Exchange Market Pressure and Absorption by International Reserves: Emerging Markets and Fear of Reserve Loss During the 2008-09 Crisis

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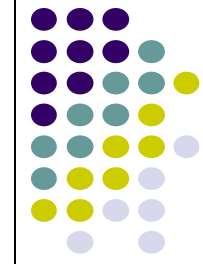
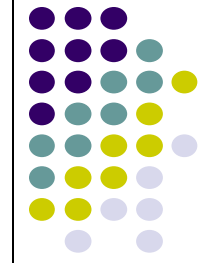
Questions on external impact of financial crisis



- When crisis first hit US and Europe, many thought EMs were “decoupled” or insulated
  - High reserve buildup
  - Better policy regimes (better fundamentals)
- Insulation lasted a very short time
- How widespread was crisis?
- How large was crisis?
- What were determinants in contagion?
- Tradeoff between reserve loss and exchange rate depreciation?

External Responses to Crisis



- Measuring exchange market pressure (EMP)
  - July 2008–February 2009 / Sept 2008–Dec 2008
  - Simple sum of % loss in international reserves and % depreciation (against USD)
  - Cross section observations on 94 countries full sample; emerging markets: MSCI 26 countries
- Results: extreme and widespread
  - 85% countries experience EMP (positive)
  - Industrial, emerging, developing– all impacted
  - All regions impacted to some extent, worst in Eastern Europe

1. EM: Larger EMP
2. More Ex Rate Absorption
%Reserves/EMP; EM=24% High Inc=34%

Table 1: Subsample Averages

Groups	*Exchange Market Pressure*	*% Chng. Exchange Rate*	*% Chng. Foreign Exchange Reserves*
Full Sample (94 countries)	31.82%	20.80%	-10.90%
Emerging Markets (MSCI index)	35.31%	26.72%	-8.58%
Income			
High	33.92%	21.15%	-12.15%
Low	33.66%	20.11%	-14.47%
Middle	28.55%	19.32%	-9.24%
Middle & Low	29.69%	19.51%	-10.40%

- Impact across all income groups, high to low-- very similar EMP magnitudes

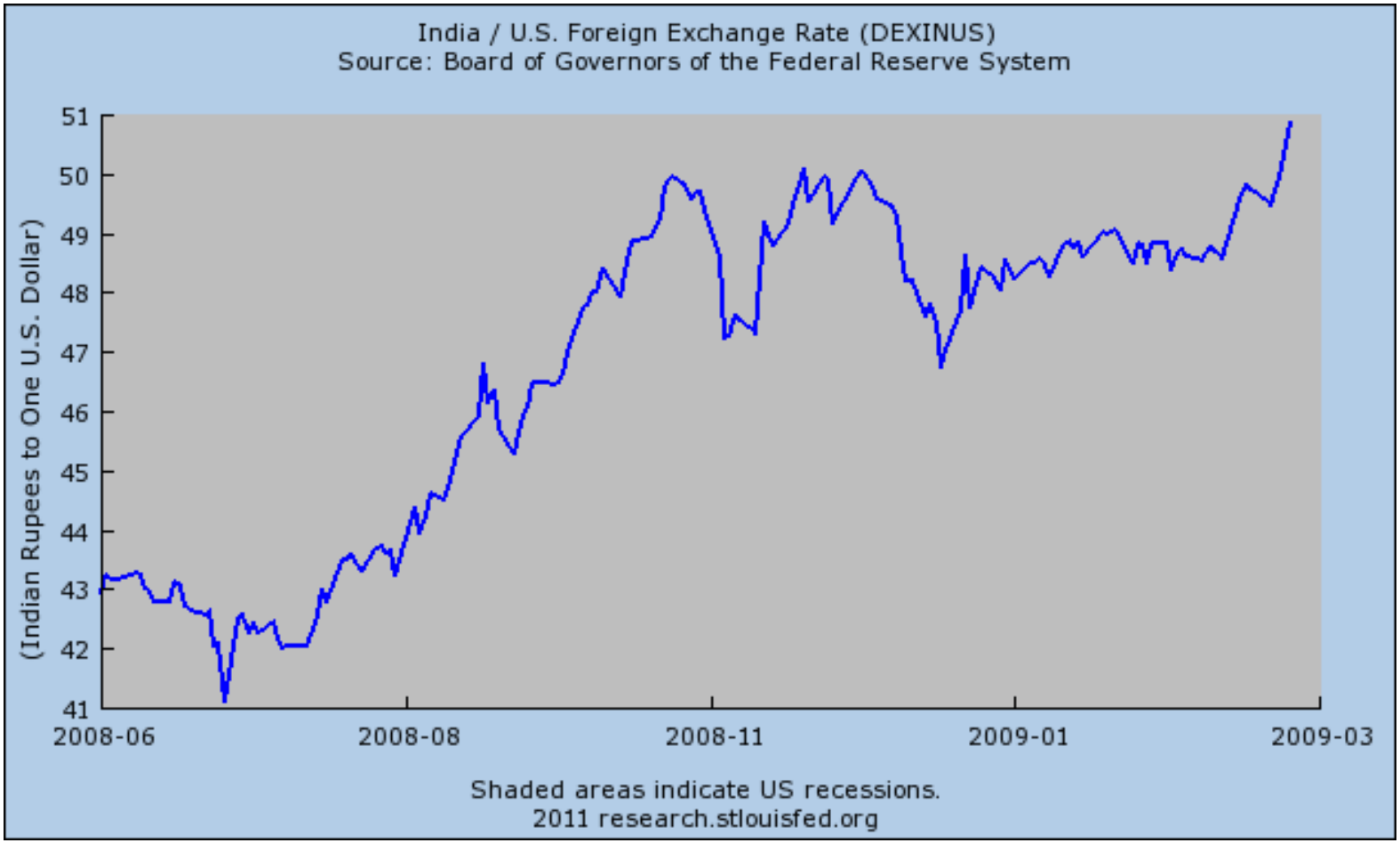
- Distribution across exchange rate depreciation and fx reserve loss: most of shock absorption through exchange rate depreciation

