Shadow Banking and Financial Intermediation

Gökçer Özgür[1]

[1]Economics Department
Gettysburg College

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Introduction
Plan

- What is shadow banking?
  - Institutional approach
  - Instrumental approach
- Why it matters?
  - Its central position in U.S. financial markets
  - Interest rate and asset prices
  - Financial instability
- Empirical Analyses
- Conclusion

Introduction
Motivation

- Shadow banking, called *fringe banking* and *parallel banking* until recently, has become a central element for the US financial system.
  - The integration of banking with capital market developments (Adrian and Shin, 2009a).
  - A barometer of overall funding conditions (Adrian and Shin, 2009b)
  - Replacement of traditional banking in the U.S. (D'Arista, 2018)
  - Financial instability (McCulley, 2009; Pozsar *et al.* 2012)
- Need for an empirical and aggregate approach

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- Lack of backstops and instability
- Subject to *runs* and *fire sales*

Shadow Banking
An example

I Loan origination, funded by commercial paper (CP) and medium-term notes (MTNs).

II Loan warehousing, funded through asset-backed commercial paper (ABCP).

III The pooling and structuring of loans into term asset-backed securities (ABS), funded by repo

IV ABS warehousing, funded by ABCP and repo

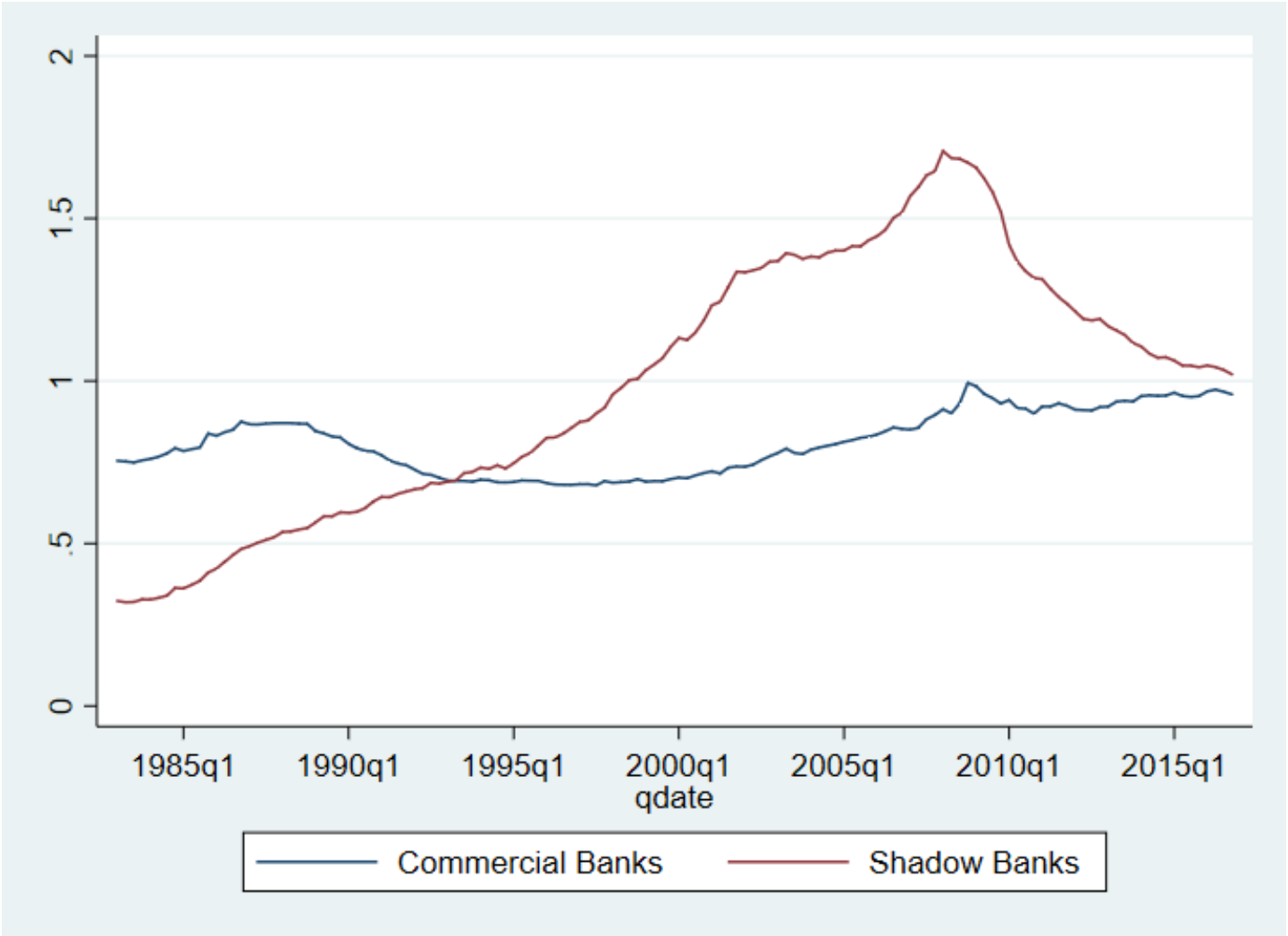
V The pooling and structuring of ABS into Collateral Debt Obligations (CDO), funded by CP and repo

