

## Chuan Du

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**Fields of Concentration:**

Macroeconomics  
Banking and Monetary Economics  
General Equilibrium Theory

**Desired Teaching:**

Macroeconomics  
Banking and Monetary Economics  
General Equilibrium Theory  
Game Theory

**Comprehensive Examinations Completed:**

2017 (Oral): Microeconomic Theory; Macroeconomic Theory  
2016 (Written): Microeconomic Theory; Macroeconomic Theory

**Dissertation Title:** *“Collateral requirements in central bank lending”*

**Committee:**

Professor John Geanakoplos (Chair)  
Professor Stefano Giglio  
Professor William English

**Expected Completion Date:** May 2021

**Degrees:**

2021 (expected):	Ph.D., Economics, Yale University
2011	M.Phil., Economics, University of Cambridge, ( <i>Distinction</i> )
2010	BA, Economics, University of Cambridge, ( <i>First Class Honours</i> )

**Work Experience:**

- 2014 – 2015      Economist, Monetary Policy Committee Unit, Bank of England  
*Assist Monetary Policy Committee member (Prof. David Miles) in policy analyses and speeches.*
- 2011 – 2014      Analyst, Resolution Directorate, Bank of England  
*Contingency planning for the orderly resolution of systemically important banks and other financial institutions in the UK.  
 Design and review Recovery and Resolution Plans (i.e. 'living wills') for financial institutions, and Special Resolution procedures for clearing members of major UK and international payment systems.*

**Fellowships, Honors and Awards:**

- 2020      Peter C.B. Phillips Scholar, Yale University
- 2017      Overbrook Fellowship, Yale University
- 2011      Stevenson Prize, Faculty of Economics, University of Cambridge
- 2011      Bronze Medal, Econometric Game
- 2010      Bank of England Post-Graduate Sponsorship
- 2010      Northam Memorial Prize, Queens' College, University of Cambridge
- 2009      Foundation Scholarship, Queens' College, University of Cambridge
- 2008      Venn Prize, Queens' College, University of Cambridge
- 2008      College Exhibition Prize, Queens' College, University of Cambridge

**Teaching Experience** (all at Yale University)

- 2019 – 2020      Residential College Maths/Science Tutor (in Economics)
- Spring 2019      Game Theory (Undergraduate), Teaching Assistant to Prof. Marina Halac
- Fall 2018      General Equilibrium Theory (Undergraduate), Teaching Assistant to Prof. Truman Bewley
- Spring 2018      General Economic Theory: Microeconomics (Graduate), Teaching Assistant to Prof. Dirk Bergemann and Prof. Juuso Välimäki
- Fall 2017      Intermediate Macroeconomics (Undergraduate), Teaching Assistant to William Nordhaus
- 2016 – 2017      Residential College Maths/Science Tutor (in Economics)

**Working Papers:**

["Collateral requirements in central bank lending"](#), *Job Market Paper*

["The collateral rule: Theory for the credit default swap market"](#) with Agostino Capponi and Stefano Giglio, *Under Review*

["Capital requirements, the safe real interest rate and the fundamental problem of bank risk taking"](#) with David Miles

**Work In Progress:**

"Supply network fragility" with Agostino Capponi and Joseph Stiglitz.

"Multinomial max-min theorem: a generalization of the binomial no-default theorem"

**Seminar and Conference Presentations:**

July 2019      Bank for International Settlements

**Referee Service:***Mathematics and Financial Economics, Operations Research***Languages:**

English (native), Chinese (native)

**References****Prof. John Geanakoplos**

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**Dissertation Abstract****Collateral Requirements in Central Bank Lending** [*Job Market Paper*]

Central bank lending during times of crisis traditionally followed Bagehot's rule: lend freely to solvent institutions, against collateral that is good in normal times, and at 'high interest rates'. The rule is designed so that the central bank can improve credit conditions without taking on any credit risk. Lately, central banks began to deviate from this approach, conducting more direct lending to firms, against a broader class of collateral, and reducing the haircuts imposed on the collateral posted. Which is the more appropriate response? Should central banks take on greater credit risk in order to provide a larger stimulus? To answer the question, I develop a model of central bank intervention in collateralized credit markets. I find that when the downturn is severe it is optimal for the central bank to take on greater credit risk.

In the model, firms borrow in order to purchase capital for production. There are two sources of financial frictions. First, firms can only borrow using non-state-contingent debt contracts. Second,

each debt contract must be backed by one unit of capital as collateral to enforce repayment. Firms can choose one or more contracts from an entire spectrum of such debt contracts that differ only in the size of the promised repayment. When the promise exceeds the value of the collateral at the point of delivery, firms default. Since all debt contracts are backed by one unit of capital as collateral, a debt contract with a higher promised repayment represents greater credit risk to the lender. The price of each debt contract, the firms' choice of contracts, and thus the credit risk faced by the lenders are fully endogenized in competitive equilibrium. This is in contrast to many papers in the literature where the amount the firm can borrow against each unit of collateral is exogenously given and the lenders face fixed value-at-risk when lending.

The borrowing constraints faced by firms amplify negative aggregate productivity shocks. During a downturn, firms experience an endogenous reduction in their liquid wealth and their ability to borrow. As a consequence, firms hold too little capital in the downturn relative to the socially efficient level.

A central bank can intervene in this case by lending to firms against collateral at more favorable terms relative to the market. Optimal intervention during severe downturns requires the central bank to take on greater risk in order to provide a larger stimulus. The paper suggests that credit facilities set up by the Federal Reserve in response to COVID-19, such as the Main Street Lending Program, can achieve greater participation and effectiveness by easing their terms of lending.

**“The collateral rule: Theory for the credit default swap market”** with Agostino Capponi and Stefano Giglio

We study the determinants of collateral requirements in central clearing houses for credit default swaps (CDSs). To do so, we develop a model of endogenous collateral requirements in the CDS market, where counterparties trade state-contingent promises backed by cash as collateral. Trading occurs due to differences in market participants' beliefs about the uncertain states of the world. We show that it is the nature – rather than the degree – of these belief differences that determines collateral requirements in equilibrium. Specifically, the highly conservative levels of collateral observed in practice can be explained by the clearinghouse's concerns over extreme tail events.

**“Multinomial max-min theorem: a generalization of the binomial no-default theorem”**

The Binomial No-Default Theorem in Fostel and Geanakoplos (2015) states that “in binomial economies with financial assets serving as collateral, any equilibrium is equivalent in real allocations and prices to another equilibrium in which there is no default”. I extend this theorem to economies with more than two states of nature when debt can be ordered by seniority. For instance, with three states of nature, borrowers can issue both senior secured debt and junior subordinated debt. The terms and credit risks associated with each creditor tier are endogenously determined. The Multinomial Max-Min theorem states that any equilibrium is equivalent to another equilibrium where the senior tranche never defaults, and the junior tranche only defaults in the worst state of the world. The expanded theorem allows for the application of the endogenous leverage framework to a richer set of models.

**Capital requirements, the safe real interest rate and the fundamental problem of bank risk taking** (with David Miles)

We show that bank capital requirements, and variations in the safe real interest rate, operate as imperfect substitutes in countering a tendency for banks to take excessive risks. A tightening of capital requirements, or of the safe real interest rate, can improve ‘prudence’ by disincentivising banks against investing in risky assets with sub-optimally low returns; but only at the cost of decreased ‘participation’ whereby more banks will forego the opportunity to invest. Numerical simulations show that a substantial capital requirement is in general the appropriate policy response. The optimal capital requirement rises as the safe real interest rate falls.