- EM had more EMP– AND absorbed relatively more thru exchange rate depreciation, less reserve loss

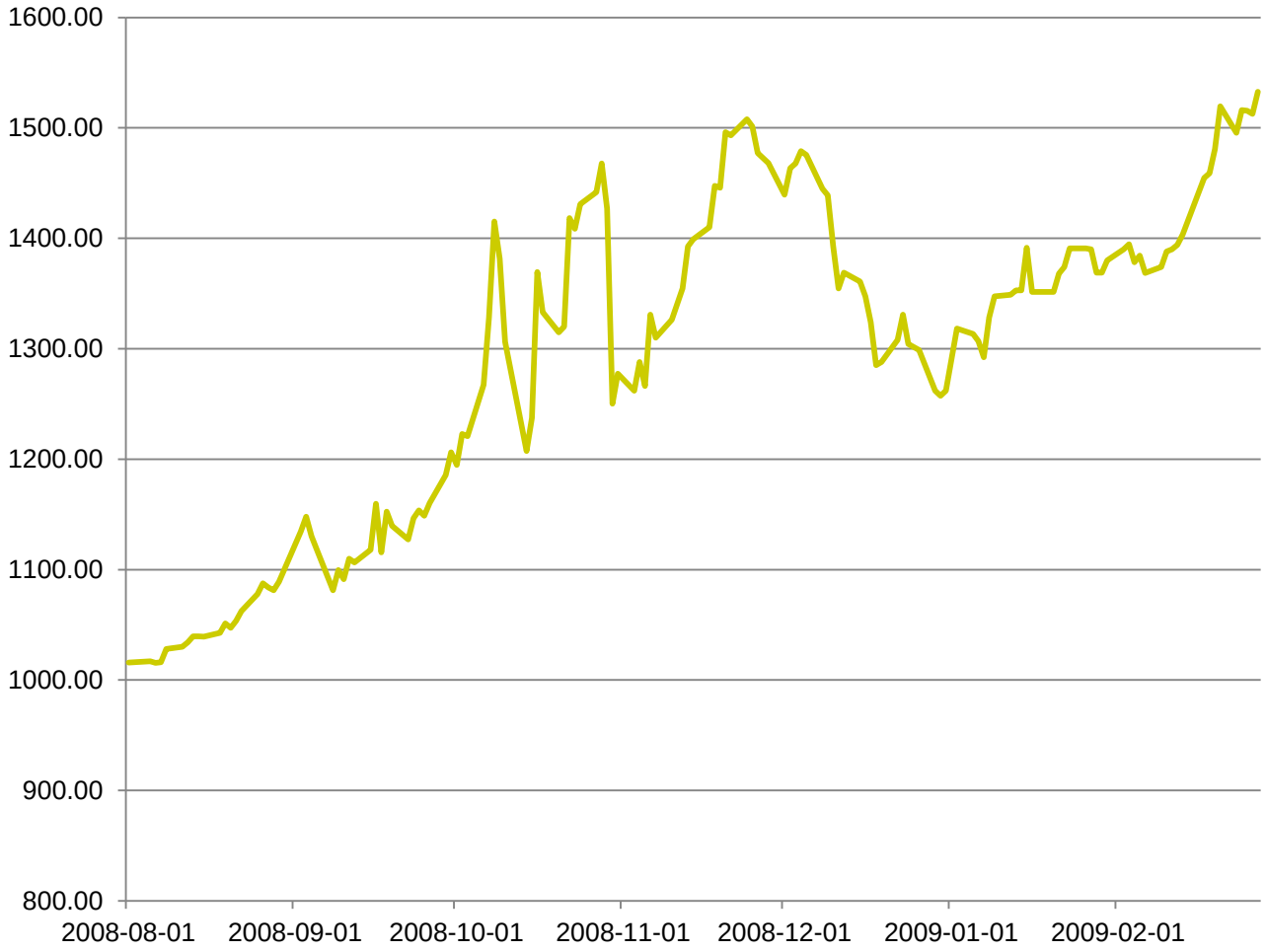
EM: Exchange Market Pressure: 9 month window

