ECON 6356
International Finance and Macroeconomics

Lecture 6:
The Global Financial Cycle: Dilemma or Trilemma?

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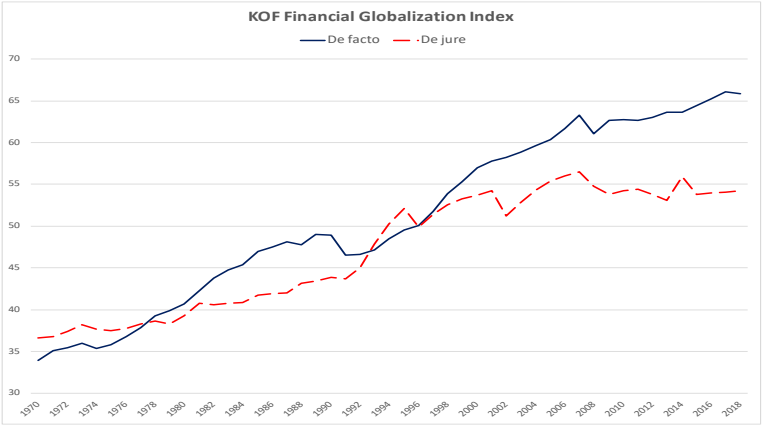
Introduction

- Monetary policy decisions have global effects
  - Financial globalization has created even more interconnection



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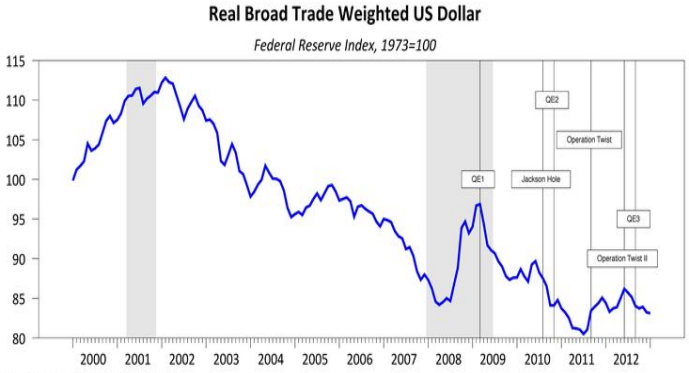
- Example 1: QE $\Rightarrow$ USD depreciates



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- Example 1: QE $\Rightarrow$ USD depreciates $\Rightarrow$ Emerging markets response
  - In 2009, Brazil adopts tax on portfolio flows
  - In late 2010, Turkey increases reserve requirements
  - In 2010, Indonesia introduces one-month minimum holding period for debt

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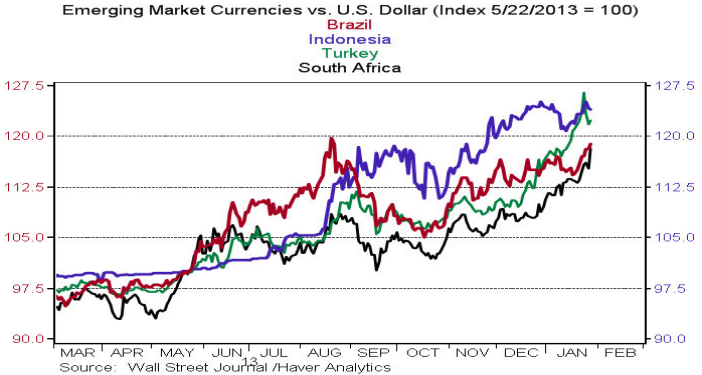
- Example 2: "Taper tantrum" $\Rightarrow$ USD appreciates



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- Example 2: "Taper tantrum" $\Rightarrow$ USD appreciates $\Rightarrow$ Emerging markets response
  - In spring of 2013, Brazil and Indonesia start raising rates
  - In June 2013, Brazil removes tax on portfolio flows
  - In early 2014, India, South Africa and Turkey also increase interest rate

Introduction

- Monetary policy decisions have global effects
  - Financial globalization has created even more interconnection
- How do other countries respond to US monetary policy shocks?
  - Do emerging markets responses make sense?
  - Is some form of international monetary policy coordination desirable?

Basic UIP Theory

- Textbook reference framework: Uncovered Interest-Rate Parity (UIP)

$$i_t = i_t^* + \mathbb{E}_t e_{t+1} - e_t$$

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- Problem: UIP does not work well empirically (Fama, 1984)
  - If so, how does consensus view based on UIP change?

A Reignited Debate

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  - Yet consensus on monetary policy response to foreign shocks largely unscathed
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  - Showed existence of a "global financial cycle" (GFC)
  - Argued flexible exchange rate not enough to insulate countries from foreign shocks
  - Concluded policymakers need to actively manage capital flows

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  - Concluded policymakers need to actively manage capital flows
- Obstfeld (2014): Flexible exchange rate still desirable
  - Although financial globalization may worsen tradeoffs
  - Financial stability concerns may hamper monetary policy effectiveness

Outline

- Empirical evidence on GFC
  - International transmission of monetary policy shocks (Rey, 2013; Miranda-Agrippino and Rey, 2020)
  - International transmission of credit shocks (Cesa-Bianchi, Ferrero and Rebucci, 2018)
  - Relevance of exchange rate regime (Obstfeld, Ostry and Qureshi, 2019)

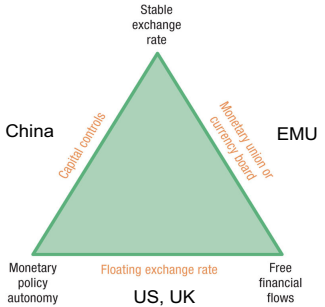
* Tools: Regression analysis and vector autoregressions (VARs)

The Trilemma

Trilemma

Proposition: *A country can contemporaneously achieve only two of the following three objectives:*

1. *Independent monetary policy;*
2. *Fixed exchange rate;*
3. *Free international movement of financial capital.*



Back to UIP

- Recall UIP

$$i_t = i_t^* + \mathbb{E}_t e_{t+1} - e_t$$

where

  - i_t = Nominal interest rate on domestic government bond
  - i_t^* = Nominal interest rate on foreign government bond
  - e_t = Nominal exchange rate (units of domestic currency per unit of foreign currency)

- UIP is a no-arbitrage condition

Example: Suppose a US citizen has 100 USD to invest:

  - Can buy US government bond that pays i_t
  - Alternatively can buy UK government bond that pays i_t^*
  - But in this case need to convert domestic USD into GBP today at exchange rate e_t
  - And need to convert payoff back in USD tomorrow at exchange rate $\mathbb{E}_t e_{t+1}$

Trilemma and UIP

- Trilemma logic relies on UIP
  - Assume free international movement of financial capital
  - Fixed exchange rate implies $e_t = 0 \; \forall t \; (\Rightarrow \mathbb{E}_t e_{t+1} = 0) \Rightarrow i_t = i_t^*$
  - Home country looses domestic monetary policy independence

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- But if UIP does not hold, is Trilemma logic still sound?
  - Failure of UIP well documented empirically
  - Policy implications much less explored

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  - Failure of UIP well documented empirically
  - Policy implications much less explored
- Enter Rey (2013): Policy implication challenge existing consensus

"Independent monetary policies are possible if and only if the capital account is managed."