VI ...etc.

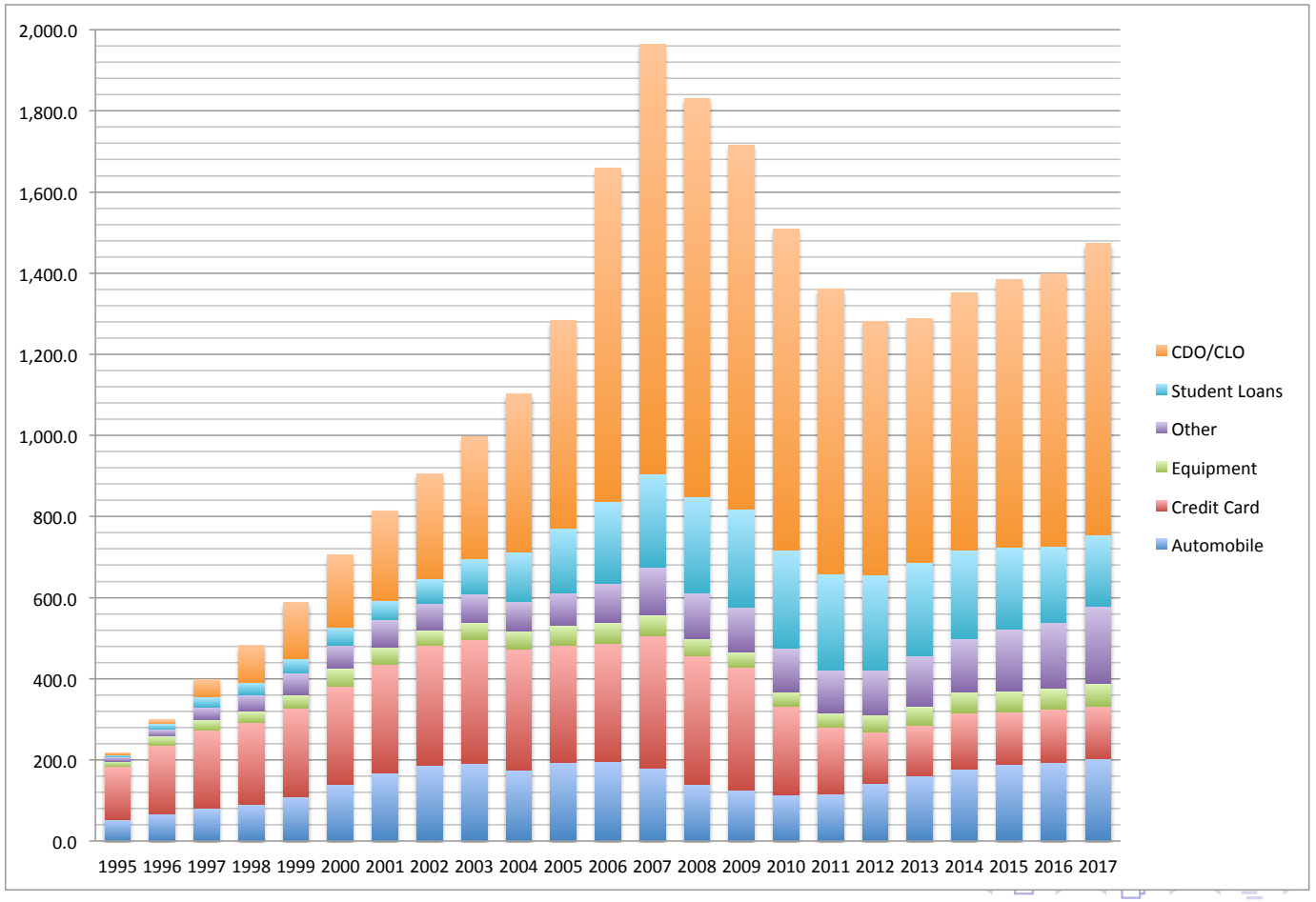
Shadow Banking
Institutions

- Shadow bank assets are defined as the total assets of money market mutual funds (MMMFs), government sponsored enterprises (GSE), Agency- and GSE-backed mortgage pools, issuers of Asset-backed securities (ABS), real estate investment trusts (REITs), security brokers and dealers, and finance companies.