Country	9-Month Sample (July 2008 - Feb. 2009)		
	Exchange Rate Depreciation	Reserve Loss	Exchange Market Pressure
Argentina	17.55%	0.86%	18.41%
Brazil	51.59%	8.25%	59.84%
Chile	18.49%	-4.80%	13.69%
China	0.00%	-3.63%	-3.63%
Colombia	42.56%	1.55%	44.11%
Czech Republic	45.05%	6.26%	51.30%
Egypt	5.47%	4.84%	10.31%
India	19.39%	19.33%	38.72%
Indonesia	31.39%	17.29%	48.68%
Israel	19.88%	-24.98%	-5.10%
Jordan	0.00%	-13.09%	-13.09%
Korea	51.55%	18.70%	70.25%
Malaysia	13.19%	27.46%	40.65%
Mexico	48.41%	5.93%	54.34%
Morocco	19.67%	20.65%	40.33%
Pakistan	11.72%	10.09%	21.81%
Peru	15.66%	16.29%	31.95%
Philippines	7.59%	-0.62%	6.97%
Poland	79.51%	28.47%	107.98%
Russia	52.32%	36.95%	89.27%
South Africa	37.11%	4.31%	41.42%
Thailand	7.53%	-8.10%	-0.58%
Turkey	45.69%	11.10%	56.78%
Venezuela	0.00%	22.89%	22.89%

Indian Rupee to USD During Crisis
June 30, 2008 – February 28, 2009
19% Depreciation, 19% Reserve Loss: 38% EME



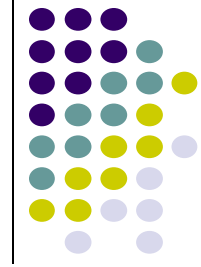
South Korean Won to USD During Crisis
Aug. 1, 2008 – February 28, 2009
51% Depreciation, 19% Reserve Loss, 70% EME



- Summary: Most global financial crisis of any financial crisis since Great Depression…and perhaps even more so…

- Absolutely a currency / balance of payments crisis!

What determines Wide EMP Variation?