The Global Financial Cycle

Global Financial Cycle (GFC)

- Strong common component among risky asset prices globally
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- Excessive credit growth in booms and retrenchment in busts
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    - Gourinchas and Obstfeld (2012)
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    - Gourinchas and Obstfeld (2012)
    - Schularick and Taylor (2012)
- Rey (2013): Dilemma
  - GFC makes exchange rate regime irrelevant
  - Actual tradeoff: Free capital mobility vs. monetary policy autonomy (dilemma and not a trilemma)

Gross Capital Flows Co-Movement

Correlations of capital inflows by asset classes into geographical regions

Liability	Equity	Equity	Equity	Equity	Equity	Equity	Equity	FDI	FDI	FDI	FDI	FDI	FDI	FDI	Debt	Debt	Debt	Debt	Debt	Debt	Debt	Credit	Credit	Credit	Credit	Credit	Credit	Credi
Flows	N. Am.	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa
Equity N. Am	1.00																											
Equity LatAm	0.39	1.00																										
Equity CE. EU	0.52	0.49	1.00																									
Equity W. EU	0.63	0.35	0.50	1.00																								
Equity Em. As	0.37	0.24	0.28	0.47	1.00																							
Equity Asia	0.24	0.31	0.28	0.40	0.31	1.00																						
Equity Africa	0.41	0.22	0.26	0.55	0.34	0.26	1.00																					
FDI N. Am	0.54	0.06	0.07	0.45	0.52	-0.07	0.22	1.00																				
FDI LatAm	0.41	0.10	0.08	0.29	0.32	-0.07	0.04	0.68	1.00																			
FDI CE. EU	0.46	0.11	0.08	0.18	0.23	-0.12	0.09	0.61	0.65	1.00																		
FDI W. EU	0.57	0.21	0.19	0.38	0.35	0.01	0.16	0.61	0.59	0.75	1.00																	
FDI Em. As	0.47	0.24	0.16	0.34	0.36	-0.04	0.04	0.65	0.77	0.69	0.64	1.00																
FDI Asia	0.36	0.16	0.03	0.29	0.30	-0.17	0.05	0.60	0.70	0.57	0.51	0.69	1.00															
FDI Africa	0.33	0.01	0.10	0.18	0.03	-0.16	-0.19	0.31	0.36	0.35	0.35	0.34	0.27	1.00														
Debt N. Am	0.42	0.17	0.32	0.51	0.29	0.21	0.31	0.40	0.39	0.55	0.51	0.48	0.37	0.08	1.00													
Debt LatAm	0.20	0.40	0.33	0.16	0.13	0.00	-0.05	0.16	0.35	0.13	0.05	0.31	0.26	0.06	0.10	1.00												
Debt CE. EU	0.37	0.42	0.50	0.43	0.13	0.17	0.19	0.14	0.35	0.14	0.12	0.47	0.21	0.04	0.37	0.52	1.00											
Debt W. EU	0.49	0.05	0.33	0.50	0.23	0.27	0.47	0.29	0.10	0.44	0.27	0.25	0.02	0.10	0.58	-0.13	0.28	1.00										
Debt Em. As	0.40	0.58	0.65	0.35	0.20	0.23	0.20	0.13	0.24	0.25	0.37	0.35	0.15	0.02	0.32	0.38	0.53	0.14	1.00									
Debt Asia	0.16	0.18	0.24	0.22	0.16	-0.04	0.16	0.35	0.31	0.30	0.30	0.45	0.26	0.14	0.45	0.27	0.42	0.19	0.39	1.00								
Debt Africa	0.26	0.27	0.39	0.18	0.07	0.14	0.09	0.12	0.21	0.10	0.01	0.41	0.21	0.07	0.21	0.46	0.61	0.15	0.44	0.32	1.00							
Credit N. Am.	0.29	-0.02	0.21	0.38	0.15	-0.01	0.32	0.20	0.02	0.19	0.20	0.12	0.09	0.04	0.37	0.14	0.23	0.25	0.23	0.25	0.03	1.00						
Credit LatAm	0.41	0.34	0.21	0.26	0.12	0.04	0.22	0.38	0.35	0.42	0.27	0.48	0.35	0.24	0.35	0.25	0.41	0.30	0.29	0.46	0.28	0.22	1.00					
Credit CE. EU	0.42	0.25	0.27	0.28	0.32	0.15	0.21	0.54	0.38	0.72	0.55	0.47	0.36	0.28	0.54	0.14	0.13	0.56	0.25	0.48	0.12	0.17	0.55	1.00				
Credit W. EU	0.19	-0.03	0.24	0.31	0.19	-0.16	0.26	0.27	0.08	0.20	0.30	0.19	0.13	0.15	0.45	0.20	0.25	0.33	0.26	0.45	0.16	0.63	0.30	0.34	1.00			
Credit Em. As	0.25	0.54	0.39	0.21	0.10	0.16	0.05	0.22	0.16	0.30	0.29	0.38	0.24	0.00	0.40	0.31	0.33	0.15	0.56	0.51	0.27	0.24	0.45	0.48	0.28	1.00		
Credit Asia	0.08	-0.03	0.02	-0.01	0.00	-0.40	-0.12	0.23	0.23	0.32	0.24	0.31	0.23	0.25	0.32	0.18	0.17	-0.01	0.13	0.37	0.08	0.43	0.35	0.23	0.52	0.37	1.00	
Credit Africa	0.11	0.06	0.01	0.15	0.01	-0.20	0.12	0.40	0.30	0.35	0.33	0.24	0.37	0.18	0.32	0.11	0.00	0.13	0.03	0.34	-0.02	0.24	0.30	0.40	0.36	0.30	0.31	1.00

