

Quiet Booms, Sudden Stops: The Volatility Credit Nexus

Xiangyu Ding, Xiang Fang, Yang Liu

The University of Hong Kong

Oct 19, 2026

China Economics Annual Conference

Research Questions

- Sudden stop: crisis with abrupt capital flow reversal and severe output contraction
- Credit booms precede and predict sudden stops
 - Yet no consensus on what makes a credit boom
 - Not all credit booms are alike: some end up with sudden stops, some do not
 - Identifying the source of “bad booms” is important for policy design
- Stochastic volatility is a critical driver of business cycle in both AEs and EMs
 - Studies on sudden stops and macroprudential policies do not analyze stochastic vol
- This paper
 - Empirically: Does risk environment driver credit booms and sudden stops?
 - Theoretically: Can standard models with stochastic volatility account for the data?

This Paper: Empirics

1. Sudden stops are preceded by low volatility at least two years in advance
 - low volatility has predictive power for sudden stops
2. Credit booms associated with low volatility are more likely to end up with sudden stops

This Paper: Quantitative Model

- A canonical small-open economy model with three key features:
 1. Recursive preference
 2. Stochastic volatility on productivity trend shock
 3. An occasionally binding loan-to-value constraint
- Replicate the empirical patterns among volatility, credit boom and sudden stop
- Mechanism
 - Precautionary saving through fluctuating exogenous volatility
 - Relaxation of current and future constraint

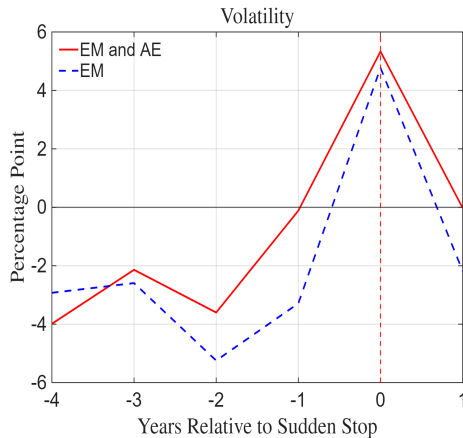
Related Literature

- Sudden stops and macroprudential policies
 - Lorenzoni (2008), Mendoza (2010), Bianchi (2011), Boz and Mendoza (2014), Bianchi, Liu and Mendoza (2016), Bianchi and Mendoza (2018), Devereux, Young and Yu (2019), Flemming, L'Huillier and Piguillem (2019), Seoane and Yurdagul (2019), Reyes-Heroles and Tenorio (2020), Schmitt-Grohé and Uribe (2020), Devereux and Yu (2020), Liu, Ma and Shen (2024), Fang, Liu and Liu (2025)
- Trend shocks in emerging market business cycles
 - Aguiar and Gopinath (2007), Garcia-Cicco et al (2010), Boz, Daude and Durdu (2011), Miyamoto and Nguyen (2017)
- Stochastic volatility in business cycles
 - AEs: Bloom (2009), Justiniano and Primiceri (2014), Basu and Bundick (2017), Bloom et al (2018), Arellano, Bai and Kehoe (2019)
 - EMs: Fernández-Villaverde et al (2011), Gourio et al (2014), Pouzo and Presno (2016), Mumtaz & Musso (2017, 2020), Akinci et al (2021), Colacito et al (2022), Roch and Roldan (2024)

Measures

- Countries: 32 EMs and 21 AEs, 1980-2024
- Measure volatility using each country's stock market realized volatility
 - Easier to measure than low-frequency macro volatility; known in real time
 - Financial volatility captures the macroeconomic risk environment (e.g. Bloom, 2009)
 - EMs with poor quality for macro variables at higher frequency
- We follow Korinek and Mendoza (2014) to define sudden stops
 - Current account to GDP reversal 2 sd above mean
 - EMBI spread (for EM) and VIX (for AE) exceeding 2 sd above the mean
 - 47 in EM and 39 in AE

Event Studies



- Sudden stops preceded with low volatility
- 78% EM SS with lower vol than trend (67% AE+EM)
- 2.5 p.p or 20 % below trend