- Correlations of EMP with economic variables and financial structure
  - Trade and GDP per capita
  - Financial indicators
    - Financial development: stock market capitalization
    - Financial openness: capital account openness
    - Balance sheet exposure: st external portfolio liabilities exceeding fx reserves (percent)
    - Financial account liabilities (total financial account external liabilities as percent of GDP)
    - Includes FDI, portfolio equity and debt liabilities, and derivatives

Table 2: Correlations with Exchange Market Pressure (EM): Emerging Markets

	All Emerging	Regional Group: E. Europe C. Asia	Regional Group: E. Asia	Regional Group: Latin America	Regional Group: Other Emerging	High Level Fin. Restrictions: Bond	Bond Inflow	Equity	Equity Inflow
Trade and GDP									
GDP per capita	**0.575*** **	-0.296	0.776	0.004	0.521	**0.817** **	**0.947** **	**0.914*** **	**0.938*** **
Trade Openness	-0.038	0.774	-0.009	-0.535	0.587	-0.076	-0.710	-0.182	-0.663
Financial Factors									
Financial Account Liabilities	**0.699*** **	0.388	0.864	**0.784** **	0.541	**0.661** **	0.601	**0.630***	0.557
Balance Sheet Exposure	0.361	0.598	-0.620	0.425	0.270	0.363	0.310	0.423	0.306
Stock Market Capitalization	0.011	0.986	0.217	-0.268	0.416	0.202	0.647	0.124	0.588
Capital Account Openness	-0.136	-0.187	0.200	0.022	**-0.816***	0.391	0.227	0.354	0.177

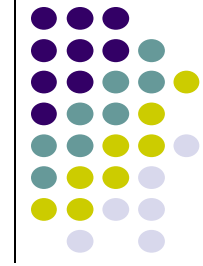
- All emerging:
  - GDP per capita higher, more EMP-- more integrated into world financial system
  - More total external liabilities, more EMP– higher external debt made countries more vulnerable (harder to refinance debt in financial crisis)
  - More balance sheet exposure, weak positive link with EMP (countries more vulnerable as can't cover short term liabilities with fx reserves)

Table 1: Exchange Market Pressure (EMP) and Pre-Crisis Emerging Markets Fundamentals; 4-Month Period.

Dependent Variable: Exchange Market Pressure (EMP), Sept.2008-Dec.2008												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Balance Sheet Exposure	0.027		0.049	0.035								
	(0.39)		(0.86)	(0.65)								
Tot. Liabilities (% GDP)		2.55e-07***	2.80e-07***	2.74e-07***	2.74e-07***	3.22e-07***	2.73e-07***	3.66e-07***	2.99e-07***	2.82e-07***	2.72e-07***	2.79e-07***
		(5.31)	(6.70)	(6.22)	(6.33)	(7.38)	(5.85)	(4.72)	(6.73)	(5.25)	(6.11)	(6.82)
GDP per capita	6.96E-06	7.13E-07	-5.63E-06	-5.49E-06	-5.49E-06	-6.79E-06	-5.26E-06	-8.66E-06	-4.24E-06	-5.59E-06	-5.47E-06	-6.29E-06
	(1.21)	(0.49)	(0.21)	(1.52)	(1.40)	(1.53)	(1.35)	(1.68)	(0.80)	(1.30)	(1.35)	(1.63)
OECD Member				0.108**	0.122**	0.175**	0.118**	0.174	0.135**	0.119**	0.124**	0.085**
				(2.20)	(2.88)	(2.99)	(2.49)	(1.44)	(2.74)	(2.50)	(2.69)	(2.23)
Swap Lines						-0.136**						
						(2.18)						
Reserves (%GDP)							-0.035					
							(0.16)					
Rise in REER (%, 2003-2007)								-0.285*				
								(2.42)				
Exchange Rate Stability Index									0.109			
									(1.38)			
Net FDI (%GDP)										0.035		
										(0.19)		
Capital Acct. Openness											-0.002	
											(0.18)	
Trade Openness												0.000
												(0.43)
Constant	0.135*	0.081**	0.104*	0.111**	0.097**	0.088**	0.102*	0.123**	0.041	0.089*	0.098**	0.097**
	(2.06)	(2.39)	(1.99)	(2.35)	(2.75)	(2.60)	(1.80)	(2.93)	(0.69)	(1.82)	(2.82)	(2.44)
Observations	18	18	18	18	18	18	18	10	16	18	18	16
R-squared	0.179	0.522	0.572	0.644	0.619	0.705	0.62	0.691	0.711	0.62	0.62	0.704

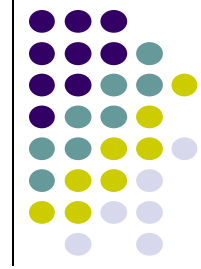
Notes: Robust t statistics in parentheses; *, **, *** indicate variables significant at 10%, 5%, and 1% respectively. All independent variables as of 2007, except for Swap Lines which indicate countries that received and used a swap line during the crisis period. Sample restricted to emerging markets that experience positive EMP.