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Flows	N. Am.	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa	N. Am	LatAm	CE. EU	W. EU	Em.As	Asia	Africa
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Credit Asia	0.32	0.07	0.22	0.03	-0.07	0.18	-0.16	0.24	0.17	0.16	0.18	0.28	-0.05	0.25	0.17	-0.10	-0.19	0.17	0.28	0.08	0.29	0.33	0.28	0.11	0.49	0.09	1.00	
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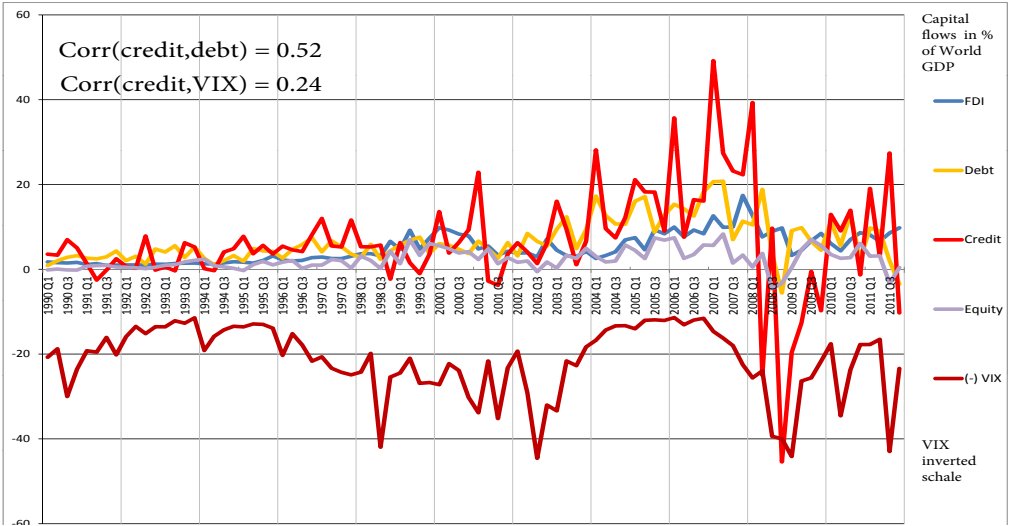
Capital Inflows and the VIX



Credit Growth, Leverage and the VIX

Conditional correlation of credit growth and leverage with the VIX

Correlations credit / VIX	*North America*	*Latin America*	*Central Eastern Europe*	*Western Europe*	*Emerging Asia*	*Asia*	*Africa*
Domestic credit growth	-0.26	-0.14	-0.14	-0.11	-0.01	-0.30	0.01
Leverage	-0.17	0.05	0.30	-0.09	-0.12	-0.25	0.03
Leverage growth	-0.32	0.06	0.07	-0.21	-0.06	-0.31	0.01

Conditioning variables: World real short rate and world growth rate

Estimating a Common Factor

- Capital flows, credit and leverage follow global financial cycle
  - What about asset prices (equity, corporate bonds, commodities)?

- Miranda-Agrippino and Rey (2020) estimate common factor driving asset prices globally

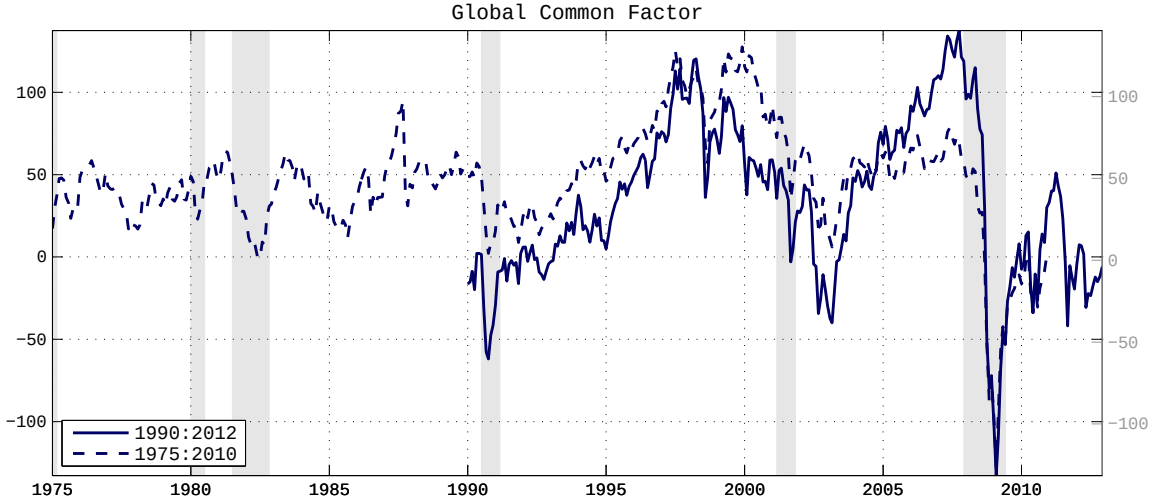
$$p_{it} = \lambda_{ig} f_{gt} + \lambda_{im} f_{mt} + \xi_{it}$$

p_{it} = Asset price i
f_{gt} = Global factor (with loading λ_{ig})
f_{mt} = Market (country)-specific factor (with loading λ_{im})
ξ_{it} = Idiosyncratic shock

Number of asset prices by region

Sample	North America	Latin America	Europe	Asia Pacific	Australia	Commodity	Corporate	Total
1975:2010	114	–	82	68	–	39	–	303
1990:2012	364	16	200	143	21	57	57	858

The Common Factor



The Role of Monetary Policy

- What drives co-movement of capital flows, asset prices, leverage, credit and VIX?
- Global banks crucially rely on USD funding (Shin, 2012; Bruno and Shin, 2015)
  - Explore role of monetary policy as key driver of GFC

The Role of Monetary Policy

- What drives co-movement of capital flows, asset prices, leverage, credit and VIX?
- Global banks crucially rely on USD funding (Shin, 2012; Bruno and Shin, 2015)
  - Explore role of monetary policy as key driver of GFC
- Vector autoregression (VAR) analysis on quarterly data between 1990 and 2012
  - Seven macro-financial variables
    - US real GDP
    - US GDP deflator
    - Log of global credit
    - Global credit inflows
    - Median leverage of European banks
    - Federal funds target rate
    - Log of VIX

Identification

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- Structural VAR (for simplicity one lag, no constant) describes "true" underlying economic structure

$$Y_t = A_1 Y_{t-1} + B\varepsilon_t$$

  - Structural shocks ε_t have well-defined economic interpretation
  - Elements of ε_t independent of each other $\Rightarrow$ Can study their effects one at a time

- Identification boils down to obtaining B

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- But we can only estimate reduced-form VAR

$$Y_t = A_1 Y_{t-1} + u_t$$

  - Elements of u_t are linear combinations of structural shocks ($u_t = B\varepsilon_t$)
  - Response to u_t confounds effects of different structural shocks

- Identification boils down to obtaining B

Example

- Assume Y_t contains two variables: GDP growth (x_t) and monetary policy rate (i_t)

- Structural VAR in matrix form

$$\begin{bmatrix} x_t \\ i_t \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x_{t-1} \\ i_{t-1} \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{dem} \\ \varepsilon_t^{mon} \end{bmatrix}$$