Predictive Regression

$$\text{Logit}(SS_{i,t+h}) = \alpha_i^{(h)} + \beta^{(h)} Vol_{it} + \delta^{(h)} X_{i,t} + \epsilon_{it}$$

	<i>h</i> = 1			<i>h</i> = 2		
Vol	-2.29* (1.20)	-2.25** (0.93)	-4.81** (2.18)	-1.95* (1.03)	-1.99** (0.86)	-3.74** (1.90)
dCredit		2.88*** (1.09)	2.77** (1.20)		2.68*** (0.90)	2.95*** (1.10)
GlobalVol			7.46 (5.27)			3.98 (4.24)
Controls	No	No	Yes	No	No	Yes
Obs	1087	1062	1062	1095	1070	1070
Pseudo-R2	0.01	0.04	0.06	0.01	0.04	0.06
AUROC	0.56	0.65	0.66	0.57	0.63	0.65

- Low volatility predicts future sudden stops
- Sudden stops differ from banking crises that can be predicted by volatility (Danielsson et al, 2018)

Quite Booms, Sudden Stops

$$\text{Logit}(SS_{i,t+h}) = \alpha_i^{(h)} + \beta^{(h)} \text{Vol}_{it} + \gamma^{(h)} d\text{Credit}_{it} + \theta^{(h)} \text{Vol}_{it} \times d\text{Credit}_{it} + \delta^{(h)} X_{i,t} + \epsilon_{it}$$

		<i>h</i> = 1		<i>h</i> = 2		
Vol		-0.69 (1.95)	-2.50 (2.09)	-1.02 (1.88)	-1.92 (1.97)	
dCredit	3.18*** (0.99)	3.53*** (1.12)	3.51*** (1.05)	2.96*** (0.87)	3.42*** (1.04)	3.37*** (1.07)
Vol × dCredit	-15.18*** (3.44)	-26.03*** (6.12)	-31.21** (12.35)	-13.91*** (3.94)	-20.54** (9.91)	-24.22* (14.56)
GlobalVol			8.01 (6.33)			3.94 (4.95)
GlobalVol × dCredit			5.54 (24.24)			6.89 (17.86)
Controls	No	Yes	Yes	No	Yes	Yes
Obs	1062	1062	1062	1070	1070	1070
Pseudo-R2	0.05	0.07	0.08	0.05	0.06	0.07
AUROC	0.67	0.69	0.70	0.65	0.67	0.67

- Credit boom is more likely to end up in stops if volatility is low
 - Volatility predicts sudden stops if credit growth is high

Volatility and Bad Booms

- Credit booms: High credit to GDP ratio above 1 std. above trend
- Bad booms: Sudden stop happens 3 years before a credit boom ends (Gordon and Ordóñez, 2020)

$$\text{Logit}(\text{BadBoom}_{it}|\text{Boom}_{it}) = \alpha_i + \beta \text{Vol}_{it} + \gamma' X_{it} + \epsilon_{it}$$

Vol	-3.38*		-3.59*	-5.28**	-5.85**		-6.19*	-8.25**
	(1.76)		(1.93)	(2.32)	(2.84)		(3.47)	(3.85)
TFPGrowth		-6.10*	-3.56	-1.93		-5.81	-3.42	-2.12
		(3.32)	(4.29)	(5.92)		(4.33)	(7.27)	(8.11)
dCredit				3.56***				3.75
				(1.25)				(2.50)
Country FE	No	No	No	No	Yes	Yes	Yes	Yes
Obs	246	348	237	236	175	248	166	166
Pseudo-R2	0.03	0.01	0.03	0.09	0.06	0.01	0.06	0.12
AUROC	0.58	0.56	0.58	0.67	0.61	0.54	0.61	0.65

Quite Booms, Sudden Stops

- Reinterpret some results in the literature
- Credit booms and asset price growth predict crises (Greenwood, Hansen, Shleifer, Sorensen, 2022)
- Credit booms with low TFP growth are bad booms (Gordon and Ordonez, 2020)
- High asset prices are associated with high growth or low volatility (Bansal and Yaron, 2004)