Summary of Results: What determines EMP?



- Total Liabilities / GDP consistently critical determinant of EMP under 4- and 9-month window…only consistent determinant
- Swaps played a role in 4- but not 9-month
- OECD played a role (Korea/Mexico) in 4- but not 9-month window
- GDP per capita (higher EMP) played a role in 9- but not 4-month window

Tradeoff between reserve loss and exchange depreciation



- Discernable patterns in relative degree of reserve loss / exchange rate depreciation for given EMP shock?
  - %ΔIR / EMP
  - High values: absorbing most of shock via reserves
- What explanatory variables?
  - Usual list of suspects: determinants of EMP
  - Find Balance Sheet Exposure to be Key.
    - More S.T. external portfolio liabilities not covered by Int. Reserves (% Reserves) implies less use of reserves in defense

Figure 1: Reserve Loss Relative to EMP and Pre-Crisis Balance Sheet Exposure (4-month window)

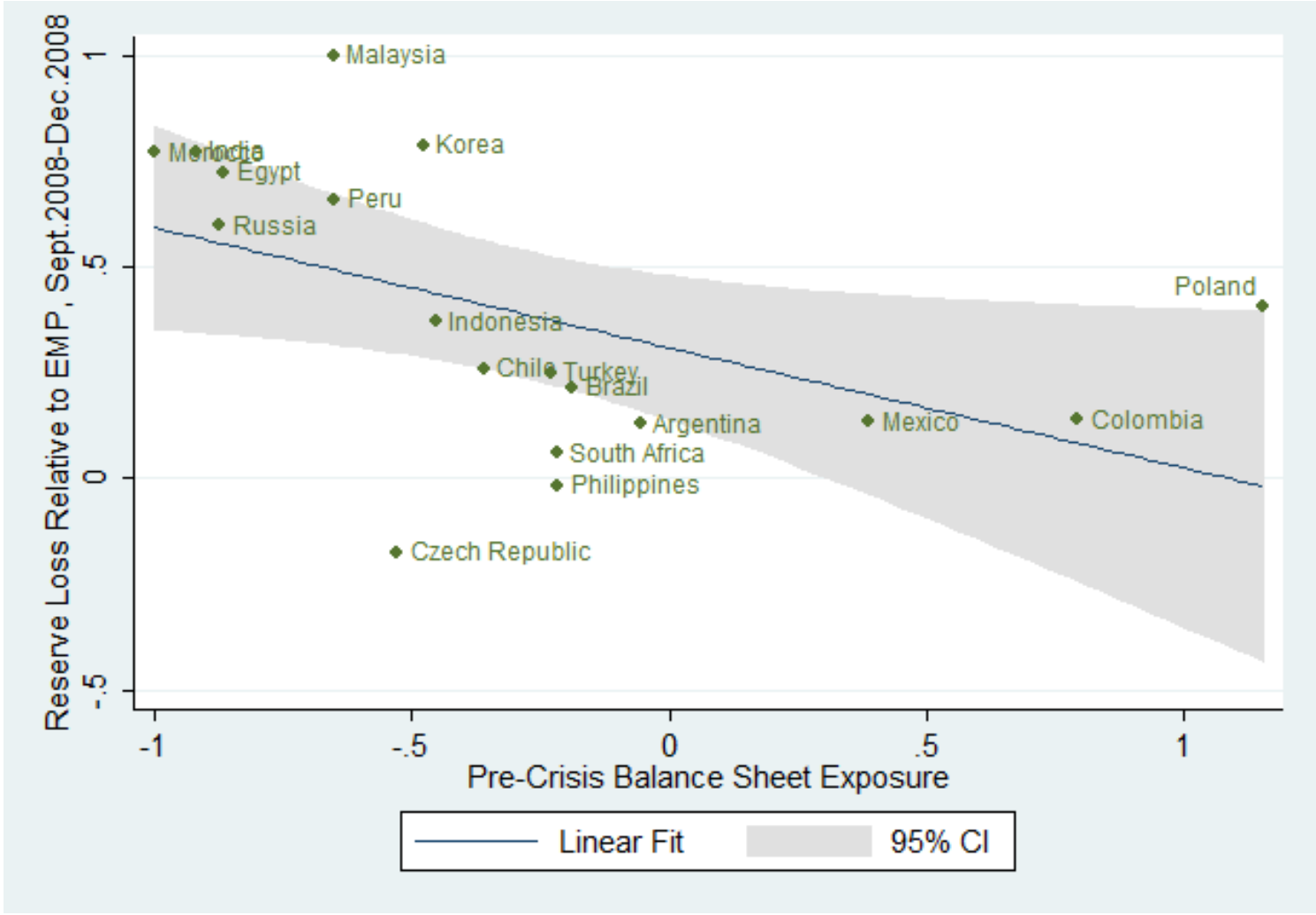
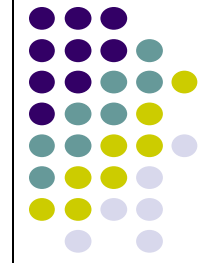