- System representation

$$\begin{cases} x_t &= a_{11}x_{t-1} + a_{12}i_{t-1} + \underbrace{b_{11}\varepsilon_t^{dem} + b_{12}\varepsilon_t^{mon}}_{=u_t^x} \\ i_t &= a_{21}x_{t-1} + a_{22}i_{t-1} + \underbrace{b_{21}\varepsilon_t^{dem} + b_{22}\varepsilon_t^{mon}}_{=u_t^i} \end{cases}$$

  - Elements of ε_t cannot be identified without further assumptions (only u_t^x and u_t^i can be estimated)

VAR Estimation

- Can estimate

$$Y_t = A_1 Y_{t-1} + u_t$$

- Estimation delivers
  - Matrix A_1
  - Reduced-form residuals u_t
  - Covariance matrix Σ_u
- Reduced-form residuals are related to structural shocks ε_t according to

$$\begin{bmatrix} u_t^x \\ u_t^i \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{dem} \\ \varepsilon_t^{mon} \end{bmatrix} \Rightarrow \begin{cases} u_t^x &= b_{11}\varepsilon_t^{dem} + b_{12}\varepsilon_t^{mon} \\ u_t^i &= b_{21}\varepsilon_t^{dem} + b_{22}\varepsilon_t^{mon} \end{cases}$$

- If we knew b_{ij}'s, we could recover elements of ε_t given estimates of elements of u_t
  - Identification $\equiv$ Figuring out b_{ij}'s

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- Consists of finding matrix B that solves

$$u_t = B\varepsilon_t$$

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- Find B that satisfies $\Sigma_u = BB'$

- Sounds easy but is actually impossible without further assumptions
  - Infinite combinations of B that give same Σ_u

One Σ_u, Many B's

- Why is it impossible to find one B that satisfies $\Sigma_u = BB'$?

$$\begin{bmatrix} \sigma_x^2 & \sigma_{xi} \\ \sigma_{xi} & \sigma_i^2 \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{21} \\ b_{12} & b_{22} \end{bmatrix}$$

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- Rewrite in system form

$$\begin{cases} \sigma_x^2 &= b_{11}^2 + b_{12}^2 \\ \sigma_{xi} &= b_{11} b_{21} + b_{12} b_{22} \\ \sigma_{xi} &= b_{11} b_{21} + b_{12} b_{22} \\ \sigma_i^2 &= b_{21}^2 + b_{22}^2 \end{cases}$$

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- Because variance-covariance matrix is symmetric, second and third equations are perfectly collinear
  - Only 3 equations to determine 4 unknowns (elements of B)

How to Solve the Identification Problem?

- Need additional relations between elements of B and element of Σ_u
- Can economic theory help?
  - Map assumptions about economy into relations among VAR parameters

How to Solve the Identification Problem?

- Need additional relations between elements of B and element of Σ_u
- Can economic theory help?
  - Map assumptions about economy into relations among VAR parameters
- Additional relations are called restrictions
- In bi-variate example, need one extra restriction for identification
  - More generally, need $k(k-1)/2$ additional restrictions (where k = number of endogenous variables)
  - Number of restrictions increases with size of VAR

Zero Contemporaneous Restrictions (Choleski)

- Many identification schemes available
  - Here we focus on zero contemporaneous restrictions (Choleski identification)
  - Some alternatives: Long-run restrictions, sign restrictions, IV, and more.

(We saw it before: Linkages between shocks in B dictate contemporaneous effects in variables)

  - Other shocks are left unidentified (hence the "partial")

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Zero Contemporaneous Restrictions (Choleski)

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- Key idea: Assume some shocks have no contemporaneous effect on some variables

  (We saw it before: Linkages between shocks in B dictate contemporaneous effects in variables)
- Rey (2013) assumes
  - GDP and prices respond with a lag (slow moving)
  - FFR responds to any variable but VIX
- Partial identification: Only focuses on effects of monetary policy shocks
  - Other shocks are left unidentified (hence the "partial")

How to Impose Zero Contemporaneous Restrictions

- Back to our example: Monetary policy has no contemporaneous effect on output
  - How do we impose such a restriction?

- Recall matrix representation

$$\begin{bmatrix} x_t \\ i_t \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x_{t-1} \\ i_{t-1} \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{dem} \\ \varepsilon_t^{mon} \end{bmatrix}$$

  - No contemporaneous effect of monetary policy shocks on output $\Rightarrow b_{12} = 0$

- Impose restriction in $\Sigma_u = BB'$ $\Rightarrow$ System now has unique solution

$$\begin{bmatrix} \sigma_x^2 & \sigma_{xi} \\ \sigma_{xi} & \sigma_i^2 \end{bmatrix} = \begin{bmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} b_{11} & b_{21} \\ 0 & b_{22} \end{bmatrix} \Rightarrow \begin{cases} \sigma_x^2 & = b_{11}^2 \\ \sigma_{xi} & = b_{11} b_{21} \\ \sigma_i^2 & = b_{21}^2 + b_{22}^2 \end{cases}$$

Impulse Response Functions

- We can now analyze impact of monetary policy shock on output and interest rates

$$\begin{bmatrix} x_t \\ i_t \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x_{t-1} \\ i_{t-1} \end{bmatrix} + \begin{bmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{dem} \\ \varepsilon_t^{mon} \end{bmatrix}$$

- Set $\varepsilon_t^{mon} = 1$ (or any other meaningful normalization)
  - OLS gives us consistent estimates of elements of A
  - Identification gives us consistent estimates of elements of B (because of consistent estimate of Σ_u)

- Impulse response function (IRF) of x_{t+j} to ε_t^{mon} (for $j \geq 0$)

$$IRF_{t+j}^{x} \equiv \frac{\partial x_{t+j}}{\partial \varepsilon_t^{mon}}$$

How to Compute IRFs to a Monetary Policy Shock

- For monetary policy shock (second element of ε_t), define shock vector as

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- We can compute IRFs to a monetary policy shock from

$$Y_t = A_1 Y_{t-1} + Bs$$

- In particular, IRFs follow recursion

$$IRF_t = \begin{cases} Bs & \text{for } t = 0 \\ A_1 IRF_{t-1} & \text{for } t \geq 1 \end{cases}$$

Dilemma

Narrative

- How does presence of GFC affects transmission of monetary policy shocks?
  - Consider interest rate tightening in US

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  - Cost of finance increases and asset prices fall worldwide
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  - Cost of finance increases and asset prices fall worldwide
  - Global credit declines and so does leverage
- Financial channel amplifies demand channel

Response of VIX to Monetary Policy Shock

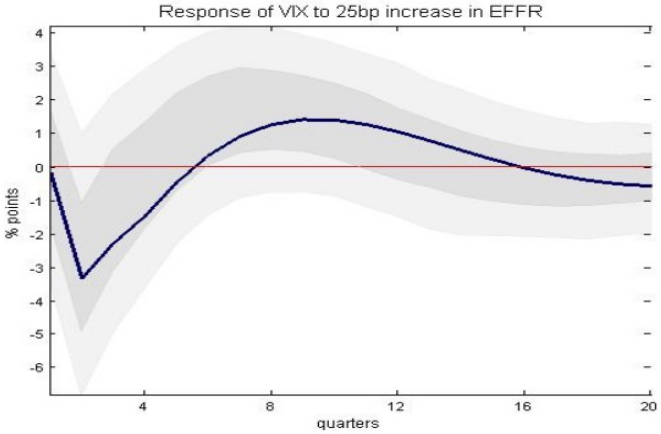

Figure 4a: 25 bp increase to the effective federal funds rate.