Total Assets as a ratio of GDP



US CDO/CLO Outstanding (USD Billions)



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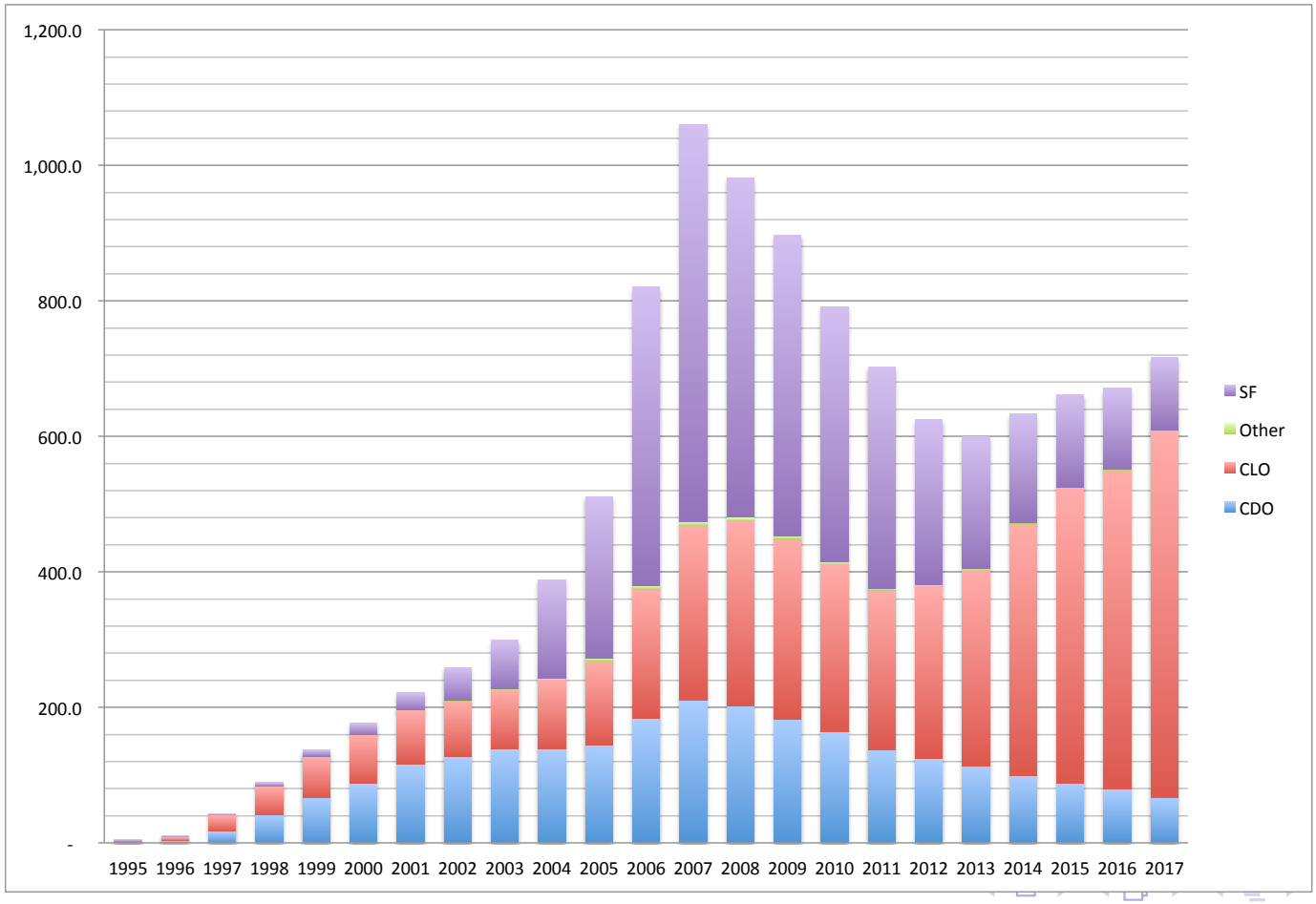
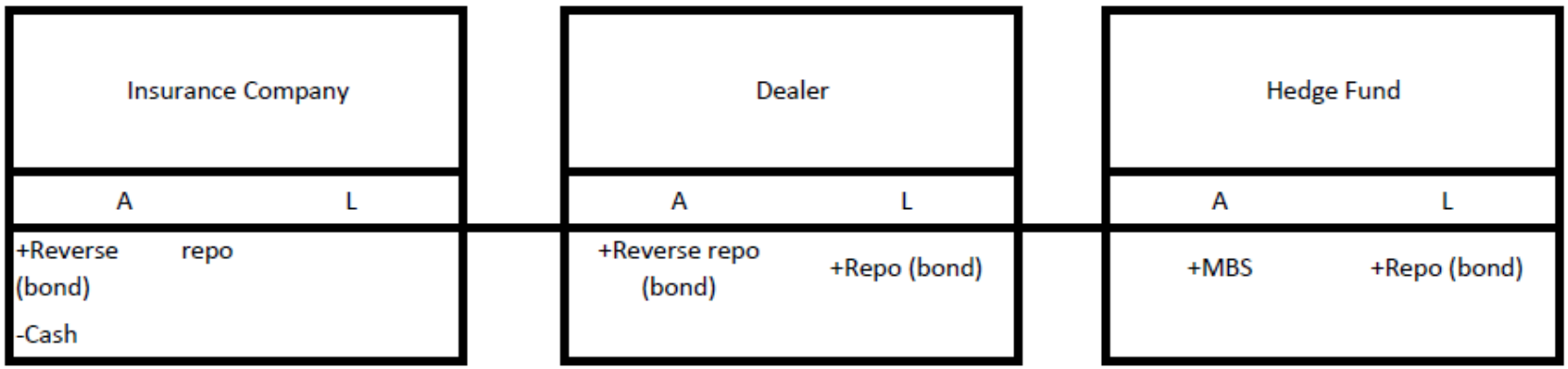


