

## **Monetary Policy, Risk-Driven Labor Markets, and Inequality**

I propose a novel transmission mechanism for monetary policy to affect labor markets. This new mechanism may imply that aggressively cutting interest rates during recessions both reduces unemployment and benefits low-wealth households by more than previously estimated. To model this mechanism, I conjoin two recent and separate strands of the literature. One strand explains unemployment fluctuations with time-varying risk premia, and the other studies the transmission of monetary policy to risk premia.

### **Intellectual Merit**

Kehoe et al. (2020) (KLMP) show that firms charge a risk premium for hiring labor when workers accumulate human capital on the job, but search frictions make it uncertain if and for how long a worker will be hired. If risk premia increase, then labor becomes a riskier input, so firms will cut jobs. Bernanke and Kuttner (2005) empirically show that risk premia also respond to the federal funds rate. Kekre and Lenel (2020) (KL) theoretically explain this fact with heterogeneous risk tolerance in a New Keynesian (NK) model. When nominal interest rates are cut, risk premia fall because wealth redistributes away from risk-averse agents to risk-tolerant ones. Furthermore, the more wealth risk-tolerant agents have, the larger the response of risk premia to monetary policy. These findings link monetary policy to wealth inequality.

I contribute to the literature on business cycles, monetary policy, and inequality by (1) constructing a model that combines key ingredients from KLMP and KL to create a novel transmission mechanism for monetary policy and by (2) quantifying the importance of this mechanism through Bayesian estimation. In my model, when nominal interest rates are cut, risk premia fall due to wealth redistribution, so firms will hire more workers. Because of this new transmission mechanism, countercyclical monetary policy may boost employment during recessions by more than standard models predict. This mechanism may also change the implications of KL's model for inequality. In KL, rate cuts increase wealth inequality, and the more unequal the economy is, the more wealth that rate cuts redistribute. But if the associated decrease in risk premia boosts labor demand as in KLMP's model, then interest rate cuts may still significantly benefit low-wealth households, whose main source of income is their labor income, not the returns from their wealth. Estimating the model allows me to quantify both the transmission of monetary policy to employment through risk premia and how much low-wealth households may benefit from it.

My proposal will additionally expand the toolkit for solving heterogeneous-agent models. Most solution algorithms linearize around a *deterministic* steady state, which yields inaccurate predictions for risk premia because agents expect *zero* aggregate risk at that state. To address this issue, I will develop a novel method for linearizing heterogeneous-agent models around the *risky* steady state, which is the economy's long-run state when agents expect *nonzero* aggregate risk, but shocks never happen. Lopez et al. (2018) show that "risk-adjusted" linearizations enable accurate analysis of representative-agent economies with time-varying risk premia.

### **Model and Empirical Approach**

Households are heterogeneous in their risk aversion, employment status, income, wealth, and portfolio choice. They can own firms by buying equity shares, which gives households claims to firms' profits. Households also receive interest from savings and earn wages if they are employed. Consumption is subject to a borrowing constraint. Heterogeneity in risk aversion is permanent, but the remaining dimensions of heterogeneity fluctuate dynamically due to uninsurable idiosyncratic earnings risk and labor-market frictions.

Firms hire workers from households by posting vacancies in a labor market with Diamond-Mortenson-Pissarides search and matching frictions. Due to these frictions and on-the-job human capital accumulation, firms demand a risk premium when hiring workers. Firms invest in new capital and combine it with labor to produce output, subject to sticky prices. Because households are heterogeneous, and they decide both their labor supply and asset positions, wage determination is

nontrivial. To simplify the model, I separate the labor supply decision from the portfolio choice problem by assuming every household has two agent types, workers and investors. Workers price the value of their employment as if they are hand-to-mouth while investors treat their household's labor income as exogenous and choose assets accordingly.

Monetary policy operates through the short-run nominal interest rate. Sticky prices give the central bank control over the real interest rate, and heterogeneity in risk aversion causes risk premia to respond to the nominal rate. Monetary policy shocks, productivity shocks, and uncertainty shocks create aggregate fluctuations.

I solve the model by linearizing around the risky steady state, which has been implemented in `RiskAdjustedLinearizations.jl`, a package I personally developed. Following Bayer et al. (2019), I approximate the distribution over idiosyncratic states with a histogram and solve households' optimization problems by using the endogenous grid method. Although the model is linearized around the risky steady state, shocks can still be nonlinear, which permits richer dynamics.

I conduct a Bayesian estimation of the model by applying the tempered particle filter (TPF), which can approximate nonlinear likelihoods, with Sequential Monte Carlo (SMC), a parallelizable Bayesian estimation algorithm. To incorporate cross-sectional micro data alongside macro data, I follow Acharya et al. (2020) and implement a "pseudo-likelihood" that penalizes deviations from micro moments. Micro-level phenomena like wealth inequality change macro-level behavior and vice-versa, so matching data at both aggregation levels is important for an accurate model.

For data, I start with standard macroeconomic time series, such as real GDP, from the Federal Reserve Economic Data (FRED) database. Since risk premia are key to my model, I measure them with time series for the equity risk premium and the dividend price ratio of the S&P 500 from the Center for Research in Security Prices (CRSP). I augment these series with cross-sectional micro data on household income and wealth from the Survey of Consumer Finances (SCF). To pin down search frictions and human capital accumulation, I follow KLMP and utilize data from the Current Population Survey (CPS) and the National Longitudinal Survey of Youth (NLSY).

### **Broader Impacts**

My novel transmission mechanism for monetary policy has direct implications for central banks and inequality. Standard models rely on unmodeled exogenous shocks to explain the dynamics of unemployment. My proposed mechanism implies that these shocks are likely the result of firms endogenously responding to risk premia, so standard models *under*-predict the impact of lower interest rates on unemployment. If a central bank cuts rates more aggressively during recessions, then unemployment may increase by far less. My mechanism also suggests that active monetary policy combats excessive inequality: sharply cutting rates in recessions boosts labor demand through lower risk premia, potentially helping low-wealth households by more than standard models would predict.

### **References**

- Acharya, S., W. Chen, M. Del Negro, K. Dogra, E. Matlin, and R. Sarfati. (2020) "Estimating HANK: Macro Time Series and Micro Moments." Working paper.
- Bayer, C., R. Luetticke, L. Pham-Dao, and V. Tjaden. (2019) "Precautionary Savings, Illiquid Assets, and the Aggregate Consequences of Shocks to Household Income Risk." *Econometrica* 87(1): 255-90.
- Bernanke, B. S. and K. N. Kuttner. (2005) "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *The Journal of Finance* 60(3):1221-57.
- Kehoe, P. J., P. Lopez, V. Midrigan, and E. Pastorino. (2020) "Asset Prices and Unemployment Fluctuations." Federal Reserve Bank of Cleveland, Working Paper No. 20-10.
- Kekre, R. and M. Lenel. (2020). "Monetary Policy, Redistribution, and Risk Premia." Working paper.
- Lopez, P., D. Lopez-Salido, and F. Vazquez-Grande. (2018) "Risk-Adjusted Linearizations of Dynamic Equilibrium Models." Banque de France, Working Paper No. 702.