Response of Financial Variables to VIX Shock

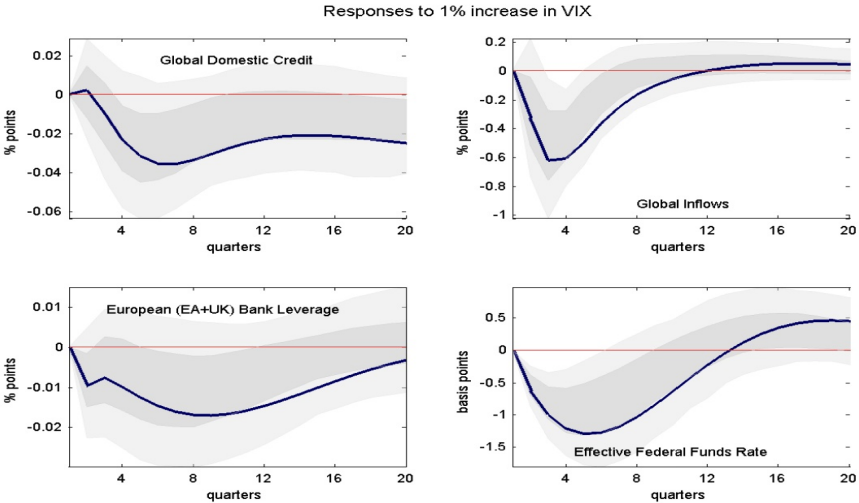

Figure 4b: Responses to a 1% increase in the VIX.

Criticism

- GFC seems really conditional on VIX (not monetary policy) shock

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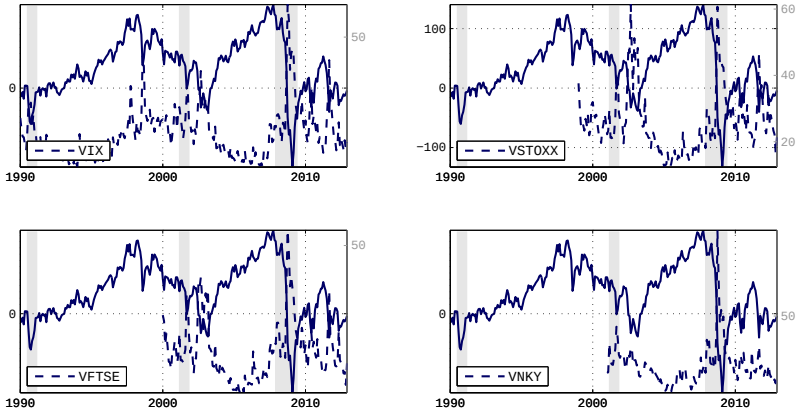
- Negative correlation between VIX and global factor



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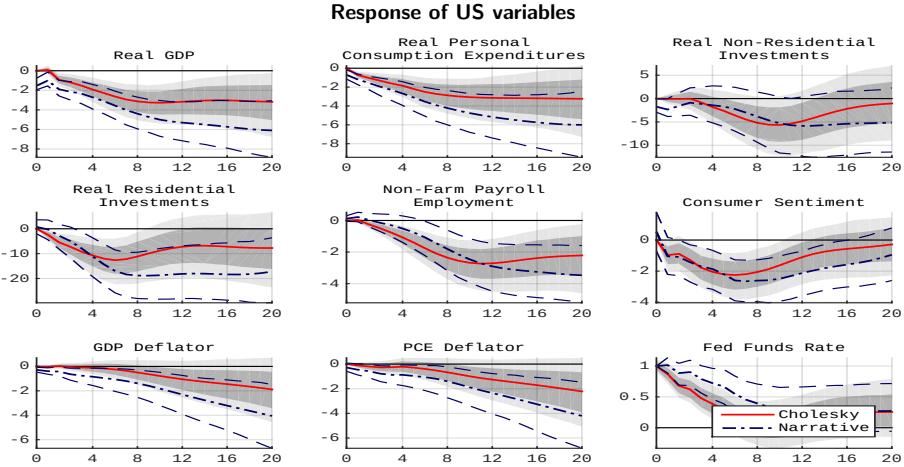

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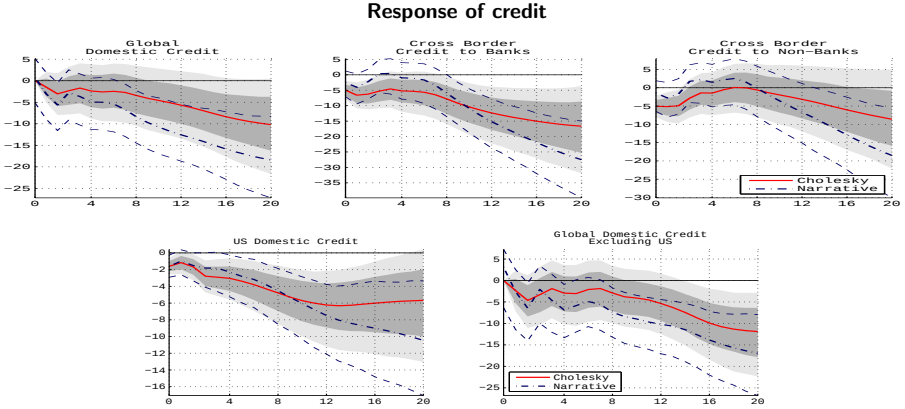

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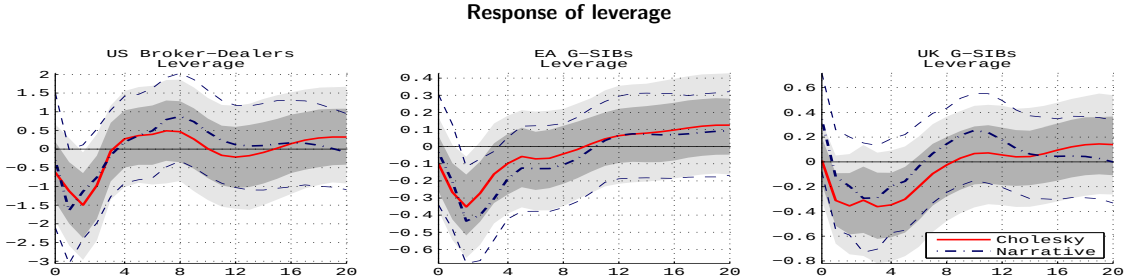