Shadow Banking
Instruments

- An alternative definition, beyond non-bank lending and securitization
- Repurchase agreements (repo), reverse repo, securities lending/borrowing, pledges; *securities finance*
- ...grew out of the securitization of assets
- ...gave leveraged trade opportunities and economized the use of cash holdings
- ...experienced rapid growth in 1990s and 2000s
- ...enabled shadow banking to integrate with the rest of the financial system.

Repo with Treasury Bonds



Shadow Banking
Instruments

Cash Borrowers		**Cash Lenders**
Hedge Funds Mortgage REITs Broker-dealers	**Dealers**	Money Market Mutual Funds Government-Sponsored Enterprises Commercial Banks Insurance Companies Municipalities
Securities Lenders		**Securities Borrowers**
Pension Funds Sovereign Wealth Funds Mutual Funds Insurance Companies Exchange Traded Funds	**Dealers**	Hedge Funds Broker-dealers

Summary

- A fusion of direct and indirect finance
- Settlement of short- and long-term interest rates, and asset prices
- Lack of backstops and instability
- The impact of shadow banking on
  - indirect finance, i.e. commercial bank lending (MSAR and MSDR models)
  - direct finance, i.e. term structure and risk premium (impulse-response functions)

MSAR Model

$$y_t = \mu_t + x_t\alpha + z_t\beta_{s_t} + \sum_{i=1}^{n} \phi_{i_{s_t}} \left(y_{t-i} - \mu_{t-i} - x_{t-i}\alpha - z_{t-i}\beta_{s_{t-i}}\right) + \epsilon_{s_t} \tag{1}$$

$$\epsilon_{s_t} \sim i.i.d. \quad N(0, \sigma_s^2)$$

- y_t is the dependent variable
- μ_t is state-invariant intercept
- x_t is state-invariant coefficient, α
- z_t is vector of state-dependent coefficients, β_{s_t}
- ϕ_i is state-invariant ith AR term

Variables

- Sample: 1983Q1-2016Q4
- Total loans of depository institutions normalized by GDP
- Total assets of shadow banking normalized by GDP
- Real GDP growth rate
- Risk premium (3-month commercial paper rate and 3-month Treasury bill)
- Term spread (10-year Treasury bond and 3-month Treasury bill yields)
- difference form

