



International Business Cycles and Financial Frictions*

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BIS-CCA Research Conference

Rio de Janeiro, April 26-27, 2012



Here is a quick description of paper

- Role of financial frictions in the international propagation of shocks
- State-of-the-art application of DSGE solution methods with portfolio choice, capital constraints, and international modeling
- Results are descriptive
 - But have broad implications for understanding financial crises, importance of financial regulation, and design of macro-prudential policy



- Motivation for this paper
 - In 2008-2009 financial linkages seemed to be of key importance in crisis propagation
 - More generally, there is “evidence” that financial linkages increase co-movement – see below for discussion
- Paper then builds model with a) financial linkages between countries b) financial constraints
- Finds that a) and b) generate strong cross country co-movement
 - Note need b), to avoid Modigliani-Miller
- Points to the importance of financial linkages as a separate mechanism for transmission of macro shocks
 - (i.e. beyond trade and direct investment linkages)



Some details

- Builds on previous literature
 - Key mechanism: borrowing constraint related to collateral
 - Kiyotaki and Moore (1997)

$$B_t \leq \kappa q_t K_t$$

- RHS equation represents 'pledgeability' of investors net worth
 - Part that can be seized upon contract default
 - Higher price of capital increases demand for capital – feedback/amplification effect
 - Extension here is diversified international portfolio – home asset price directly affects foreign investment



Some details

- Extends literature of by Devereux-Yetman (2011b), Devereux-Sutherland (2011b), Dedola Lombardo (2011) , Quadrini-Perri (2011)



Main comments

- Some comments on the model and results
 - Model solution – some questions..
 - Matching business cycle moments
 - Types of shocks in the model
 - Importance of financial structure
- Empirical evidence on financial integration and co-movement
 - Crisis versus non-crisis?
- Policy implications
 - Efficient risk-sharing versus financial contagion
 - Need for macro-prudential regulation
 - Monetary policy



Solution approach: Finding a portfolio

$$\alpha = \alpha(\Theta(s_{-1}), Y(s_{-1}), Y^*(s_{-1}))$$

Take an approximation to the 'true' portfolio

$$\alpha = \bar{\alpha} + \frac{\alpha_1}{2} \theta(s_{-1}) + \frac{\alpha_2}{2} y(s_{-1}) + \frac{\alpha_3}{2} y^*(s_{-1})$$

Zero order term

First order terms



Solution method: Devereux-Sutherland

$$EU'(C(s))R_x(s) = 0 \quad (1)$$
$$\Rightarrow E[(c(s) - c^*(s))r_x(s)] = 0$$

2nd-o accurate portfolio selection equation

Then combine with first order approximations

$$c(s) - c^*(s) = y(s) - y^*(s) + \bar{\alpha}r_x(s) \quad (2)$$

$$r_x(s) = g_1y(s) + g_2y^*(s) + g_3\theta(s)$$

1st o approx of rest of model contains $\bar{\alpha}$ terms but not α_i terms, so combining (1) and (2) gives the $\bar{\alpha}$ terms.



Problem with Heathcote-Perri method (used in the paper)

2nd-o approximation of (2) will give equations with α_i terms, but don't have enough conditions to solve these.

Additional terms undetermined..

Devereux-Sutherland – need 3rd-o solution of (1) to get these

My guess: this is not quantitatively important, but needs to be corrected in paper – correction is easy!



Performance of the model

- In terms of matching co-movements, model does well
 - Financial frictions generate increased co-movement
 - With financial frictions, increased financial linkages generate higher co-movement
- But in other dimensions, model could be improved
 - Lower output volatility than in unconstrained model
 - Substantially lower investment volatility than in the data



Financial frictions lead to an increase in co-movement of output and consumption

		Model 1	Model 2	Model 3
	Data	Unconstrained	Constrained	Constrained
			25% Foreign Exposure	86% Foreign Exposure
(D) Cross-Country Correlations				
Consumption	0.44	0.28	0.45	0.75
Output	0.61	0.23	0.34	0.52
Investment	0.46	0.76	0.46	0.29
Labor	0.43	0.23	0.34	0.54



But it substantially reduces the volatility of output itself

	Data	Model 1 Unconstrained	Model 2 Constrained 25% Foreign Exposure	Model 3 Constrained 86% Foreign Exposure
(A) Standard Deviation in %				
Output	2.06	2.52	1.84	1.78
Net Export	0.39	0.28	0.21	0.16

Due to the reduction in response of market investment in the constrained economy?

