks after the disasters, which could suggest relief (less negative effect than expected) or

acknowledgment of high-level preparedness after the 2004 regional tsunami event. More importantly, we find evidence of significantly lower returns on Singaporean financial stocks after regional natural disasters in the 2020-2024 subsample period, potentially capturing Singaporean financial firms' increasing regional and global economic exposure in recent years.

Capital Requirements, Credit Supply, and Real Effects on Firms

Bálint Várgedő

In this paper we estimate the impact of capital requirement (CR) changes on corporate lending and real economic outcomes using granular firm-bank data from Hungary. Leveraging detailed loan-level and firm-balance sheet information, we find significant reductions in credit supply and increases in interest rates following tighter CR, with multi-bank firms showing notably stronger immediate reactions. While firms partially offset these impacts by forming new banking relationships, aggregate firm-level effects remain substantial: a 1 percentage point increase in firm-level CR reduces corporate credit volume by 2.5–6.0% and elevates interest rates by 2.0–4.8 basis points. Real activity deteriorates significantly, with investment declining by 1.5%, sales by 1%, and employment marginally. Smaller firms and those reliant on domestic banks are disproportionately affected, whereas firms borrowing from foreign banks applying IRB methods experience milder disruptions. Our findings highlight critical trade-offs in bank capital regulation, firms' ability to adapt to new circumstances and underscore the differential vulnerability of smaller firms to credit supply shocks.

Cybersecurity Disclosure in European Companies: The Role of ESG Score and Board Characteristics

Le Ngoc Thuy Trang, Felix Buabeng-Andoh, Drahomíra Pavelková, Chune Young Chung

As cybersecurity gains prominence in European risk management and regulatory frameworks, this study investigates how board characteristics and ESG performance influence cybersecurity disclosure (CSD) among leading firms. Using a sample of the 49 largest European companies by 2023 revenue and employing a GMM regression to address endogeneity, CSD is quantified through the frequency of cybersecurity-related keywords and paragraphs in annual reports. Results indicate that longer CEO tenure and more independent directors are negatively associated with CSD, suggesting tendencies toward information conservatism and limited engagement in cyber-related transparency. Regarding board gender composition, only firms meeting or exceeding the EU's 40% female representation benchmark demonstrate significantly higher CSD. Additionally, ESG performance exhibits a strong positive effect on CSD. Notably, greater CSD also enhances firm performance when accounting for endogenous factors. This study contributes to corporate governance and ESG literature by elucidating how board dynamics shape cybersecurity transparency. It also provides practical insights for European corporate leaders in aligning cyber disclosure strategies with regulatory standards and stakeholder expectations, ultimately supporting long-term competitiveness and sustainable governance.

Credit Supply and Decarbonisation: Firm-Level Evidence from the Euro Area

Neža Ahčin, Matej Marinč, Matic Petričeк

In this analysis, we combine loan-level credit register data for all euro-area banks with granular firm-level carbon emission data to estimate the impact of credit supply on firms' decarbonisation. Exploiting loan-level data of firm relationships with multiple banks (as in Khwaja and Mian, 2008), we isolate bank-specific credit supply shocks from firm-specific demand shocks. We estimate the effect of a credit supply shock on growth in firms' carbon intensity. Our findings indicate that greater credit supply leads to higher growth of firms' carbon intensity, which implies that credit supply expansion alone is unlikely to drive economy-wide decarbonisation. Obtained estimates reveal substantial heterogeneity in firms' responses to changes in credit supply. We find that higher credit supply reduces the growth of carbon intensity among less-polluting firms, indicating that already cleaner firms are (self-)incentivized to further green their operations. Additional credit can support the green transition even among more polluting firms, but only if they operate in sectors with the recognized ability to adopt cleaner technologies and practices.

Directed R2 Connectedness Measures

Márton Espán, Milán Csaba Badics

The R2 connectedness approach proposed by Naeem et al. 2024 has gained attention for capturing contemporaneous dependencies among financial variables through linear regression and R2 decomposition. However, we show that it can produce misleading results when causal relationships are present, leading to inconsistencies between the inferred network and the true data generating process. To address this issue, we introduce the Directed R2 connectedness measure, which integrates the LiNGAM algorithm by Shimizu et al. 2006 to uncover structural causal directions. This extension improves both the interpretability and reliability of the connectedness analysis in the presence of underlying causal mechanisms. We validate our framework through simulation studies and apply it to U.S. asset market data, highlighting its advantages over the traditional R2 approach.