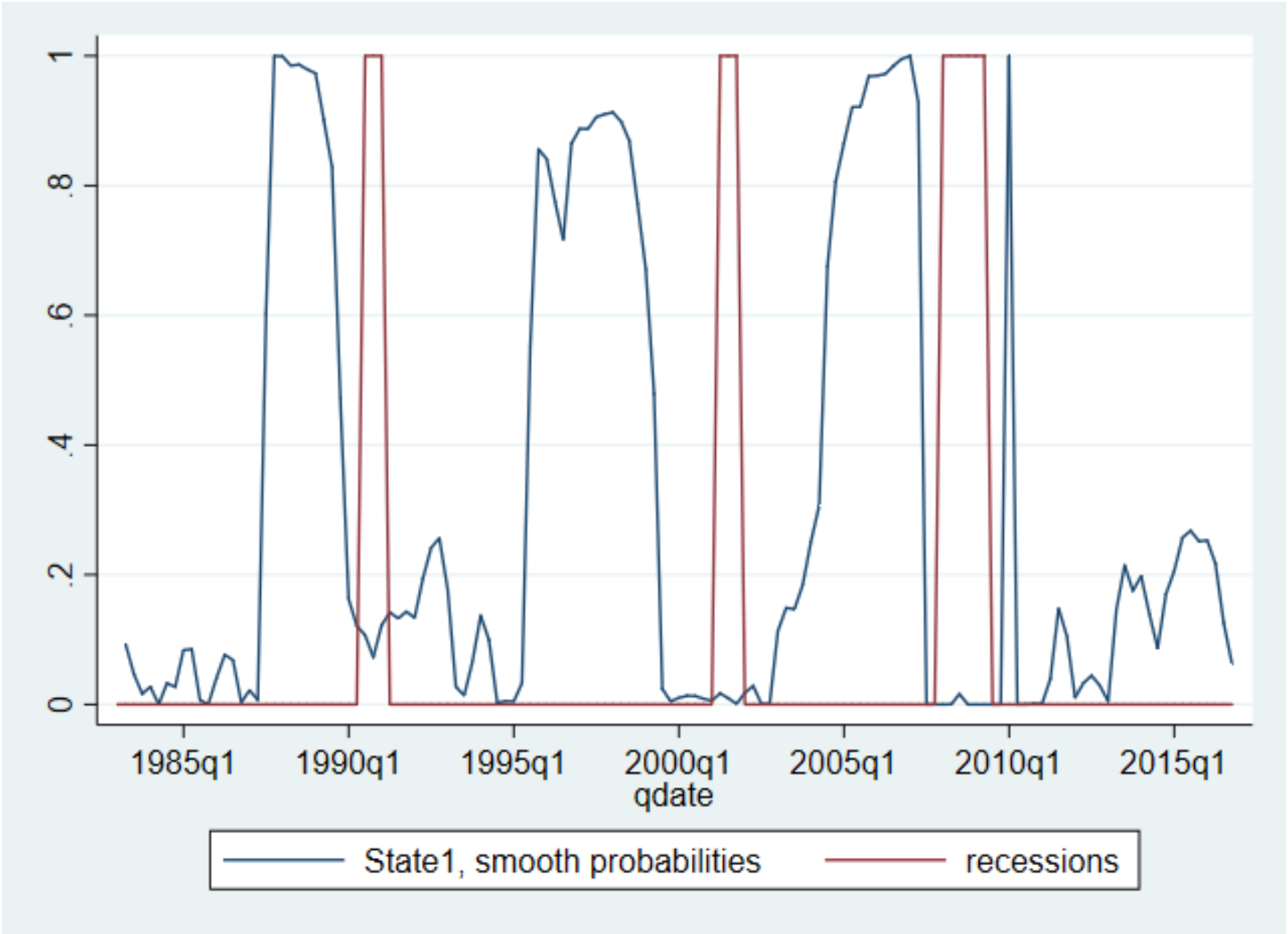
Results

Table 1:: Estimation results

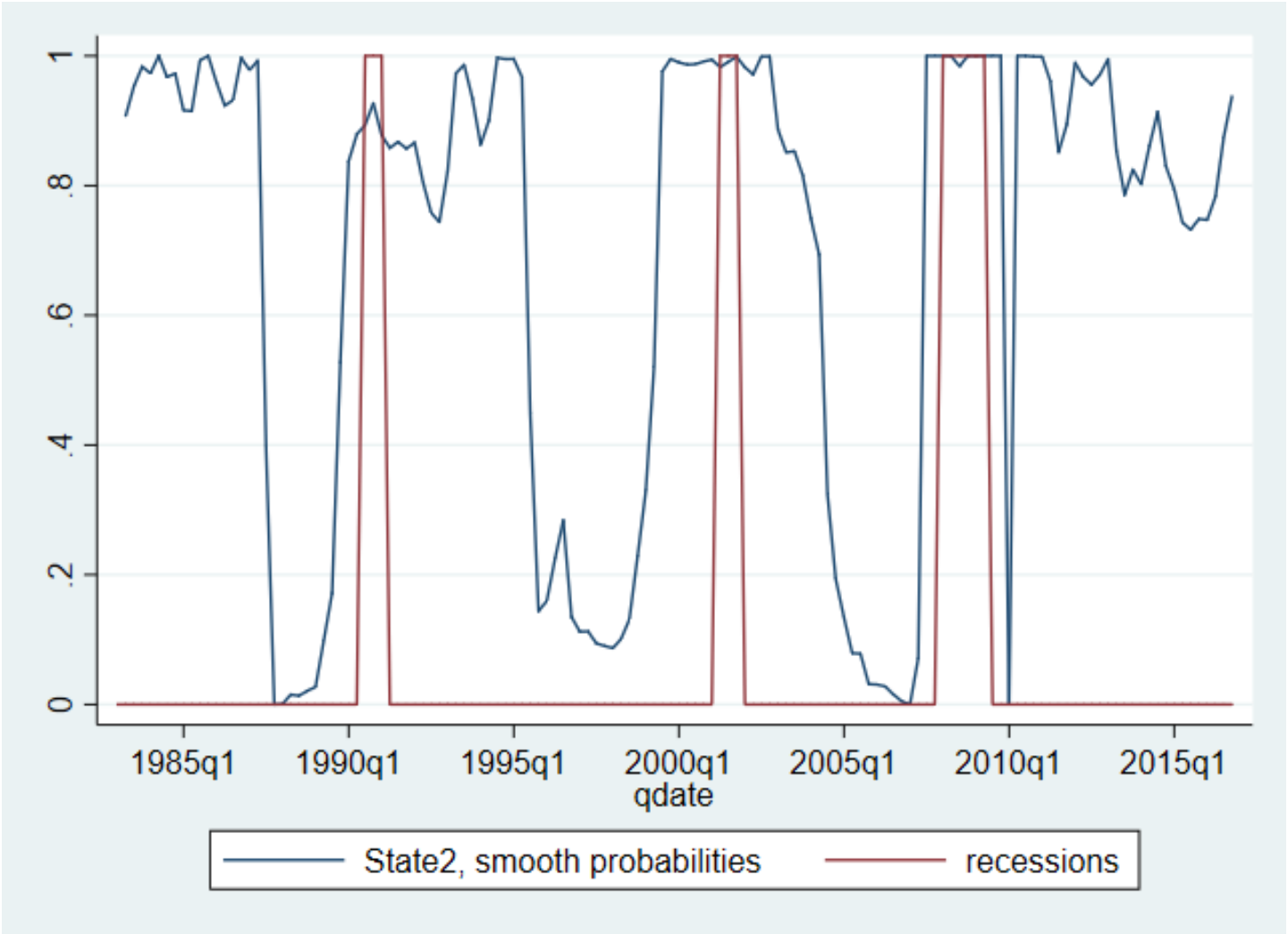
	Parameter	Coefficient	Standard error	z	$P > z$
	μ_t	0.0002	0.003	0.07	0.943
	GDP_t	0.0003*	0.0002	1.74	0.082
	$AR(1)$	-0.015	0.089	-0.18	0.859
	$AR(2)$	0.212***	0.071	2.98	0.003
	$AR(3)$	0.134	0.93	1.44	0.15
	$AR(4)$	0.553***	0.78	7.07	0.000
State 1	$shadow_t$	-0.073**	0.0302	-2.42	0.015
	$risk_t$	-0.006**	0.002	-2.46	0.014
	$term_t$	-0.002	0.001	-1.29	0.198
State 2	$shadow_t$	0.214***	0.034	6.31	0.000
	$risk_t$	0.007***	0.002	3.5	0.000
	$term_t$	-0.004***	0.001	-4.18	0.000
	σ_1	0.002	0.0005		
	σ_2	0.004	0.0003		
	P_{11}	0.836	0.078		
	P_{12}	0.163	0.078		
	P_{21}	0.064	0.041		
	P_{22}	0.935	0.041		
	Log likelihood	525.588			

Note: *, **, *** denote significance at 10%, 5%, and 1%.