Lesson from this literature – borrowing constraints

a) lead to amplification effects of asset prices,

b) but constraints may lead to dampening of response to productivity shocks – see below



Separate point:

Investment is much less volatile than in the data

	Data	Model 1 Unconstrained	Model 2 Constrained 25% Foreign Exposure	Model 3 Constrained 86% Foreign Exposure
(B) Standard Deviation relative to Output				
Consumption	0.63	1.07	1.01	0.99
Investment	2.82	0.55	0.67	0.77
Labor	0.67	0.73	0.71	0.71

Suggests that the adjustment costs of investment are much too high?

Tension: lower adjustment costs reduce volatility of capital price



Some minor points about paper

- Model is not aimed at explaining financial crisis
 - But would be nice to to a quantitative exploration of transmission in crisis episode
- Assumption that bond markets are not financially integrated – quite counterfactual
 - This could easily be relaxed and may help results (Devereux and Yetman 2011a)
- GHH preferences play big role in labor supply response
 - Nice to see alternative specification?
 - Endogenous labor to home-sector complicates results



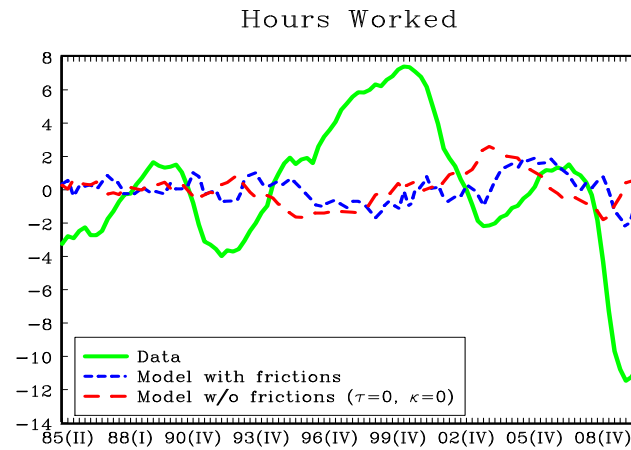
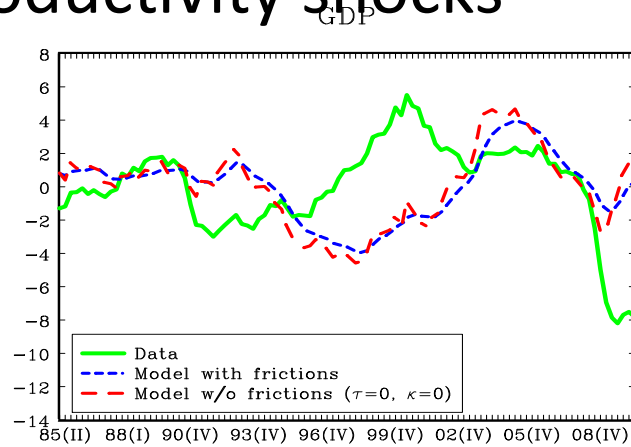
Alternative shock processes

- Here the model is driven by productivity shocks
- But in financial crisis, clear evidence of shocks coming from financial sector itself
 - Alternative: shock to leverage ratio κ
 - Used in Dedola-Lombardo (2011), Devereux-Sutherland (2011b), Quadrini and Jerman (2011)
 - Related work by Christiano Motto Rostagno (2010).
 - Captures breakdown in financial intermediation?
- But what is a financial shock?
 - Jermann Quadrini (2011) develop a method for measuring in 'Solow-Residual style' accounting style estimates

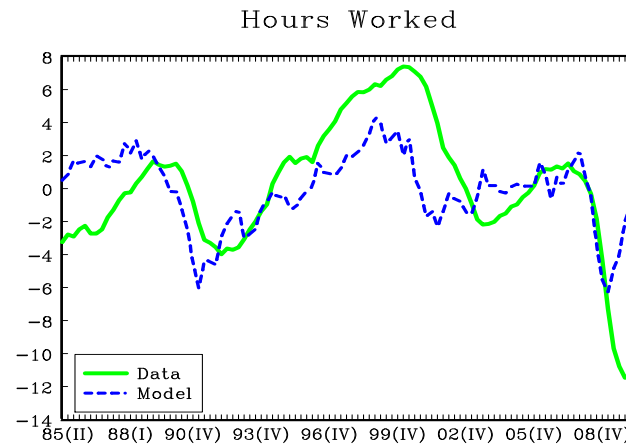
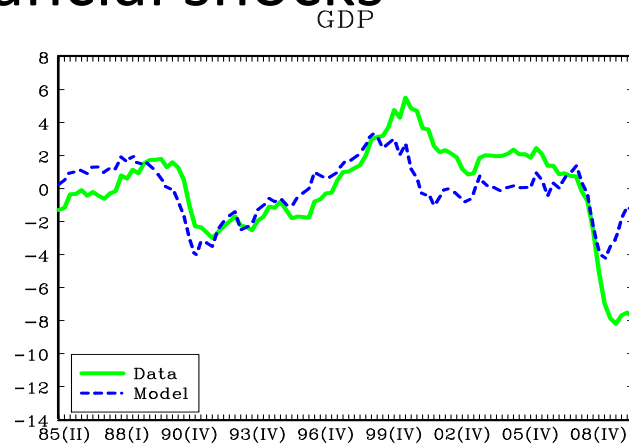