Robustness: Emerging Markets Subsample

	<i>h</i> = 1			<i>h</i> = 2		
Vol	-1.76*** (0.12)	-3.90*** (1.34)	-3.30** (1.52)	-1.64*** (0.34)	-2.66** (1.21)	-1.03 (0.70)
<i>dCredit</i>		7.43*** (2.12)	7.41*** (2.01)		5.97** (2.61)	5.79** (2.86)
Vol × <i>dCredit</i>			-12.79 (12.18)			-27.72** (13.21)
<i>GlobalVol</i>		12.12** (5.65)	15.14** (7.46)		5.34 (6.64)	5.74 (8.85)
<i>GlobalVol</i> × <i>dCredit</i>			-27.62 (35.40)			-1.91 (41.61)
<i>LagSuddenStop</i>		-16.05*** (0.46)	-16.20*** (0.65)		-15.91*** (0.62)	-16.42*** (0.69)
<i>GDPGrowth</i>		0.63 (8.79)	0.36 (8.99)		5.11 (10.94)	6.78 (9.69)
<i>Infl</i>		-0.05 (0.06)	-0.05 (0.08)		-0.04 (0.04)	-0.07 (0.07)
<i>Country FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Obs</i>	461	431	431	462	431	431
<i>Pseudo R2</i>	0.04	0.27	0.28	0.03	0.19	0.22
<i>AUROC</i>	0.63	0.80	0.77	0.62	0.78	0.73

Robustness: GDP Volatility

	$h = 1$		$h = 2$	
<i>GDPVol</i>	-15.39**	-10.04	-5.08	-1.75
	(7.10)	(7.22)	(4.86)	(4.54)
<i>dCredit</i>	1.46**	3.26***	1.53*	2.94***
	(0.60)	(0.45)	(0.83)	(1.07)
<i>GDPVol</i> × <i>dCredit</i>		-54.25***		-36.55**
		(11.78)		(17.49)
<i>GlobalGDPVol</i>	24.00***	18.84***	13.27*	9.55
	(4.14)	(4.19)	(7.21)	(7.67)
<i>GlobalGDPVol</i> × <i>dCredit</i>		37.76*		26.79
		(22.04)		(19.76)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Country FE</i>	Yes	Yes	Yes	Yes
<i>Obs</i>	1286	1286	1296	1296
<i>Pseudo R2</i>	0.05	0.07	0.03	0.04
<i>AUROC</i>	0.66	0.67	0.61	0.62

Robustness: External Credit

- **dExtCredit**: 3-year changes in foreign debt liability as ratio of GDP

	<i>h</i> = 1		<i>h</i> = 2	
<i>Vol</i>	-4.98**	-4.09*	-3.47*	-2.59
	(2.13)	(2.24)	(1.97)	(1.87)
<i>dExtCredit</i>	-0.00	0.24	-0.05	0.21
	(0.52)	(0.76)	(0.53)	(0.50)
<i>Vol</i> × <i>dExtCredit</i>		-14.62***		-14.35***
		(4.30)		(5.25)
<i>GlobalVol</i>	10.61*	9.62	6.94	6.56
	(6.06)	(6.35)	(4.58)	(4.57)
<i>GlobalVol</i> × <i>dExtCredit</i>		20.20		8.32
		(12.36)		(7.25)
<i>Controls</i>	Yes	Yes	Yes	Yes
<i>Country FE</i>	Yes	Yes	Yes	Yes
<i>Obs</i>	1076	1076	1076	1076
<i>Pseudo R2</i>	0.10	0.11	0.09	0.10
<i>AUROC</i>	0.68	0.68	0.68	0.67