Do Green Customers Green-light Suppliers' Debt Financing: Evidence from Sustainable Development Goals

Joey Yang, Chenhao Guo

This paper examines the impact of customers' alignment with the United Nations' 17 Sustainable Development Goals (SDGs) on the debt financing policies of suppliers. Using a global supply chain dataset from 2015 to 2022, we find that customers' SDG alignment significantly increases suppliers' leverage, particularly in long-term debt. This effect is more pronounced among suppliers with stronger Environmental, Social, and Governance (ESG) performance, which lowers debt costs and facilitates greater access to debt financing. Notably, the additional leverage is not allocated to further investment, which indicates strategic adjustments or alternative uses. The effect is also stronger when suppliers face greater customer bargaining power, highlighting ESG performance as a

bargaining tool in supplier-customer interactions. By uncovering the financial implications of customer firms' SDG engagement in the global supply chain, this study contributes to the supply chain literature on sustainable customers and supplier financing policies.

Does Central Bank Tone Matter for Fama-French Factor Returns?

Marcell P. Granát, Bence Siket

Much of monetary policy related information comes from the communication of central bank. The tone and the environment in which certain words are expressed has a predictive effect on the future path of monetary policy and on financial market developments, therefore it is crucial to understand and quantify as precisely as possible the sentiment of central banks. In this paper we estimate whether the tone of Fed speeches has an impact on the Fama-French five factors and on the momentum factor. We construct four different types of sentiment indicators to measure the tone of the Fed speeches. These indices differ in terms of their complexity – whether they capture single-word or multi-word contexts – and to what extent the indicator was created for a monetary policy context. We also applied an LLM to construct a hawkish-dovish index to investigate whether it could capture the complexity of these texts better. Based on the results of this research, it can be concluded that the tone of Fed communication has a substantial predictive power on the six market factors. We show that the Apel-Grimald sentiment index mirrors LLM-generated sentiment, both correlating with inflation and Federal Funds rate changes and aiding market prediction.

Driving Quality in Environmental, Social, and Governance Disclosures: The Role of Information Technology and Auditors in Ethiopia

Fekadu Agmas Wassie, Lakatos László Péter

The increasing significance of Environmental, Social, and Governance (ESG) disclosures has brought attention to their quality, particularly in emerging markets like Ethiopia. Equally, the role of auditors in evaluating ESG disclosures has gained significance due to increasing stakeholder demand for transparency and accountability. This study explores the role of Information Technology (IT) and auditors in driving the quality of ESG disclosures in Ethiopia. A quantitative research approach was adopted, using a survey of internal audit professionals working in various Ethiopian companies listed on the Ethiopian Securities Exchange (ESX). The study examines the relationship between IT adoption, auditors' presence and role, and ESG disclosures' quality. The findings suggest that IT and auditors significantly enhance the accuracy, transparency, and reliability of ESG reporting. Implications for policymakers, companies, and auditors are discussed.

ESG and Asset Pricing Models: Comparison of UK and USA Markets

Sachini Welandawe, Dr. Vasco Vendrame, Prof. Ismail Adelopo

Environmental, social, and governance (ESG) performance impacts stock returns by reducing firms' exposure to ESG related risks. This paper investigates whether ESG-

related risks are priced in the UK stock market and compares the findings to the US market. In addition, the study also examines the pricing of individual ESG pillars (E, S, and G). Using ESG-augmented Capital Asset Pricing Model (CAPM) and Fama-French 3-Factor model, the analysis is conducted across 1) unconditional, 2) conditional (static), and 3) dynamic frameworks for stocks listed in the FTSE All-Share, NASDAQ, and NYSE/AMEX for the period 2004 to 2022. The conditional models account for different market regimes, identified through both the sign of market returns and a Markov regime-switching model. The findings of this paper reveal that ESG related risk is not priced unconditionally or in dynamic models in the UK market, but it exhibits positive pricing in the bullish regime. In contrast, ESG risks are more significantly priced in the US market, especially under dynamic models. There is no evidence that ESG provides a hedge in market downturns suggesting that investors do not prioritize

Failing Public Procurement Procedures in the EU

Tünde Tátrai, Péter Juhász, Gyöngyi Vörösmarty, David Tresó

While the efficiency of public procurements is a widely researched topic, the reasons why a procurement call can be unsuccessful have received little attention. Nevertheless, void procurement calls are a waste of resources and lead to no supply. The Tenders Electronic Daily database provides an opportunity to explore the specificities of procurement tenders within the EU, and has been searchable since 2016. We have constructed a database from more than 4 million calls in the TED database for 2016-2023 to investigate the traits of unsuccessful calls that amounted to more than 16 percent of all procurements. Our logit regression-based results show that the criterion type used, the contracting body type, and the item being purchased significantly affect the call's success, even when controlling for stand-alone year and country effects and their cross effects. It also seems more market-friendly and more challenging to manipulate procedure types, calls with EU funding, and those awarded by a central purchasing body have a higher chance of being declared unsuccessful.