Look at Jermann-Quadrini (2011) estimates of both productivity and financial shocks for US economy

Productivity shocks



Financial shocks





So what about international Co-movement?

- Financial shocks cause extremely high co-movement
 - Quadrini and Perri 2011
 - Dedola and Lombardo 2011 Devereux-Sutherland 2011
- Intuition
 - Cause equivalent responses of asset prices in all countries
 - Unlike productivity shocks, do not directly impact on returns
 - Therefore both investment and employment response is the same in all countries, whatever source of shock
 - Moreover, does not depend on *extent of integration*
 - Key issue is whether markets are integrated, not by how much
- In some cases, multiple equilibrium associated with *endogenous* co-movement
 - Financial contagion effect – see below



In the model, the financial frictions are in investment decision

- One lesson from the crisis is that the skeletons are as likely to be in the financial sector (more likely?) than in corporate sector
- Detailed modeling of financial sector shocks requires more elaborate models of financial intermediation, role of banks, inter-bank markets etc
 - Gertler and Karadi 2011, Curdia and Woodford Dib 2011, and others
- Most papers are in closed economy
 - Can extend this to look at international co-movement
 - Kollman et al. (2011) role of global banks



OK, but what is the empirical evidence on financial linkages and international co-movement?

- A key feature in the paper is that linkages of equity holdings lead to positive co-movement
 - Joint effects of portfolio diversification and net-worth determined borrowing constraints
- Note that basic theory suggests (in absence of financial frictions)
 - Trade should enhance business cycle correlations
 - Financial integration should reduce correlations
 - Productivity shocks in one country should lead to reallocation of capital and opposite effects on hours-worked
- What is the evidence?



Let's do a super-quick review of results in literature

- Imbs 2005 – highly cited paper
 - Both trade and financial linkages increase co-movement

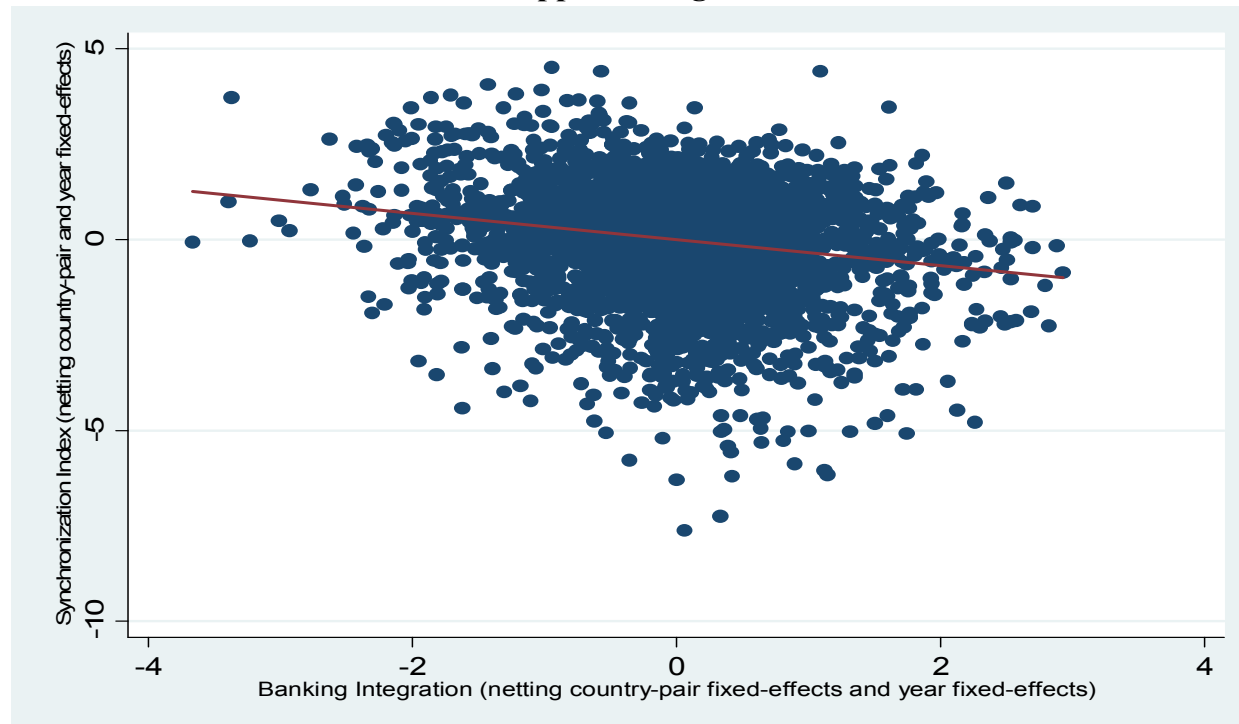
ρ^Y			
Finance	0.0481 2.89***	0.0150 1.95**	-8.32×10^{-3} -1.15
Trade	0.0348 8.15***	0.0443 4.01***	0.0621 5.66***
Structure	-0.2441 -11.68***	-0.2153 -8.22***	-0.2444 -8.81***
Obs.	780	607	552