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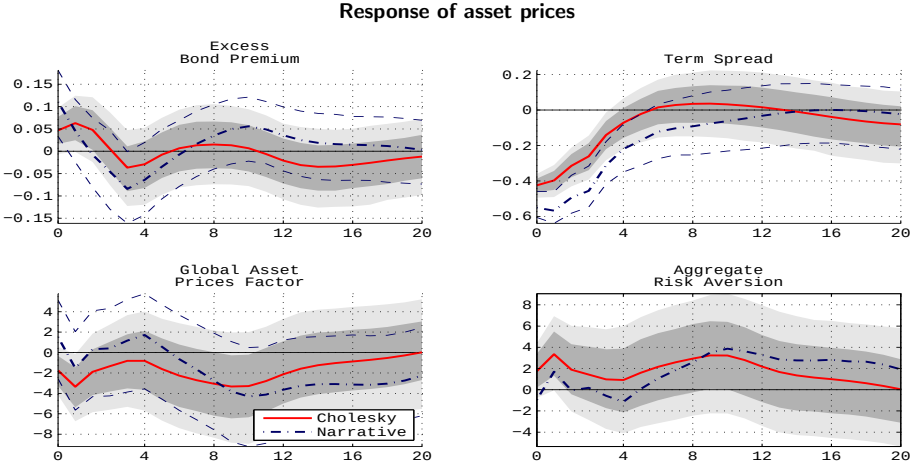

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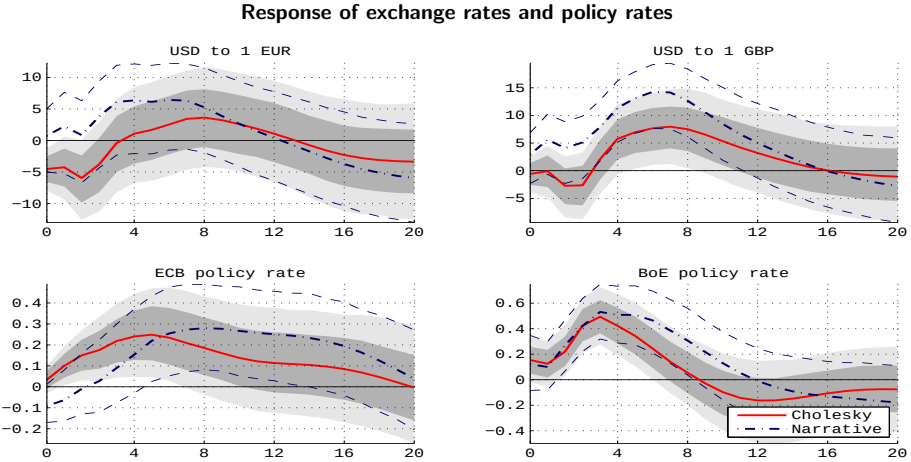

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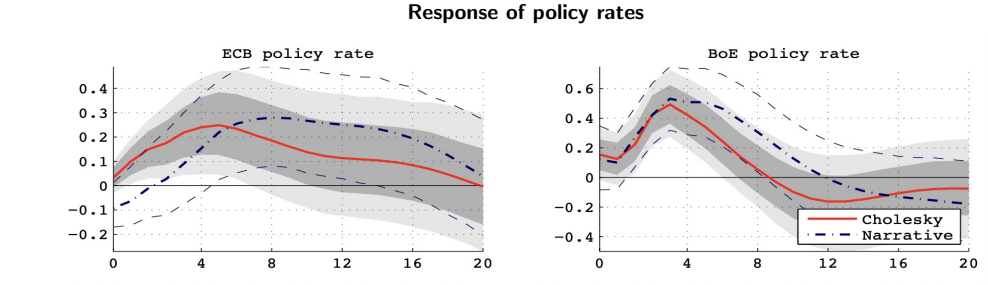

- Foreign central banks tighten interest rates ⇒ Consistent with "dilemma" hypothesis
  - Although also consistent with "fear of floating" (Calvo and Reinhart, 2002)...

The International Transmission of Credit Shocks

An Alternative Driver of the GFC

- Could alternative factors drive GFC?
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An Alternative Driver of the GFC

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  - Cesa-Bianchi, Ferrero and Rebucci (2018) consider credit supply shocks
- Idea: Study response to shocks to leverage of US broker-dealers
  - Capture financial innovation or changes in risk appetite
- Approach: Panel VAR with **global variable** (leverage of US broker-dealers)
  - 57 countries (24 advanced and 33 emerging economies)
  - Sample: 1985:Q1-2012:Q4
  - Country-specific variables:
    - ⋆ International credit
    - ⋆ Private consumption
    - ⋆ Current account ratio to GDP
    - ⋆ Real house prices
    - ⋆ Real exchange rate vis-a-vis USD

International Credit and Leverage of US Broker-Dealers

- International credit = Cross-border total claims of BIS reporting banks on country i
- Leverage of US broker-dealers = Assets/Equity (source: Federal Reserve's Flow of Funds)
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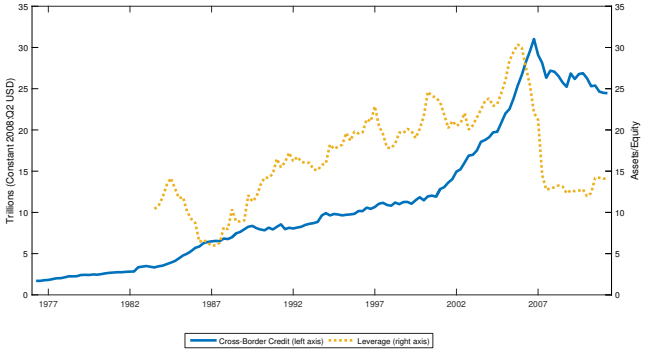

PVAR

- Add leverage of US broker-dealers to vector of country$-i$ variables

$$Y_{it} = \left[\begin{array}{ccccccc} LEV_t & KF_{it} & C_{it} & HP_{it} & RER_{it} & CA_{it}/Y_{it} \end{array} \right]$$