Smooth probabilities for State 1



Smooth probabilities for State 2



MSDR Model

$$y_t = \mu_t + x_t\alpha + z_t\beta_{s_t} + \epsilon_{s_t} \tag{2}$$

$$\epsilon_{s_t} \sim i.i.d. \quad N(0, \sigma_s^2)$$

- y_t is the dependent variable
- μ_s is state-invariant intercept
- x_t is state-invariant coefficient, α
- z_t is vector of state-dependent coefficients, β_{s_t}

Variables

- Sample: 1998M1-2018M7
- Total lending in securities finance
- Term spread (10-year Treasury bond and 3-month Treasury bill yields)
- GDP growth rate and risk premium dropped
- difference form

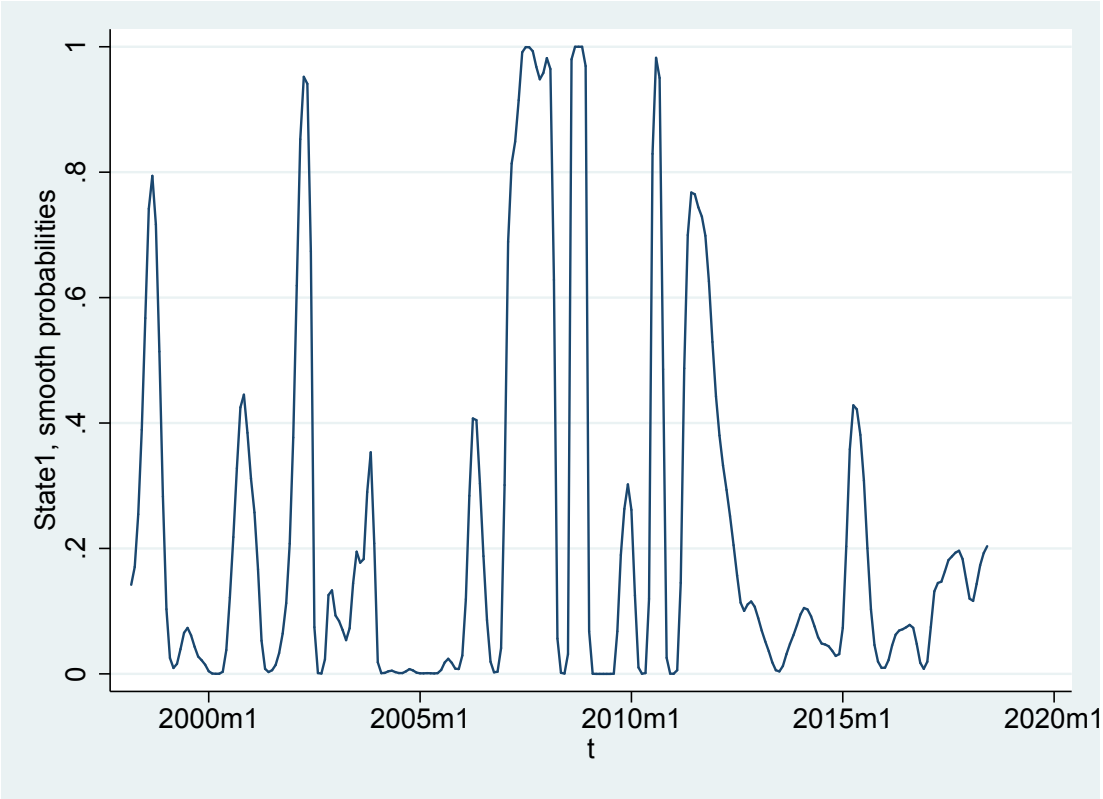
MSDR Results

Table 2:: MSDR Results

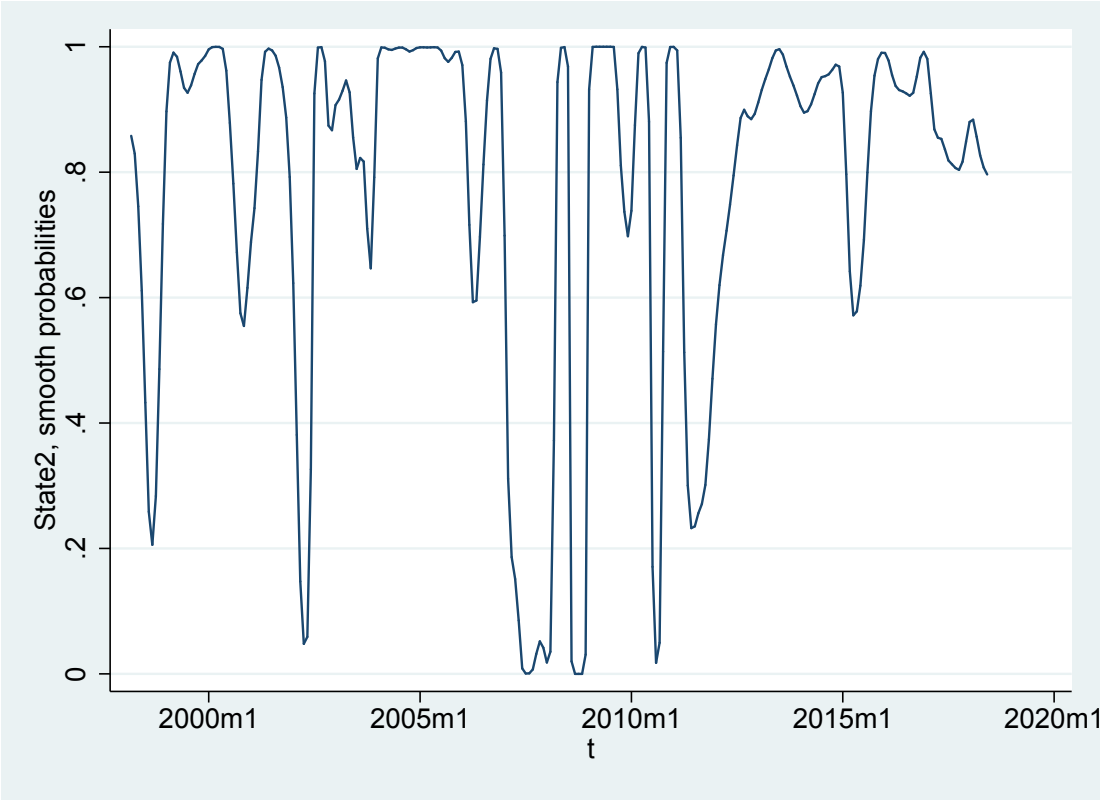
	Parameter	Coefficient	Standard error	z	$P > z$
