Research Statement

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I am a macro-finance researcher studying how the financial system has been and should be organized. My work focuses on three main areas: US government financing costs, the impact of financial frictions on inequality, and FinTech alternatives to the current financial system. I deploy a broad methodological toolkit that draws on historical institutional knowledge, nonlinear time-series analysis, deep learning computational techniques, and economic theory that emphasizes parsimonious mechanisms and institutional detail.

I highlight three main contributions from my research here and then discuss specific papers in more detail below. In my first strand of research, I estimate US government and private sector borrowing costs back to the early nineteenth century. This requires developing methods to accommodate the unconventional tax treatments and embedded options that were common throughout the twentieth century. Treasury "flower bonds" are one prominent example. Contrary to previous work, I find little evidence for a stable negative relationship between the Treasury's funding advantage over the private sector and the market value of government debt. Instead the government faces a financing trilemma: it cannot simultaneously maintain low borrowing costs, ensure a stable and productive financial sector, and use monetary–fiscal policy to devalue its debt. In my second strand of research, I show how the organization of the banking, pension, and insurance systems changes households' access to investment opportunities and thereby affects inequality. This involves solving and estimating macroeconomic models with agent heterogeneity, asset pricing, and aggregate risk. These models have previously been intractable because their state spaces become too large. I resolve these technical constraints by developing a new toolkit for using deep learning to solve heterogeneous-agent macro-finance models. In my third strand of research, I show how digital settlement systems improve contract enforcement but also give their providers natural information monopolies. This leaves policy-makers with a trade-off: they cannot simultaneously expand access to uncollateralized credit, minimize rent extraction, and preserve user privacy.

Government Borrowing Costs

One strand of my research studies the borrowing costs and constraints faced by the US federal government. I study this question using both historical empirical work and theoretical macroeconomic modeling. My work shows that the

pricing wedge between Treasurys and private debt is substantially more state- and policy-dependent than standard models assume.

On the empirical side, I estimate zero-coupon yield curves for Treasurys from 1790 to the present and corporate bonds from 1860 to the present. This delivers the first consistent, long-run calculation of the US Treasury's funding advantage, as measured by the spread between comparable corporate and Treasury yield curves. Estimating historical yield curves requires overcoming three main challenges.

First, I show how to extract a common zero-coupon yield curve from bonds with heterogeneous contractual and tax features (Lehner et al., 2025, R&R JPE, second round). Two particular challenges are that Treasurys had partial income tax exemptions before World War II and most long-maturity Treasurys during the 1960s and 1970s were "flower bonds." Flower bonds could be redeemed at par, rather than market value, to pay federal estate taxes upon the bondholder's death. This meant that they provided a tax concession that increased in value during periods of high inflation when nominal rates rose and market prices dropped well below par. The yield curve literature has handled bond heterogeneity by documenting summary statistics for particular types of securities[1] or estimating discount functions for homogeneous subsamples of plain bonds[2]. Neither approach can accommodate the twentieth-century data, in which tax treatments and embedded options vary substantially across securities. To overcome these difficulties, I integrate nonparametric yield-curve estimation with explicit models of the different historical tax and option features. The contribution is a feature-adjusted yield-curve methodology that makes public and private borrowing costs genuinely comparable across all maturities and all periods.

Second, I show how to work with sparse historical bond data. At many points in the nineteenth century, only a handful of federal bonds traded, so conventional methods cannot estimate a separate yield curve at each date. To address this problem, I develop a dynamic Nelson–Siegel model that pools information across time while allowing the yield curve and its volatility to evolve across wars and institutional regimes (Payne et al., 2025, QJE). Bond-specific pricing errors prevent unusual securities from disproportionately determining the estimates, while Hamiltonian Monte Carlo methods make it possible to estimate the resulting high-dimensional nonlinear model. The contribution is a general method for recovering term structures from long but thin panels while allowing the data to determine how information should be pooled across time.

Third, I construct the new security-level datasets required for the analysis. In Payne et al. (2025), I assemble prices, quantities, and contractual descriptions for every security issued by the US federal government between 1776 and 1960. In Lehner et al. (2025), I construct the complementary monthly security-level data on US corporate bond prices, cash flows, and credit ratings beginning in 1860. Together, these databases offer the first complete picture of the US bond market for the entire history of the federal government.

[1] e.g., Homer (1968); Salomon Brothers (1988)

[2] e.g., Diebold and Li (2006); Gürkaynak et al. (2007); Liu and Wu (2021); Filipović et al. (2022)

The new yield curve estimates revise our understanding of government debt pricing. Recent macro-finance papers have argued that the government's funding advantage is well modeled as a stable scarcity relationship: when the market value of government debt rises, its funding advantage falls.[3] That is, debt "quantity" increases can forecast "spread" decreases. I show that the apparent fit of these models arises from data limitations rather than underlying economics (Lehner et al., 2025). The most commonly used existing measure for the US funding advantage on long-maturity securities is the spread between the Moody's AAA corporate yield index and the Fed's long-term bond index (which I refer to as the "index-based spread"). These indices compute the average yield-to-maturity across bonds with a wide range of characteristics, which leads to large distortions, particularly during the 1960s and 1970s when the implicit hedge in US Treasury flower bonds exaggerates the index-based spread. Once yield curve estimates are adjusted for flower-bond provisions and the other tax and option features present in the bond sample, debt quantities can no longer explain variation in the long-maturity funding advantage. An affine term-structure model instead attributes most variation in the US Treasury's funding advantage to changes in financial-regulatory regimes and to the same level and slope factors that price ordinary fixed-income securities.