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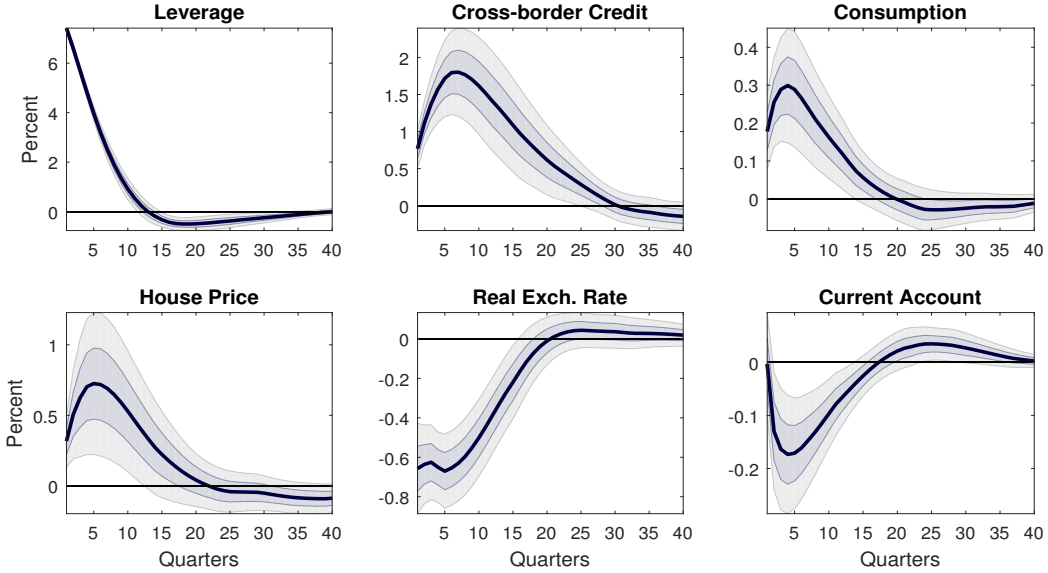
  - Estimate VAR country by country, confidence bands reflect cross-country heterogeneity

- Identification: Shocks to LEV_t shift global supply of cross-border bank credit
  - A "push" shock (Calvo, Leiderman and Reinhart, 1996)
  - Arguably exogenous to conditions in individual country i (small open economy assumption)
  - Drop US from sample
  - Implementation: Country-by-country Choleski decomposition

The Transmission of Global Credit Supply Shocks



Further Results

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  - Control by augmenting vector of endogenous variables with world GDP (ordered first)
  - Results largely unchanged (slightly noisier)
- Results also robust to further checks
  - Exclude other large economies (Germany, Japan, Switzerland, UK) that could affect credit supply
  - Control for world equity prices
  - Exclude lagged country variables from leverage equation

The Determinants of Broker-Dealers' Leverage

x_t	(1)	(2)	(3)	(4)	(5)
ΔFFR_t	-2.477**				-2.613**
	[-2.364]				[-2.536]
ϵ^{MP}		-0.0497			
		[-0.650]			
$R_t^L - R_t$			-0.900		
			[-1.642]		
VIX_t				-0.00182**	-0.00195**
				[-2.057]	[-2.252]
Obs.	111	91	111	111	111
Adj. R^2	0.049	0.005	0.024	0.037	0.091

- Leverage of US broker-dealers weakly related to monetary policy and VIX
  - But small $R^2 \Rightarrow$ Most of variance unexplained
  - Our interpretation: Other factors (financial innovation and changes in risk appetite) drive credit supply

Does the Exchange Rate Regime Still Matter?

FX Regime and Emerging Markets

- Obstfeld, Ostry and Qureshi (2019) focus on role of exchange rate in insulating EMEs

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  - Quarterly data over 1986-2013
  - VXO = Volatility index precursor of VIX

FX Regime and Emerging Markets

- Obstfeld, Ostry and Qureshi (2019) focus on role of exchange rate in insulating EMEs
- Question: Does response to VXO shocks differ across FX regimes?
  - Quarterly data over 1986-2013
  - VXO = Volatility index precursor of VIX
- Answer: Yes!
  - Domestic financial conditions respond in all FX regimes but more under fixed exchange rates
  - With fixed exchange rates, one standard deviation increase in VXO implies
    - One percentage point larger reduction in domestic credit growth
    - About two percentage points larger reduction in real house price growth
    - Banking system leverage and capital flows also more sensitive
    - But no systematic difference in the response of stock returns

Methodology

- Panel regression

$$f_{it} = \beta_0 + \mu_i + \beta_1\, fix_{it} + \beta_2\, int_{it} + \beta_3\, VXO_t + \beta_4\, fix_{it} \times VXO_t + \beta_5\, int_{it} \times VXO_t + \sum_k \lambda_k z_{itk} + \varepsilon_{it}$$

  where
  - f_{it} = Financial variable
  - fix_{it}, int_{it} = Dummy variables for fixed/intermediate FX regime
  - VXO_t = Log of VXO index (financial shocks)
  - z_{itk} = Global and domestic control variables

- If global financial conditions relevant for domestic financial conditions $\Rightarrow \beta_3$ statistically significant

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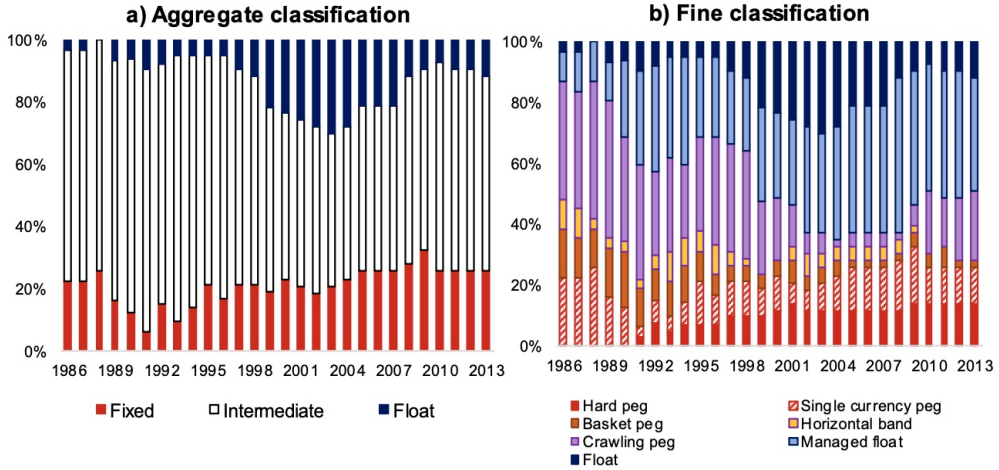
- If global financial conditions relevant for domestic financial conditions $\Rightarrow \beta_3$ statistically significant
  - But iff FX regime matters, β_4 and/or β_5 statistically significant too
  - Also estimate version with time fixed effects (β_3 not separately identified)

