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Ahyan Panjwani

Address: Department of Economics
Yale University
New Haven, CT 06520-8268

Telephone: +1 (203) 804 7962

E-mail: ahyan.panjwani@yale.edu

Web page: https://www.ahyanpanjwani.com/

Citizenship: Pakistan, F-1 Visa

Fields of Concentration:
Macroeconomics
Financial economics
Real Estate
Development economics

Desired Teaching:
Macroeconomics
Microeconomics
Financial economics
Environmental economics
Development economics

Comprehensive Examinations Completed:
2018 (Oral): Macroeconomics, Financial Economics
2017 (Written): Microeconomic Theory, Macroeconomic Theory

Dissertation Title: *Underwater: The Effect of Federal Policies on Households' Exposure to Climate Change Risk*

Committee:
Professor John Geanakoplos (Chair)
Professor Eduardo Davila
Professor Atif Mian

Expected Completion Date: May 2022

Degrees:

2022 (expected)	Ph.D., Economics, Yale University,
2019	M.Phil., Economics, Yale University,
2018	M.A., Economics, Yale University,
2016	B.A., Economics and Mathematics, Reed College

Fellowships, Honors and Awards:

2020	Joseph Hopkins Twichell (Class of 1859) Memorial Fellowship, Yale University
2019	Prize Teaching Fellowship, Yale University
2018	Falk Foundation Fellowship, Yale University
2016	Sperling Fellowship, Cambridge University *(declined)*
2016	Gerald M. Meier Award for Distinction in Economics, Reed College
2016	Phi Beta Kappa, Reed College
2015	V&E Dusenberry Scholarship, Reed College
2014	P&J Werthemeier Scholarship, Reed College
2014	McGill Lawrence Fellowship, Reed College

Teaching Experience:

Fall 2020	Mathematical Economics (Undergraduate), Teaching Assistant to Prof. John Geanakoplos
Spring 2020	Financial Markets (Undergraduate and MBA), Teaching Assistant to Prof. Robert Shiller
Fall 2019	Financial Theory (Undergraduate), Teaching Assistant to Prof. John Geanakoplos
Summer 2019	Econometrics (Masters), Instructor of record, University of Central Asia
Spring 2019	Financial Theory (Undergraduate), Teaching Assistant to Prof. Eduardo Davila
Fall 2018	Intermediate Macroeconomics (Undergraduate), Teaching Assistant to Prof. William Nordhaus

Working Papers:

"Underwater: The Effect of Federal Policies on Households' Exposure to Climate Change Risk" *Job Market Paper*

*"*The Credit Surface" with John Geanakoplos.

Works in Progress:

"Diversifying Households' Climate Risk with Leverage" with Chase Ross and Sharon Ross

*"*The Effect of Banking Intermediation on Agricultural Outcomes: Evidence from Pakistan*"* with Faizaan Kisat.

Referee Service:

Science Advances

Languages:

English (fluent), Urdu (native)

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References

Prof. John Geanakoplos
Yale University
Department of Economics
New Haven, CT 06520
Phone: +1 203-432-3397
john.geanakoplos@yale.edu

Prof. Atif Mian
Princeton University
Department of Economics
Princeton, NJ 08544
Phone: +1 609-258-6718
atif@princeton.edu

Prof. Eduardo Davila
Yale University
Department of Economics
New Haven, CT 06520
Phone: +1 203-436-2506
eduardo.davila@yale.edu

Dissertation Abstract

Underwater: The Effect of Federal Programs on Households' Exposure to Climate Change Risk
[Job Market Paper]

Two government policies implicitly encourage homeownership in areas increasingly threatened by climate change. First, the government spends billions of dollars helping rebuild homes and infrastructure after a major disaster. Second, government-sponsored enterprises, Fannie Mae and Freddie Mac, do not charge mortgagors for location-specific climate risk. In this paper, I estimate how many fewer homeowners would live in areas exposed to climate risk—specifically flood risk—after removing both distortions. I show that the government can achieve most of this reduction by taxing at-risk homeowners and charging them a flood risk premium as part of the mortgage despite continuing assistance after a disaster.

To quantify the effect of correcting the distortions, I introduce climate risk and location choice in the canonical model of lifecycle consumption and housing choice. Households vary by creditworthiness and wealth. They choose between buying a home in a safe region, buying a home in an at-risk region (which offers added amenity value), or renting. Flooded homeowners in the at-risk region suffer dis-utility from living in a devastated home. These homeowners also receive a transfer as assistance to rebuild if they choose to stay in their existing home.

I have two main empirical results. First, I quantify government assistance after a climate event. It is challenging to directly measure the cost of some relief measures like mortgage forbearance. I use Hurricane Sandy's landfall in New Jersey as a natural experiment to determine the effect of government assistance on flooded homeowners' decision to pay their mortgage dues. Using difference-in-differences, I find that government aid reduced the probability of affected homeowners not being current by 15%. By targeting this moment from the natural experiment in the model, I infer that government assistance amounted to $48,000 per household. Second, I estimate the flood risk premium in New Jersey is 26 basis points.

My model delivers two quantitative predictions. First, jointly correcting the two distortions would have reduced the number of homes affected by Hurricane Sandy by 21%—73,000 households—in New Jersey. Second, in addition to charging them the flood risk premium as part of the mortgage while assisting flooded homeowners ex-post, a tax equal to the median flood insurance premium on at-risk homeowners would have reduced the households exposed to Sandy by 58,000. Consequently, residential losses from the storm would have been lower by 30%, i.e., $2.3 billion.

The Credit Surface with John Geanakoplos
[Working Paper]

We develop a quantitative, policy-relevant tool—the credit surface—for tracking credit conditions in the housing sector. Given market expectations of growth in home prices, coupled with the default and prepayment rates for mortgages, the credit surface outputs the fair mortgage rate for a loan given the borrower's credit score and desired loan-to-value ratio at origination. Depending on the market environment, the credit surface flattens or tightens, indicating the phase of the leverage cycle the market currently is in. We generate the credit surface for each month between 2002 and 2010, demonstrating its evolution over the course of the boom and bust of the housing market in the U.S.

Diversifying Households' Climate Risk with Leverage with Chase Ross and Sharon Ross
[Work in Progress]

Climate risk threatens to erode—or entirely destroy—home values, reducing homeowners' housing wealth. We show that household mortgage leverage has an overlooked benefit: it helps diversify climate risk. We present a simple model to show the conditions under which higher levels of equilibrium mortgage leverage increase aggregate consumption. The effect is particularly strong for people where housing wealth is a large share of their total wealth. We use property-level data to confirm the predictions of the model. We show that consumption of households with more mortgage leverage reduced their consumption less than their less-levered counterparts in the aftermath of the Midwestern Floods of 2019.

The Effect of Banking Intermediation on Agricultural Outcomes: Evidence from Pakistan with Faizaan Kisat *[Work in Progress]*

This paper analyzes the impact of credit provision on farm profitability in emerging markets. Working with a local financial institution in Pakistan, we issue a credit facility to farmers that finances the purchase of all farm inputs during a cropping cycle. The loan is repaid using the funds generated at harvest, and farm output is sold to a pre-contracted bulk buyer. Our results will quantify the efficiency gains associated with reductions in credit and supply chain frictions in agriculture markets.