Forecasting Price Volatility of Non-Ferrous Metals: A Comparison of Econometric, Machine Learning, and AI Models

Rafal Sieradzki, Slawomir Kwiatek

This study addresses a critical gap in volatility modelling research by systematically comparing traditional econometric methods, machine learning, and artificial intelligence (AI) approaches in forecasting the volatility of six non-ferrous metals traded on the LME. Specifically, it evaluates GARCH, HAR, LSTM, and Chronos, using MSE, MAE, and QLIKE as performance metrics. Results indicate that the GARCH model achieves the best or comparable performance to LSTM in terms of MSE, while retaining interpretability. In contrast, the pretrained Chronos model demonstrates superior accuracy under MAE and QLIKE metrics, leveraging its hybrid machine learning and large language model architecture, albeit at the expense of interpretability due to its opaque feature design. Across all models, a tendency to overestimate volatility and underpredict or lag in response to volatility spikes was observed, reflecting difficulties in capturing structural

breaks and sudden shifts. While the HAR model incorporates multiple time horizons, it similarly struggles to anticipate sharp volatility surges. Notably, although Chronos outperforms others on certain metrics, no model consistently excels across all conditions, highlighting trade-offs between accuracy, adaptability, and interpretability. These findings underscore the ongoing challenge of reliable volatility forecasting in highly dynamic markets and suggest potential for future improvements with continued advancements in AI-based approaches.

Foreign Exchange and Energy: Mapping Risk and Return Connectedness in Developed and Emerging Economies

Florin Aliu, Ujkan Bajra, Renata Karkowska, Szczepan Urjasz

This study investigates the intricate and evolving relationships between energy markets and foreign exchange markets, with a particular focus on emerging market currencies. Recognizing the foundational role of energy commodities in global production and trade, and currencies as barometers of macroeconomic stability, we explore how shocks in one domain influence risk and return dynamics in the other. Employing a Time-Varying Parameter VAR (TVP-VAR) model, we analyze daily data from 2014 to 2024 across four key energy benchmarks (WTI, Brent, TTF, Henry Hub) and twelve major currency pairs from both developed and emerging economies. Our results reveal strong and dynamic spillovers in both returns and volatility. WTI and Brent crude emerge as central transmitters of shocks, while natural gas benchmarks mainly absorb spillovers, highlighting the growing integration of energy markets. Currency pairs, particularly from emerging economies, display pronounced bidirectional connectedness, reflecting their sensitivity to global disruptions. Return spillovers are typically short-lived and immediate, whereas volatility linkages are more persistent and intensify during crises such as the COVID-19 pandemic. These findings underscore the importance of distinguishing between return- and volatility-driven contagion channels, offering practical insights for investors, policymakers, and risk managers operating in an increasingly interconnected financial environment.

Is Bail-In Regulation Credible? Evidence from EU Banks' Bond Issuance

Leyla Yusifzada, Robert Faff

The European Union introduced a bail-in tool under the Banking Recovery and Resolution Directive to prevent bank rescues financed by public funds. We study the credibility of the European bail-in tool by investigating the stock market reaction to European banks' bond issuances. We find that bonds under more scrutiny from market participants have more positive market reactions to bond issuances after the introduction of the bail-in tool. Banks with positive information are incentivized to issue bonds after the introduction of the bail-in tool. This finding confirms that the risk sensitivity of banks' investors has increased after the introduction of the bail-in rule and suggests that the bail-in rule is credible.