Robustness: Using Weekly Realized Return Volatility

	$h = 1$			$h = 2$		
Vol	-1.61*** (0.21)	-2.87*** (0.98)	-1.96* (1.12)	-1.44*** (0.39)	-1.95* (1.01)	-0.47 (0.79)
dCredit		2.44* (1.35)	2.88** (1.26)		2.81** (1.26)	3.09*** (1.20)
Vol $\times$ dCredit			-17.93** (8.92)			-19.29** (9.11)
GlobalVol		6.77 (6.00)	9.23 (6.53)		3.78 (4.72)	4.58 (5.28)
GlobalVol $\times$ dCredit			-14.38 (15.86)			-4.14 (15.87)
LagSuddenStop		-15.59*** (0.36)	-16.57*** (0.37)		-17.34*** (0.37)	-16.90*** (0.38)
GDPGrowth		-1.60 (6.84)	-3.18 (6.12)		2.81 (6.77)	2.39 (6.11)
Infl		-0.02 (0.04)	-0.03 (0.05)		-0.03 (0.03)	-0.04 (0.05)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1058	1021	1021	1065	1021	1021
Pseudo R2	0.02	0.12	0.14	0.01	0.12	0.13
AUROC	0.58	0.70	0.73	0.58	0.71	0.70

Robustness: Alternative Detrend Method

	$h = 1$			$h = 2$		
dVol (First Difference)	-4.91** (2.17)			-4.55*** (1.44)		
Vol (One-Sided Qudratic)		-10.01*** (3.65)			-7.99** (3.89)	
Vol (One-Sided HP)			-7.63** (3.80)			-5.82* (3.41)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1330	1379	1379	1331	1380	1380
Pseudo R2	0.12	0.11	0.10	0.14	0.11	0.11
AUROC	0.73	0.73	0.72	0.73	0.72	0.71

Model: Setup

- Small open economy
- Households have **recursive utility** and borrow from abroad at constant r
 - To front-load and smooth consumption
 - To purchase intermediate input for the production
- Borrowing is **limited by a value of collateral**, which depends on the capital price
- Firms produce using labor, intermediate input and capital (with fixed supply)
- Productivity exhibits **stochastic trend** with **time-varying second moments**

Model: Production

- Production function

$$Y_t = A_t F(k_t, M_t, h_t) - p_m M_t$$

where

$$F(k_t, M_t, h_t) = k_t^{\alpha_k} M_t^{\alpha_m} h_t^{\alpha_h}$$

- Productivity

$$A_t = \Gamma_t^{1-\alpha_m}, \frac{\Gamma_t}{\Gamma_{t-1}} = g_t$$

- The growth rate follows

$$\log g_t = (1 - \rho_g) \mu_g + \rho_g \log g_{t-1} + \epsilon_{g,t}, \quad \epsilon_{g,t} \sim N(0, \sigma_g^2)$$

$$\log \sigma_t^2 = (1 - \rho_\sigma) \mu_\sigma + \rho_\sigma \log \sigma_{t-1}^2 + \epsilon_{\sigma,t}, \quad \epsilon_{\sigma,t} \sim N(0, \sigma_\sigma^2)$$

Model: Households

$$V_t = \max_{c_t, M_t, h_t, k_{t+1}, B_{t+1}} \left\{ (1 - \beta) \left[C_t - \chi \frac{\Gamma_{t-1} h_t^{1+\omega}}{1 + \omega} \right]^{1 - \frac{1}{\psi}} + \beta \left[E_t \left(V_{t+1}^{1-\gamma} \right) \right]^{\frac{1 - \frac{1}{\psi}}{1 - \gamma}} \right\}^{\frac{1}{1 - \frac{1}{\psi}}}$$

$$A_t F(k_t, M_t, h_t) - p_m M_t + Q_t k_t + B_t = C_t + \frac{B_{t+1}}{1 + r} + Q_t k_{t+1}$$