To reconcile macro-finance with the historical data, in Payne and Szőke (2026) I provide a new theory for how government monetary, fiscal, and financial policies can generate and erode government funding advantage. The dominant models of government funding advantage impose that US Treasurys exogenously and permanently deliver non-pecuniary benefits (e.g., bond-in-utility and bond-in-advance). My new yield curve estimates show that these models have problems fitting the data. Instead I build a general equilibrium model in which financial regulations can make Treasurys a useful hedging asset for financial institutions so long as the government ensures inflation volatility is low. The Treasury funding advantage is therefore policy-dependent, fragile, and potentially far-reaching in its macroeconomic effects. The government faces a financing trilemma: it cannot simultaneously maintain a large funding advantage, ensure a stable and productive financial sector, and use monetary–fiscal policy to devalue its debt. This illustrates a form of "financial dominance," in contrast to the "monetary" and "fiscal" dominance scenarios often discussed in the literature. If the government wants to use the financial sector to lower its borrowing costs, then it must constrain monetary–fiscal policy to ensure that banks are able and willing to purchase government debt.

Financial Frictions, Inequality, and Deep Learning Methods

Another strand of my research studies how financial frictions and regulations change agents' exposure to risk and wealth inequality. This is a technically challenging topic because it necessarily involves solving models with aggregate

[3] e.g., Krishnamurthy and Vissing-Jorgensen (2012); Krishnamurthy and Li (2023); Choi et al. (2022)

shocks, asset pricing, and agent heterogeneity. I have pioneered a deep learning technique for solving these models.

My principal economic application is in Gopalakrishna et al. (2026) (Reject & Resubmit, JoF), which shows that the regulation of the banking and pension-insurance sectors affects inequality by changing which households can access financial markets and earn risk premia. I build a heterogeneous-agent macro-finance model in which households face costly capital-market participation and incomplete insurance, banks provide deposits, and pension and insurance funds supply long-term retirement products. Like in the data, wealthier households participate more directly in capital markets, while poorer households depend more heavily on deposits and other intermediated pension or insurance products. Financial institutions face equity-raising and portfolio constraints, so household portfolios, intermediary balance sheets, asset prices, and the wealth distribution evolve jointly. I use deep learning to globally solve and calibrate the model to US macroeconomic, asset-pricing, and household-portfolio evidence from 2010–2024. Macroprudential policy counterfactuals then show that inequality considerations augment the much-studied growth-stability trade-off. Tighter intermediary regulation can improve financial stability but also lower growth and increase inequality because wealthier households are better positioned to earn the higher spreads that regulation creates.

Solving heterogeneous-agent macro-finance models with aggregate shocks is challenging because the entire distribution of agents becomes an aggregate state variable and so a recursive equilibrium is characterized by an infinite-dimensional "master equation." I have two methodologically focused papers that develop my deep learning approach for solving these continuous-time master equations. Gu et al. (2026) (JPE Macro) describes the basic technique and compares different implementation approaches. The agent distribution is approximated in three ways: with finitely many agents, a discretized state space, and a projection onto basis functions. Each approach converts the master equation into a high-dimensional nonlinear partial differential equation. The equilibrium value functions are then represented by neural networks and trained using deep learning techniques to satisfy the master equation. I demonstrate the method by solving models featuring heterogeneity across households, firms, or locations and frictions that cause aggregation to fail (e.g., illiquid assets, transaction costs, and relocation difficulties). The contribution is a framework for computing global solutions to heterogeneous-agent economies that preserves nonlinear distributional feedback rather than approximating only local dynamics.

Payne et al. (2026) (R&R Econometrica, Conditionally Accepted) demonstrates that my deep learning solution approach can be deployed at scale and used to estimate macroeconomic models. I focus on crisis episodes in quantitative models with search and matching frictions and two-sided heterogeneity. In these models, the distribution of agents has a complicated interaction with the general equilibrium clearing conditions because agents must forecast the distribution of potential counterparties. I use deep learning techniques to jointly characterize solutions across both the state space and the economic parameter

space. This allows the algorithm to create a surrogate mapping from economic parameters to simulated moments, which can be used to fit the parameters to match data. I use the solved model to show that the full state distribution matters for aggregate dynamics, especially during asymmetric crises such as COVID. This is because firms anticipate that unemployment will become concentrated among lower-productivity workers and consequently change their hiring decisions. Quantitatively, incorporating this distributional feedback makes unemployment recover about 25 percent faster than under the commonly imposed assumption that decisions are independent of the distribution.