Table 3: Reserve Loss Relative to EMP and Pre-Crisis Emerging Markets Fundamentals; 4-Month Period.

Dependent Variable: Reserve Loss Relative to EMP, Sept.2008-Dec.2008								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Balance Sheet Exposure	-0.284**	-0.280*	-0.246	-0.306**	-0.642***	-0.283*	-0.296*	-0.250
	(2.20)	(2.08)	(1.45)	(2.64)	(4.62)	(2.07)	(1.86)	(1.50)
Tot. Liabilities (% GDP)		0.056	0.198	0.35	-0.101	0.075	0.034	0.136
		(0.12)	(0.35)	(0.87)	(0.31)	(0.16)	(0.07)	(0.26)
GDP per capita			0.000					
			(0.39)					
Commodity Exports				4.176**				
				(2.32)				
Trade Openness					0.001			
					(0.29)			
Capital Acct. Openness						-0.026		
						(0.47)		
Swap Lines							0.159	
							(0.83)	
OECD Member								-0.083
								(0.38)
Constant	0.309***	0.274	0.268	-4.029*	0.118	0.272	0.266	0.259
	(3.80)	(1.08)	(1.04)	(2.11)	(0.56)	(1.07)	(1.02)	(0.98)
Observations	18	18	18	17	16	18	18	18
R-squared	0.244	0.245	0.263	0.508	0.481	0.254	0.267	0.255

Conclusions



- Widespread crisis, hitting every region and income class
- Exchange rate depreciation absorbed most of the shock, rather than reserve loss (“fear of reserve loss”)
- Financial factor determining size of shock transmission is mainly total external liabilities
- Financial factor determining relative use of reserves (compared to ex rate depreciation) is balance sheet exposure, but this varies by the pre-crisis level of reserves

Conclusions II

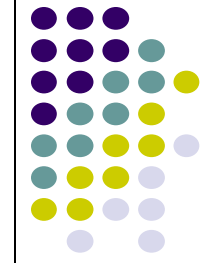
- EMs relied primarily on Exchange Rate depreciation:
  - Competitive depreciations at times of collapsing demand, the downside risk of higher inflation is muted.
  - Unknown crisis duration → fear of losing IR.
  - The global recession → depreciations part of the adjustment of small economies, but can't resolve global collapsing demands.
- Key importance of balance sheet effects in explaining vulnerabilities and adjustments.
  - Higher total foreign liabilities/GDP → higher vulnerability to the financial crisis.
  - Higher external portfolio liabilities/ international reserves → greater exchange rate depreciation and comparatively less reserve loss.

Thanks for your attention

http://crisiscartoon.blogspot.com/

http://www.naldzgraphics.net/wp-content/uploads/2010/02/27-financial-crisis-illustration.jpg

Why?