- Loan-to-Value collateral constraint: Household debt + firm's working capital

$$\underbrace{-\frac{B_{t+1}}{1 + r}}_{\text{Debt}} + \underbrace{\theta p_m M_t}_{\text{Working Cap.}} \leq \kappa Q_t k_t$$

where $B < 0$ indicates net borrowing, and Q_t is the price of capital

Calibration

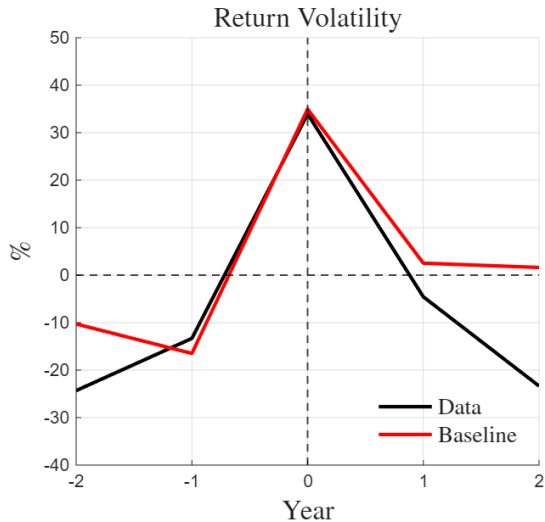
Description	Variable	Value	Source / Target
<i>Panel A: Standard Parameters</i>			
Real interest rate	r	0.040	Standard value
Labor share	α_h	0.350	Labor share = 2/3
Input share	α_m	0.450	Bianchi & Mendoza (2018)
Frisch Elasticity of Labor	$1/\omega$	1.182	Mendoza (2010)
Working capital coefficient	θ	0.160	Bianchi & Mendoza (2018)
Collateral margin	κ	0.900	Bianchi & Mendoza (2018)
Persistence of growth	ρ_g	0.780	Flemming et al. (2019)
Persistence of volatility	ρ_σ	0.660	Colacito et al. (2022)
<i>Panel B: Calibrated Parameters</i>			
Impatience	β	0.910	Probability of crisis = 3.4%
IES	ψ	1.500	GDP drop during sudden stop = -4.7%
RRA	γ	10.00	Equity premium = 7.5%
Capital Share	α_k	0.028	NFA / GDP = -35%
Average log growth	μ_g	0.017	$E(\Delta \log \text{GDP}) = 1.7\%$
Average log variance	μ_σ	-7.521	$\text{Std}(\Delta \log \text{GDP}) = 4.7\%$
Std. of volatility shocks	σ_σ	0.580	$\text{Std}[\sigma_{t+1}]/E[\sigma_{t+1}] = 40\%$

Aggregate Moments

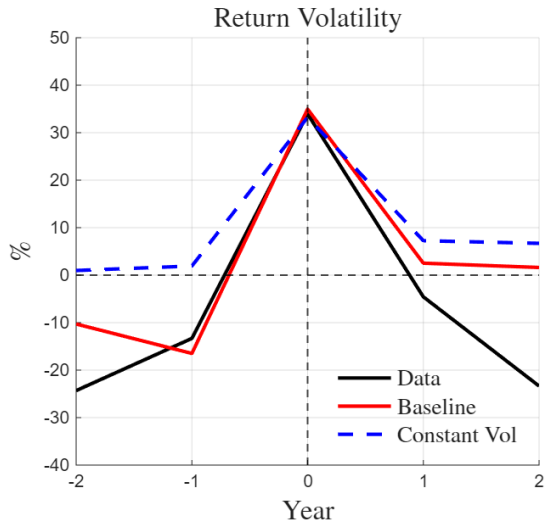
<i>Description</i>	<i>Moments</i>	<i>Data</i>	<i>Model</i>
<i>Std of GDP Log Growth</i>	$Std(\Delta \ln Y)$	4.66	4.71
<i>NFA to GDP</i>	$E(B'/Y)$	-34.9	-34.9
<i>Sudden Stop Probability</i>	$Prob(SS)$	3.38	3.33
<i>Sudden Stop GDP Drop</i>	$\Delta_{ss} \ln Y$	-4.75	-4.78
<i>Equity Premium</i>	$E(R^k - R)$	7.50	7.49
<i>Cyclical of Detrend CA</i>	$Corr(CA/Y, Y)$	-30.6	-55.6
<i>Std of CA to GDP Ratio</i>	$Std(CA/Y)$	4.41	3.10
<i>Std of Cons. Relative to GDP</i>	$Std(\Delta \ln C)/Std(\Delta \ln Y)$	1.25	1.48
<i>Autocorrelation of GDP Growth</i>	$Corr(\Delta \ln Y_{t-1}, \Delta \ln Y_t)$	26.5	41.3
<i>Sudden Stop Asset Price Drop</i>	$\Delta_{ss} \log(Q)$	-28.5	-22.4