FX Regimes

Figure 2. De Facto Exchange Rate Regimes in EMEs, 1986–2013



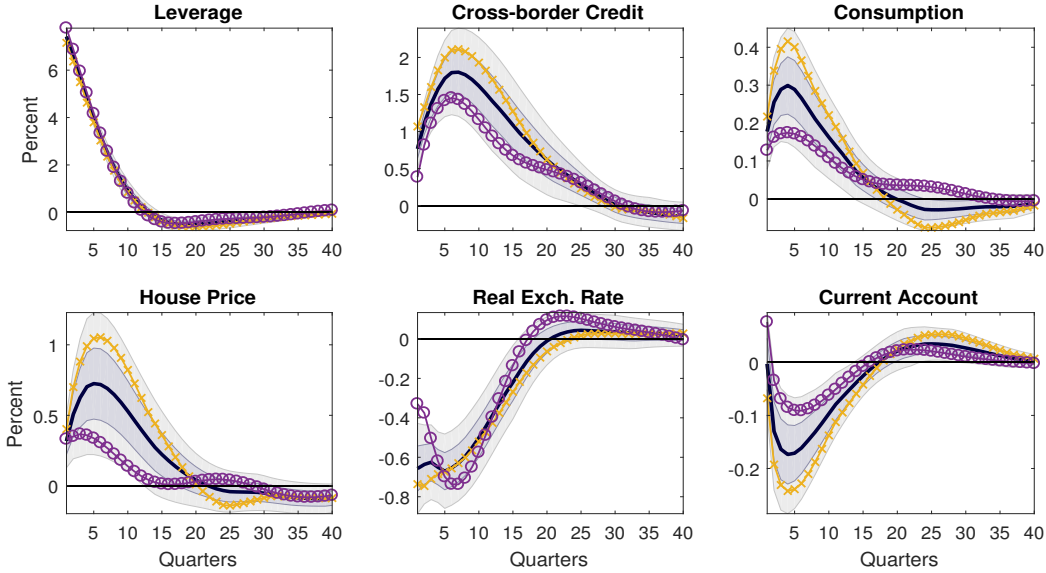
Example: Credit Growth

	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	2000-13	1986-2013
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fixed regime	3.007***	8.942***	8.822***	9.345***	10.089***	10.061***	9.222**
	(1.011)	(3.149)	(3.165)	(3.151)	(3.086)	(3.440)	(4.095)
Intermediate regime	1.141	0.436	0.529	0.894	1.650	3.714*	2.001
	(0.726)	(2.131)	(2.132)	(2.197)	(2.270)	(2.024)	(2.347)
Log (VXO)	-1.542***	-1.241*	-1.228*	-1.136*			
	(0.490)	(0.655)	(0.643)	(0.672)			
Fixed x log (VXO)		-1.981*	-1.942*	-2.091**	-2.312**	-2.543**	-3.069**
		(1.003)	(1.002)	(1.002)	(0.988)	(1.068)	(1.237)
Intermediate x log (VXO)		0.237	0.204	0.111	-0.087	-0.921	-0.743
		(0.726)	(0.723)	(0.743)	(0.768)	(0.628)	(0.726)
Lagged real GDP grow th	1.006***	0.994***	0.994***	0.976***	0.871***	0.723***	0.720***
	(0.164)	(0.163)	(0.164)	(0.166)	(0.174)	(0.263)	(0.244)
Lagged private credit/GDP	-0.090***	-0.091***	-0.092***	-0.090***	-0.085***	-0.145***	-0.109***
	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.018)	(0.020)
Real US T-bill rate			0.036				
			(0.079)				
Fixed x real US T-bill rate			-0.103				
			(0.173)				
Intermediate x real US T-bill rate			0.021				
			(0.076)				
Real shadow federal funds				-0.002			
				(0.072)			
Fixed x real shadow rate				0.073			
				(0.129)			
Intermediate x real shadow rate				0.077			
				(0.063)			
Lagged net capital flow s/GDP							0.050***
							(0.017)
Lagged central bank policy rate							-0.238**
							(0.113)
Linear trend	0.016	0.015	0.017*	0.022*			
	(0.010)	(0.010)	(0.010)	(0.012)			
Global financial crisis	1.619***	1.714***	1.674***	1.523**			
	(0.552)	(0.553)	(0.571)	(0.578)			
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-year effects	No	No	No	No	Yes	Yes	Yes
Observations	2,555	2,555	2,555	2,555	2,555	1,844	1,598
Adjusted R2	0.235	0.240	0.240	0.240	0.253	0.434	0.421
No. of countries	43	43	43	43	43	42	35

Macroeconomic Effects

	1986-2013	1986-2013	1986-2013	1986-2013	2000-13
	(1)	(2)	(3)	(4)	(5)
Fixed regime	2.521**	2.511**	2.518**	2.879***	2.564**
	(1.011)	(0.998)	(0.980)	(1.019)	(1.050)
Intermediate regime	0.406	0.294	0.253	0.895	0.693
	(0.477)	(0.461)	(0.471)	(0.541)	(0.462)
Log (VXO)	-0.459***	-0.479***	-0.492***		
	(0.101)	(0.101)	(0.102)		
Fixed x log (VXO)	-0.756**	-0.756**	-0.753**	-0.856**	-0.758**
	(0.320)	(0.317)	(0.312)	(0.333)	(0.337)
Intermediate x log (VXO)	-0.158	-0.122	-0.117	-0.291	-0.189
	(0.157)	(0.151)	(0.153)	(0.186)	(0.163)
Real US T-bill rate		-0.034*			
		(0.019)			
Fixed x real T-bill rate		0.020			
		(0.027)			
Intermediate x real T-bill rate		-0.015			
		(0.025)			
Real shadow federal funds rate			-0.011		
			(0.020)		
Fixed x real shadow rate			0.011		
			(0.026)		
Intermediate x real shadow rate			-0.014		
			(0.026)		
Lagged net capital flow s/GDP	0.013***	0.014***	0.014***	0.010**	0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lagged institutional quality	0.654	0.741	0.775	0.930	1.183
	(0.908)	(0.919)	(0.944)	(1.098)	(1.899)
Lagged private credit/GDP	-0.018***	-0.018***	-0.018***	-0.017***	-0.023***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lagged real GDP per capita	-1.947***	-1.872***	-1.920***	-2.022***	-1.541*
	(0.609)	(0.587)	(0.585)	(0.611)	(0.840)
Linear trend	0.014**	0.011**	0.011**		
	(0.005)	(0.005)	(0.005)		
Global financial crisis	-1.462***	-1.419***	-1.411***		
	(0.249)	(0.248)	(0.244)		
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Quarter-year effects	No	No	No	Yes	Yes
Observations	2,121	2,121	2,121	2,121	1,635
Adjusted R2	0.345	0.351	0.347	0.421	0.497
No. of countries	38	38	38	38	38

Transmission of Global Credit Supply Shocks by FX Regime



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- Financial integration $\Rightarrow$ Global financial cycle
  - Financial shocks (monetary policy, credit, etc.) originate in hegemon countries, propagate globally
- Flexible exchange rate does not fully insulate countries from financial shocks
  - Yet transmission not completely independent of exchange rate regime
- Next: Frameworks to think about cross-border macroeconomic interdependence
  - Policy spillovers, expenditure switching, coordination.