But.. recent paper by Kalemli-Ozkan et al.

- Business cycle synchronization negatively associated by bilateral bank lending – using BIS data
- Emphasize need for panel estimation rather than cross section

Appendix Figure 2





Is co-movement different during a crisis?

- Devereux and Yetman (2011a)
 - For OECD countries, growth fall in crisis more related to financial linkages with US rather than trade linkages

	(1)	(2)	(3)	(4)	(5)
<i>X</i>	-0.020 (0.844)	0.003 (0.982)			-0.043 (0.662)
<i>CRX</i>		-0.007 (0.775)			0.039 (0.144)
<i>TIC</i>			-0.005 (0.035)	-0.006 (0.006)	-0.007 (0.005)
<i>CRTIC</i>				-0.046 (0.022)	-0.078 (0.009)

- but..Devereux and Yetman (2011b)
 - opposite results for Asia-Pacific countries



There is a *LARGE* follow-up literature with mixed results

- Rose and Spiegel (2010, 2011)
 - Negative results – little robust evidence on causes of differential effects of crisis
- Davis (2011)
 - Type of integration matters – bonds (+), equity (-)
- Cetorelli and Goldberg (2010)
 - Deleveraging by banks in industrial countries affected emerging economies
- Conclusion – no conclusion
 - Definitive empirical support still not there



What seems to be clear

- Simple implications of financial integration and risk-sharing are overwhelmingly rejected by the data
 - Does not reduce consumption volatility or increase cross-country consumption correlations
 - But we don't know the reason



Now, what about implications for policy?

- Role of financial markets – risk sharing versus contagion
 - 2nd best environments - Need to do welfare analysis
 - Devereux and Sutherland (2011b) – welfare losses from financial market integration
- Key feature of collateral constraint
 - Introduces a non-pecuniary externality – Bianchi 2012
 - What does this imply for macro-prudential policy?
 - Tax capital inflows? – ambiguous...
 - Bianchi and Mendoza – prudential taxes on inflows
 - Benigno et al. 2011, Devereux and Yu 2012 – subsidize inflows



Implications for policy

- Financial market liberalization
 - Relevance to old literature (McKinnon) on stages of liberalization
 - Liberalization with financial constraints may be counterproductive
- Relevance for monetary policy?
 - Dedola, Lombardo, Karadi (2012) find a large welfare gain from cooperation in *unconventional* monetary policy
 - Intuition: with financial shocks and very large positive macro co-movements, large positive welfare spillovers of monetary policy
 - Monetary policy as macro-prudential policy
 - Christiano and Ikeda 2012



Conclusions

- Paper represents valuable contribution to the literature
- Key need to understand synchronization of macroeconomic activity – especially very high co-movement during economic crisis
- Differentiate trade linkages from financial linkages
- Paper offers a template for studying broad range of further issues
 - Need to incorporate role of other shocks (e.g. financial)
 - Need to have more detailed modeling of financial sector
 - Need to explore effects of policy and optimal policy



Overall, nice paper!

- Look forward to seeing future work by Wen