- Model generates key characteristics of emerging market business cycle

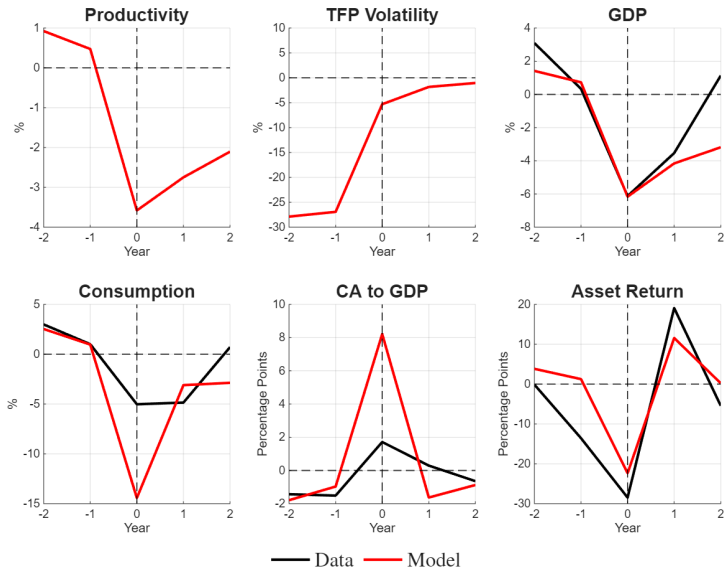
Volatility and Sudden Stop Dynamics



Volatility and Sudden Stop Dynamics



Sudden Stop Events



Predictive Regression and Credit Boom Interaction

<i>Panel A: Data</i>						
		<i>h = 1</i>			<i>h = 2</i>	
<i>Vol</i>	-2.29* (1.20)	-2.25** (0.93)	-2.50 (2.09)	-1.95* (1.03)	-1.99** (0.86)	-1.92 (1.97)
<i>dCredit</i>		2.88*** (1.09)	3.51*** (1.05)		2.68*** (0.90)	3.37*** (1.07)
<i>Vol</i> × <i>dCredit</i>			-31.21** (12.35)			-24.22* (14.56)
<i>R</i> ²	0.01	0.04	0.08	0.01	0.04	0.07
<i>AUROC</i>	0.57	0.65	0.70	0.57	0.63	0.67

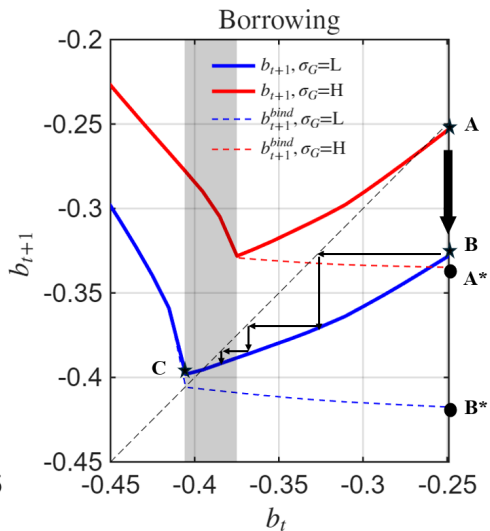
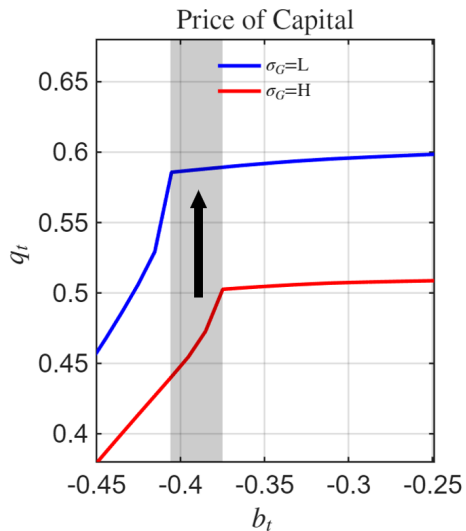
<i>Panel B: Model Simulated Data</i>						
		<i>h = 1</i>			<i>h = 2</i>	
<i>Vol</i>	-9.42	-8.96	-8.97	-8.18	-7.44	-7.30
<i>dCredit</i>		4.95	5.04		7.31	6.72
<i>Vol</i> × <i>dCredit</i>			-2.03			-7.49
<i>R</i> ²	0.11	0.11	0.11	0.09	0.10	0.10
<i>AUROC</i>	0.74	0.74	0.74	0.70	0.72	0.72