Liquidity provision vs. Demand and Information Advantage: A comparison of Short- and Long-term Institutions

Menachem (Meni) Abudy, Avi Wohl

In Israel, there is a sharp distinction between long-term savings institutions—primarily retirement-focused and tax-advantaged—and mutual funds (MFs), which are not tax-advantaged and are typically held for short-term investment. We use a unique dataset from the Tel Aviv Stock Exchange covering 2013–2024 and focusing on non-dually listed stocks in the TA-125 index. The data provides, for each stock-day, the number of shares bought and the number of shares sold, and the average transaction prices, separately for mutual funds and long-term institutions (LTs). We assess trading profitability using the daily closing price as a benchmark. We find that LTs earn significant average returns of 0.081%, while MFs lose -0.013%. MFs' losses are mainly associated with unexpected sales, whereas LTs' gains are stronger for unexpected buys. Moreover, LTs' unexpected purchases are positively associated with returns over the following two days. These findings suggest that MFs tend to consume liquidity, while LTs act as liquidity providers with potential information advantages. Our results contrast with U.S. evidence based on quarterly data, where long-term institutions are not clearly distinguished. The findings have implications for the optimal design of investment vehicles, supporting the separation of long-term investors into distinct institutional structures.

Macro Risks and Their Impact on Insurers' Stock Prices: Analyzing Climate, Geopolitical, and Cyber Threats

Karolina Puławska, Artur Sikora, Małgorzata Snarska, Wojciech Strzelczyk

The growing impact of climate, geopolitical, and cybersecurity risks poses challenges for financial markets, particularly the insurance sector. While prior research examines these risks individually, comparative evidence across regions and insurance segments remains limited. This study examines insurers' stock price sensitivity to extreme macro risks using event study methodology, AR-GARCH models, and impulse response analysis. By analyzing daily stock price data from insurers in the European Union (EU), the United Kingdom (UK), and the United States (US) from June 2015 to May 2024, we find that climate risk drives the strongest stock price reactions and is systematically priced into equity risk premia, particularly in the UK and US. Geopolitical and cybersecurity risks exhibit weaker direct effects, but remain embedded in risk premia. Moreover, insurance stock returns adjust rapidly to extreme events, without lasting market distortions. These results underscore regional and sectoral differences in risk pricing, offering valuable insights for investors, regulators, and policymakers seeking to manage financial stability.

Nonlinear Transmission of Monetary Policy and Housing Market Imbalances: Evidence from a Factor-Augmented Threshold VAR Analysis

Péter Horváth

In recent decades, persistently low rates have driven housing booms and prompted questions on how market imbalances shape policy effects. In this paper, I investigate how such imbalances affect the monetary transmission in the United States. I create a stress indicator from the rent-price ratio and credit-to-GDP gap, then embed it in a factor-augmented threshold VAR with two regimes to isolate periods of high stress. I show that this framework consistently flags emerging housing bubbles. Regime-specific generalized impulse responses show somewhat larger contractions under adverse conditions, confirming the existence of the financial accelerator effect along the housing cycle. Furthermore, monetary conditions are eased more gradually around forming bubbles, suggesting that macro-financial signals should be incorporated in policy frameworks to effectively manage deleveraging high market pressure.

Optimal Sharing of Family Tax Allowance Among Parents: Personal Income Tax Optimization Strategies in Hungary

Erzsébet T. Varga, Petra Németh, Mátyás Kulisity

Although tax optimization is predominantly a concept associated with the corporate sector, it can also present an opportunity for households they are aware of and consciously make use of the legal possibilities offered by personal income taxation in Hungary. Two features of the family tax allowance system in Hungary present opportunities for optimization. Firstly, the beneficiaries of the family tax allowance have the freedom to choose how to distribute it among themselves. Secondly, a portion of the allowance can be claimed as a social security contribution. Furthermore, Hungarian taxpayers can allocate their taxes, a prerogative that is further enhanced if they engage in self-care activities during the year. A salient issue is the impending increase in the family tax allowance rate in 2025 and 2026, which may necessitate the reconsideration of optimal strategies and could potentially result in financial losses for households if the tax advance declaration is filled out automatically without undergoing a thorough review. The main findings of this study indicate that for both two-child and three- and four-child families, we find households with incomes that can only maximise their disposable income if they choose the optimal family tax allowance splitting strategy.

Systemic Risk and Climate Change: a Common Impact of Transition and Physical Climate Risks on the Polish Banking Sector

Ewa Dziwok, Witold Szczepaniak

This study examines the impact of climate change on the financial stability of the Polish banking sector, focusing on physical and transition climate risks. Using a multidimensional systemic risk framework, it evaluates vulnerabilities of systemically important Polish banks through integrating the physical and transition climate dimension into the climate stability measure S&CRISK. A DCC-GARCH model was applied to capture

time-varying sensitivities between market and climate factors. Physical risk is represented by temperature anomalies, while transition risk is proxied by a stranded assets index. Findings confirm an impact of climate change on financial stability, particularly during crises like COVID-19 and the war in Ukraine, and highlight an increasing systemic fragility of banks investing in brown assets. The study, tailored to economic and regulatory context of Poland, offers methodology adaptable to broader datasets. Results emphasise the need for robust risk management frameworks that integrate climate risks to mitigate financial instability.