FinTech and Alternatives to the Current Financial System

A third strand of my research studies how FinTech and other financial innovations could reorganize the provision of money, credit, and information. I use economic theory to evaluate new regulatory trade-offs.

In Brunnermeier and Payne (2026), I study the effectiveness of FinTech payment and credit systems. Over the past decade, we have seen major innovations in the provision of payment services (e.g., Alibaba, WeChat, Brazil's PIX, Indian FinTechs). Proponents argue these systems can overcome long-standing frictions in the financial system and deliver both low-fee payment services and large-scale uncollateralized credit. To evaluate these claims, I build a general equilibrium model in which commitment frictions prevent the efficient issuance of uncollateralized IOU contracts. I study how interoperability and privacy protections within a digital settlement system can mitigate or exacerbate these financial frictions. I show that policy-makers face a trilemma: governments cannot simultaneously expand uncollateralized credit access, minimize rent extraction, and preserve user privacy. Different implementations of a central bank digital currency select different points in this trilemma according to the degree of privacy they provide. In Brunnermeier and Payne (2024), I study a related problem created by segmented information. Banks are better at evaluating collateral, while technology platforms observe trading histories that reveal borrowers' cash flows. Combining their information would improve lending, yet strategic competition and lobbying can prevent efficient sharing. This points toward coordinated regulation of information collection across the financial and technology platform sectors.

I also study whether redesigning financial contracts can make the existing banking system more resilient. In Payne and Weiss (2026) (R&R JME, third round), I introduce an asset-transfer option into the canonical Diamond–Dybvig environment. During a run, a patient depositor can close their account by taking ownership of unliquidated intermediary assets rather than demanding immediate payment. Each transfer improves the intermediary's balance sheet, eliminates the strategic complementarity that sustains a self-fulfilling run, and preserves liquidity insurance without relying on deposit insurance. The mechanism is particularly useful when depositors are large and sophisticated enough to evaluate or hold bank assets, as many uninsured depositors at Silicon Valley Bank were, and it outperforms suspension when policy-makers have limited com-

mitment, depositors interact repeatedly with the bank, or asset returns contain aggregate risk. The contribution is to shift the policy response to runs from expanding public guarantees toward designing private contracts that let informed creditors stabilize an intermediary without forcing inefficient liquidation.

Future work

My future research will use the empirical, computational, and theoretical tools developed in my current work to study three aspects of financial-system design.

The first agenda studies the interaction between government debt obligations and inflation. A long-running debate asks whether monetary models can abstract from the Treasury balance sheet, as in many New Keynesian models, or must treat Treasury and central-bank liabilities as parts of an interconnected government balance sheet, as in the Sargent–Wallace tradition. My historical evidence suggests that resolving this debate requires incorporating two additional mechanisms. First, financial intermediaries are typically the marginal buyers of government debt and money-like assets. This means that their choices determine the key macro-finance spreads: the government's funding advantage, the term premium, and the liquidity premium. In this sense, incorporating financial intermediary balance sheets into monetary-fiscal models changes the government's ability to jointly satisfy monetary and fiscal objectives. Second, fiscal-policy reaction functions are slow-moving and depend in complicated ways on which political coalitions form. This necessitates moving beyond heuristic policy rules or benevolent planner problems and instead modeling the appropriate household heterogeneity to microfound the frictions in policy setting. I will develop a quantitative monetary–fiscal–financial model that can capture the joint long-run behavior of inflation, output, Treasury yields, and the key macro-finance spreads.

The second agenda brings together household finance and institutional asset pricing. A large literature shows that financial-intermediary constraints are central to understanding asset prices. However, these intermediaries are ultimately funded by households and exist to provide households with financial services. This means their balance sheets must be connected to the borrowing constraints, participation limits, exposure to uninsured idiosyncratic labor-income risk, and other household frictions that shape the underlying demand for these products. Making these connections explicit is essential for evaluating the welfare consequences of how the financial system is organized. Yet few models incorporate these interactions because combining aggregate risk, constrained intermediaries, and household frictions is technically difficult. My deep-learning toolkit offers a way to overcome these barriers. I will develop a quantitative model that jointly matches data on household finance, intermediary balance sheets, and asset pricing, and use it to evaluate the efficiency and distributional consequences of alternative pension, insurance, and banking systems.

A final agenda studies the design of public payment and settlement infrastructure. My current work shows that combining settlement, information collection, and contract enforcement can create natural-monopoly forces: a dominant

ledger may expand unsecured credit while also extracting rents, restricting interoperability, and weakening privacy. These forces have intensified competition among central banks, technology platforms, and traditional financial institutions over control of payment infrastructure. I will study whether the government should provide a core, economy-wide digital settlement system on which regulated private intermediaries can build payment and credit services. The central design problem is to determine which functions (e.g., settlement, identity, information portability, privacy protection, and contract enforcement) should be provided publicly and which should remain private. The contribution will be a framework for designing public digital infrastructure that preserves innovation and credit access while limiting monopoly power.

Together, these agendas aim to develop an integrated account of how government liabilities, financial regulation, and settlement infrastructure should be designed when fiscal capacity, financial stability, and household welfare are jointly determined.

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