- The model qualitatively matches the negative coefficient of *vol*, positive coefficient on credit growth, and the negative interaction coefficient

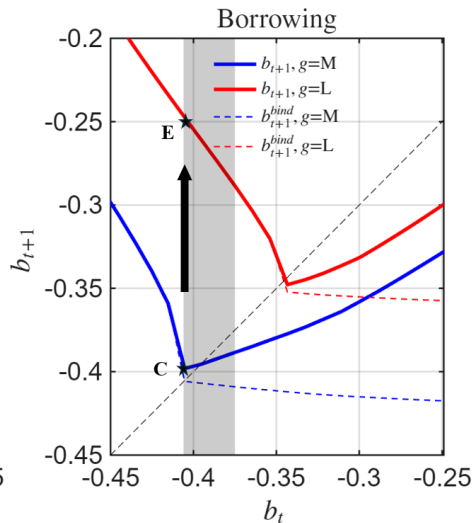
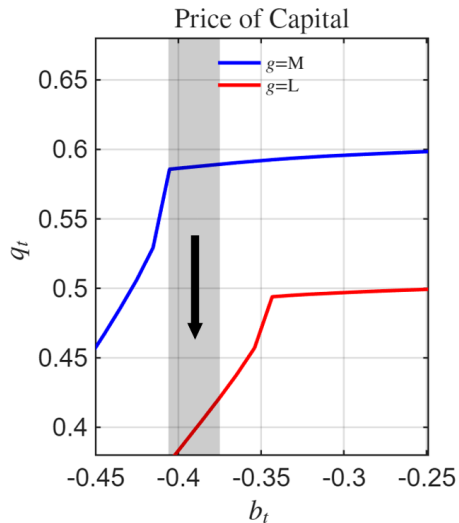
Mechanisms

- Low volatility boosts asset price and relaxes current and future constraint
- Low volatility reduces precautionary saving
 - Less concerned about future possibility of a binding constraint
- Low volatility makes large negative shocks unlikely (quantitatively less important)
- Two alternative models cannot match the volatility dynamics:
 - CRRA utility
 - Replace the trend shock with a transitory cycle shock that follows $AR(1)$