- All 8 countries had international reserves exceeding short-term debt
- High level of reserves induced the “group of 8” to use reserves and limit depreciation
  - Countries used reserves to meet balance sheet exposure of systemic banks or politically powerful agents in the first phase of the crisis.
- EM with few reserves, used depreciation to absorb EMP shock

Table 3 : Correlations - Fraction of EMP due to Loss of Reserves with Balance Sheet Exposure (2007)

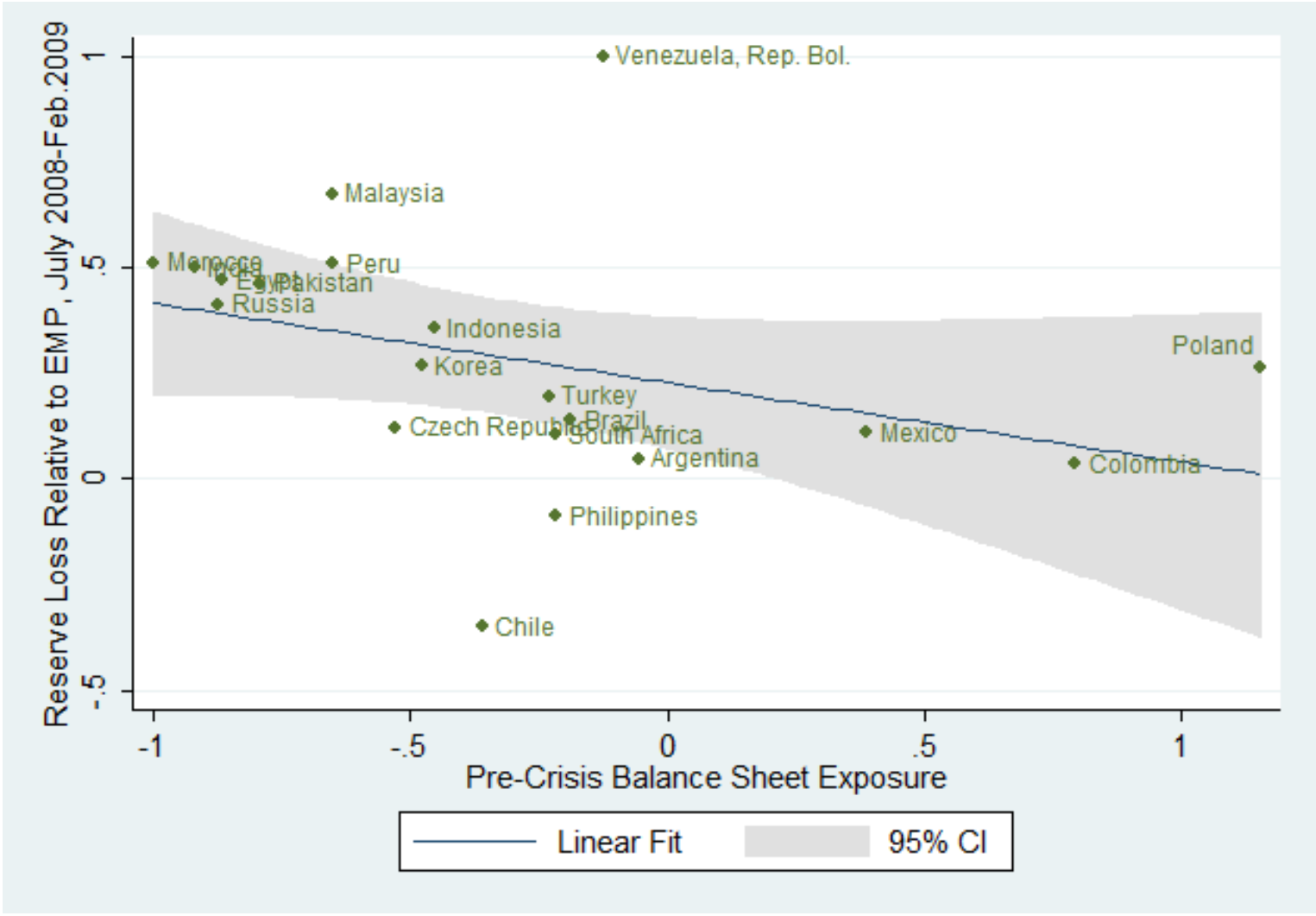
(%ΔIR)/EMP Cutoff:	Corr. w/ Balance Sheet Exposure	Number of Countries
None	-0.3557	20
10%	-0.3252	16
20%	-0.1565	11
30%	**0.6718****	9
40%	**0.9142*****	8

