

Research Statement

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My research lies within the domains of applied econometrics, empirical finance, and applied macroeconomics, addressing critical economic issues arising from climate change, the global shift towards sustainable energy, and the pressing imperatives of sustainability. Focusing on the economic impacts of climate change and the necessary transformation towards sustainable energy systems, my work engages dynamic, interdisciplinary questions in areas such as climate finance markets, energy markets, financial and commodity markets. By employing advanced econometric and mathematical methodologies—including time series analysis, panel data analysis, event studies, and computational modelling, I investigate complex market behaviours and connectedness within financial and commodity markets.

Through collaborative research initiatives and interdisciplinary approaches, my research not only seeks to unravel the complex dynamics shaping the global economy but also aims to provide actionable insights. Specifically, I employ a systems-thinking approach to the UK investment system to enhance resilience within financial frameworks. This work reflects my commitment to innovative research design and methods that aligns with real-world economic and environmental demands, laying the groundwork for a sustainable economic future.

I currently have a publication in a peer-reviewed journal, the *International Review of Financial Analysis* (CABS 3), one paper accepted at the *Journal of Environmental Management* (CABS 3), and several working papers in prestigious series like USAEE/IAEE and CESifo. This paper examines volatility dynamics, including persistence, seasonality, the Samuelson hypothesis, and the interconnectedness between equity and commodity futures markets. Specifically, this study investigates how financialisation has reshaped the dynamics within these markets.

As well as this, I am preparing to submit seven papers to prominent journals, including *Review of Finance* (CABS 4), *Nature Climate Change*, *Journal of Money, Credit and Banking* (CABS 4), and *Quantitative Economics* (CABS 4). These papers cover three main areas: (i) energy economics, (ii) climate economics, and (iii) financial-commodity markets. For example, in climate economics paper, we evaluate paleoclimate sensitivity i.e. the relationship between global temperatures and radiative forcing over the past 800,000 years using two recently proposed co-movement measures, namely, (i) long-run covariability and (ii) quantile coherency. Our findings indicate that the relationship is considerably weaker during full glacial climates compared to interglacial periods and intermediate glacial climates.

Currently, I am the lead researcher on the New Capital Consensus (NCC) project, which is undertaken in collaboration with the Chatham House Sustainability Accelerator. This project brings together a wide range of industry experts, thinktanks, politicians, and academic advisors, including Sir Keith Skeoch former chair of Standard Life, Paul Johnson from the Institute of Fiscal Studies, and Professor David Pitt-Watson (University of Cambridge). Together, we are advocating for systemic reform in the financial sector, aiming to develop a practical theory of finance that goes beyond traditional paradigms, such as the efficient markets hypothesis.

From the NCC work, I co-authored a white paper with Professor Iain Clacher which is feeding into policy discussions with the UK Treasury, the Department for Work and Pensions, and the Department for Business and Trade. Additionally, the NCC group serves as a convening body for broader financial reform efforts, collaborating with the London Stock Exchange's Capital Markets Industry Taskforce, the Tony Blair Institute for Global Change, New Financial, and others to foster systemic perspectives within finance.

I have also recently embarked on developing research grant applications, with planned submissions focused on corporate biodiversity footprints and systems thinking approach in financial system, targeting funding bodies such as UKRI-ESRC.

I am currently involved in several collaborative projects that focus on three primary research streams: (i) Climate Change and Biodiversity, (ii) Financial Systems and Challenges of Ergodicity, and (iii) Market Dynamics. These projects are collaborated with scholars from institutions such as Xi'an Jiaotong Liverpool University, University of Nottingham Ningbo, Curtin University, University of Aberdeen, Duke Kunshan University, University of Exeter, University of York, University of Leeds, University of Reading, University of Southampton, and the University of Brussels.

In the first research stream, I am exploring the impacts of climate change on financial decision-making, including a study on pension fund trustees' understanding of climate risk, conducted with colleagues such as Iain Clacher, Mark Freeman, Ben Groom, Jason Lowe, and Pamela Searle Leon. Additional projects investigate paleoclimate sensitivity (with Chris Smith) and corporate biodiversity footprints (with Tapas Mishra). In the biodiversity project, we aim to focus on examining the relationship between corporate biodiversity footprints and ESG investment returns and examine how environmental and social metrics interact with economic performance, contributing to sustainable economic models.

The second research stream focuses on the adaptive complexity of financial systems, especially under conditions of market stress or crisis. Traditional financial models, often based on ergodic assumptions, struggle to capture the unpredictable, non-linear dynamics of financial networks. My work in this area addresses the unique, non-ergodic nature of these systems to provide insights into risk management and financial resilience, aiming to bridge the gap between conventional models and the real-world complexities of global financial systems.

In the third research stream, a solo-authored endeavour, I plan to investigate energy markets specifically focussed on: (i) dynamic nexus of climate risks, oil shocks and the energy futures market, and (ii) time-varying "long memory" in crude oil markets.

The first paper aims to analyse the short- and long-term dynamic interplay between climate risks, oil price shocks, and the behaviour of the energy futures market. Given the increasing significance of climate-related financial risks and the volatility of oil prices, understanding their interaction in the context of the energy futures market can reveal valuable insights for risk management, policy implications, and investment strategies. The paper will therefore focus on 'how climate risks impact the volatility and price discovery mechanisms in the energy futures market, in response to oil price shocks?'

The second paper aims to explore the time-varying "long memory" in crude oil markets by employing Local Whittle estimation, a robust method for estimating persistence in time series data. The study seeks to understand the dynamic nature of memory in crude oil markets, particularly in the face of external shocks and structural shifts. The findings will shed light on how "long memory" properties affect market efficiency, potentially identifying predictable price movements that challenge the Efficient Market Hypothesis (EMH).

In the future, I intend to seek external funding to expand upon these three research streams, both locally and internationally. As an Assistant Professor at your institution, I would prioritise building multidisciplinary collaborations with scholars specialising in mathematics, energy and environmental issues, sustainable finance, and the economics of systems thinking as it relates to sustainable development. Additionally, I would leverage my industry experience and connections to work closely with colleagues on consulting and applied research projects. These initiatives would not only enhance your institution's visibility but also deepen the societal impact of the research through practical, high-visibility contributions.