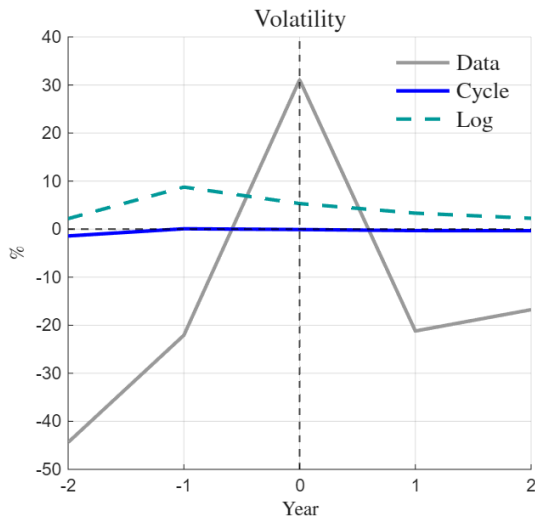
Mechanisms: Credit Boom



Mechanisms: Sudden Stop

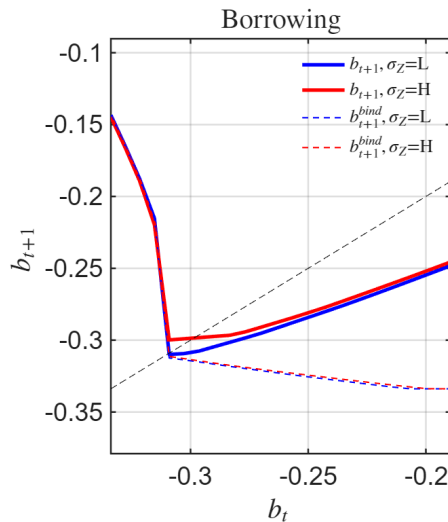
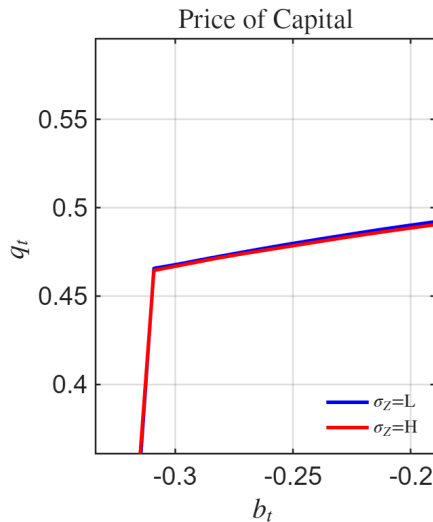


Role of Recursive Preference and Trend Shock



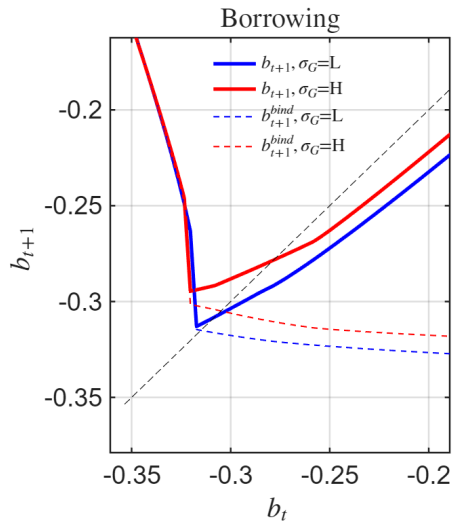
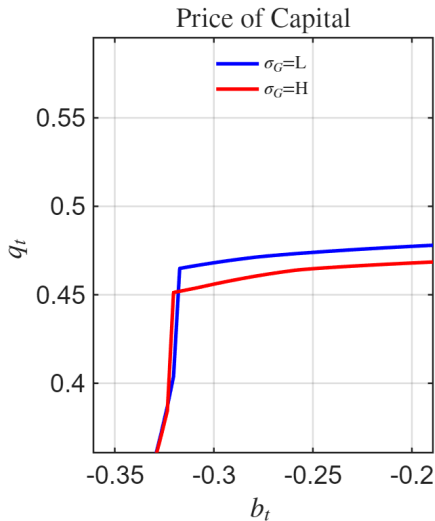
- Log preference/cycle shocks cannot generate low volatility preceding sudden stops

Log Preference



- Volatility barely moves collateral price, thus having little impact on borrowing

Cycle Shock



- Volatility has small impact on collateral price and borrowing

Conclusion: Quiet Booms, Sudden Stops

- **Open-economy 'Volatility Paradox':** Low volatility forecast sudden stops
- Credit booms associated with low volatility more likely to end up in sudden stops
- Echoes Minsky (1992); Brunnermeier and Sannikov (2014)
- A calibrated quantitative model replicates the volatility dynamics in the data
 - Key ingredients: recursive utility and stochastic volatility on trend shock
- Implication: macroprudential policy in response to volatility