The Random Matrix -Based Informative Content of Correlation Matrices in Stock Markets

Laura Molero González, Roy Cerqueti, Raffaele Mattera, Juan E. Trinidad Segovia

Studying and comprehending the eigenvalue distribution of the correlation matrices of stock returns is a powerful tool to delve into the complex structure of financial markets. This paper deals with the analysis of the role of eigenvalues and their associated eigenvectors of correlation matrices within the context of financial markets. We exploit the meaningfulness of Random Matrix Theory with the specific aspect of the Marchenko-Pastur distribution law to separate noise from true signal but with a special focus on giving an interpretation of what mean these signals in the financial context. We empirically show that the highest eigenvalue serves as a proxy of market spillover. Furthermore, based on an analysis of portfolio betas, we prove that the eigenvector associated with this eigenvalue is the market portfolio. These analyses of portfolio betas also reveal that the second and third-highest eigenvalues, and their associated eigenvectors, result in some cases of counter-behavior that makes them suitable to be a safe haven during high-volatility periods. The analysis is performed on a set of indices coming from developed and emerging countries over a time period ranging from 2015 to 2024.

The Role of Tax-free Investment Opportunities in Household Financial Decisions: Real-world Implications of Tax-exempt Hungarian Government Securities

Zsuzsa R. Huszár, Erzsébet T. Varga

Our analysis examines whether tax knowledge impacts investment decisions. Using representative survey data of the Hungarian population from 2022, we investigate whether the decision maker's knowledge of the interest tax exemption on government securities impacts investment decisions. Our research shows that tax awareness plays a decisive role in the ownership of certain financial instruments, most notably for government securities. On the other hand, there are various other investment assets for which tax knowledge does not play a role.

Trade War and Price Response: Firm-Level Evidence from the 2025 U.S. Tariff Shock

Márton Ács, Eszter Baranyai, Gábor Neszveda

This study investigates the impact of the April 2025 "Liberation Day" tariff announcements on U.S. stock market returns using event study methodology. We assess the structure of market reactions, evaluate the role of ESG scores and firm characteristics in explaining cross-sectional differences in abnormal returns. Our findings reveal strong negative surprises, misaligned expectations, and no protective value of ESG performance during the policy shock.

Workforce Exposure to LLMs by Human Capital, Including Foreign Language Proficiency

Balázs Szabó, Eszter Baranyai, Gábor Neszveda

Major technological advancements have been shown to exert heterogeneous effects on different demographic groups within the labor market, shaping broader societal and economic outcomes. This study investigates workforce exposure to large language models (LLMs)—one of the fastest-growing branches of artificial intelligence—across key human capital attributes: education, work experience, and foreign language requirements. The latter remains underexplored despite the multilingual capabilities of LLMs. We utilize and complement a detailed dataset of 13,200 web-scraped job postings from Profession.hu, a leading Hungarian job portal, and map to the U.S. O*NET database. Using multivariate linear regressions with OLS estimation, we find an inverted U-shaped relationship between LLM exposure and both educational attainment and foreign language proficiency. Jobs requiring mid-level education and intermediate language skills exhibit the highest exposure. Variation across languages reflects differences in occupational and task compositions. Furthermore, multilingual roles – particularly those involving less commonly spoken languages – are associated with higher levels of exposure. These findings underscore the need for targeted skill development and language education strategies to support workforce resilience in the face of AI-driven transformation.

When Green Finance meets Innovation

Emilia Németh-Durkó

This study introduces the concept of green innovation potential to explain cross-country differences in translating sustainable finance into eco-innovation, applying panel data from 2014 to 2020. Green innovation potential is defined as a multidimensional construct integrating financial capacity, absorptive capacity, and innovation responsiveness. Based on this framework, EU member states are differentiated in terms of their green innovation potential, reflecting the heterogeneity of capacities and outcomes across countries. The typology highlights that front-runners effectively leverage green finance into measurable innovation outcomes, while countries with weak institutional or absorptive capacities risk greenwashing, where financial inflows fail to deliver substantive results. By incorporating heterogeneity, the

framework provides a nuanced perspective on the conditions under which sustainable finance fosters innovation. For policymakers, it underscores that financial instruments such as green bonds are only effective when embedded in a supportive institutional and policy environment that enables the absorption and conversion of resources into tangible innovation outcomes.

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