	μ_t	0.001	0.0001	9.99	0.000
State 1	$secin_t$	-0.171	0.033	-5.12	0.000
	$term_t$	0.006	0.002	2.82	0.005
State 2	$secin_t$	0.100	0 .025	3.92	0.000
	$term_t$	-0.007	0.001	-7.01	0.000
	σ	0.001	0.00007		
	P_{11}	0.801	0.069		
	P_{12}	0.198	0.069		
	P_{21}	0.058	0.028		
	P_{22}	0.941	0 .028		
	Log likelihood	1200.982			

Note: All estimates are significant at 1%.

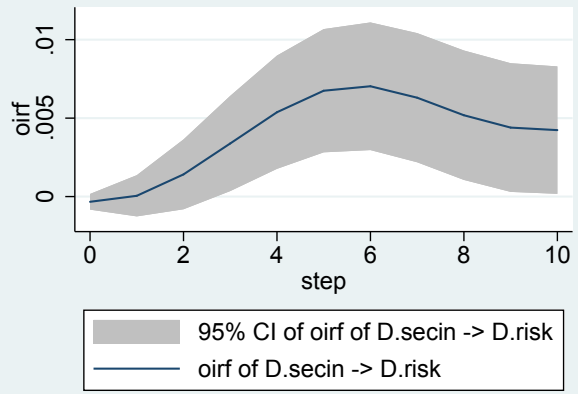
Smooth probabilities for State 1

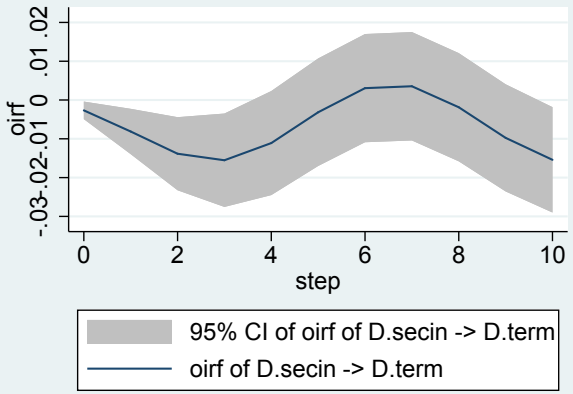


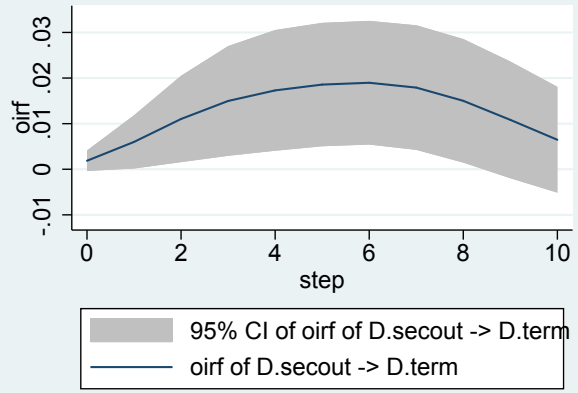
Smooth probabilities for State 2



Orthogonalized impulse-response functions







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- Cross-border flows?
- Regulation? Sharing the risk vs. wager