•Negative for full sample of 20 ("none"…no cutoff): -0.36 correlation (p-value = 0.12)

•Limited reserves constrained how countries responded to crisis

•Negative turns to significant positive for countries with VERY LARGE (30% or 40% or greater) use of reserves: 0.91 correlation for 8 countries with heaviest use of reserves

Figure 2: Reserve Loss Relative to EMP and Pre-Crisis Balance Sheet Exposure (9-month window)



Groups	Exchange Market Pressure	% Chng. Exchange Rate	% Chng. Foreign Exchange Reserves
Region			
N. America and W. Europe	39.31%	25.55%	-13.76%
E. Europe and Central Asia	54.80%	34.01%	-20.24%
East Asia	25.65%	18.58%	-7.07%
South Asia	30.87%	9.49%	-21.37%
Latin America	23.02%	15.75%	-7.27%
Africa & Middle East	21.11%	15.36%	-5.51%

- All regions impacted
- E. Europe and Central Asia most impacted…both on exchange rates and reserve losses

Groups	Exchange Market Pressure	% Chng. Exchange Rate	% Chng. Foreign Exchange Reserves
High Level Capital Restrictions			
Bond	29.45%	17.82%	-12.25%
Bond Inflow	25.97%	14.48%	-12.30%
Equity	29.36%	19.07%	-12.69%
Equity Inflow	27.28%	19.38%	-8.94%

Countries with high levels of financial restrictions:

- Not markedly different from average of low/middle income group:

Middle & Low	29.69%	19.51%	-10.40%

Perhaps because it is low/middle income countries that have high capital account restrictions

Country	Exchange Market Pressure % Chng.	Exchange Rate % Chng.	Foreign Exchange Reserves
Poland	107.98%	79.51%	-28.47%
Zambia	96.59%	60.00%	-36.59%
Russia	89.27%	52.32%	-36.95%
Malta	86.00%	23.44%	-62.56%
France	77.86%	23.44%	-54.42%
Korea	70.25%	51.55%	-18.70%
Sweden	69.74%	49.50%	-20.24%
Romania	66.67%	50.00%	-16.67%
Greece	66.18%	23.44%	-42.75%
Portugal	64.24%	23.44%	-40.80%
New Zealand	63.99%	44.85%	-19.14%
Sri Lanka	63.24%	6.31%	-56.93%
Slovenia	61.08%	23.44%	-37.65%
Austria	59.88%	23.44%	-36.44%
Brazil	59.84%	51.59%	-8.25%
Australia	59.82%	46.23%	-13.59%
United Kingdom	56.88%	40.00%	-16.88%
Turkey	56.78%	45.69%	-11.10%
Cyprus	56.39%	23.44%	-32.95%
Jamaica	55.26%	22.55%	-32.72%
Bulgaria	54.61%	24.00%	-30.61%
Swaziland	54.38%	37.11%	-17.27%
Mexico	54.34%	48.41%	-5.93%
Czech Republic	51.30%	45.05%	-6.26%
Mauritius	49.70%	28.79%	-20.91%
Indonesia	48.68%	31.39%	-17.29%
United Arab Emirates	45.88%	0.00%	-45.88%
Colombia	44.11%	42.56%	-1.55%
Kyrgyz Republic	41.59%	17.13%	-24.46%
South Africa	41.42%	37.11%	-4.31%
Cote d'Ivoire	41.18%	23.47%	-17.71%
Ecuador	41.05%	0.00%	-41.05%
Malaysia	40.65%	13.19%	-27.46%
Morocco	40.33%	19.67%	-20.65%
Hungary	40.28%	58.09%	17.82%
Germany	39.42%	23.44%	-15.98%
Paraguay	39.37%	27.68%	-11.69%
Belgium	38.96%	23.44%	-15.52%
India	38.72%	19.39%	-19.33%
Kenya	38.62%	18.37%	-20.25%
Ireland	38.62%	23.44%	-15.18%
Norway	37.08%	36.77%	-0.31%
Iceland	36.85%	42.43%	5.58%
Burkina Faso	36.46%	23.47%	-12.99%

Country	Exchange Market Pressure	% Chng. Exchange Rate	% Chng. Foreign Exchange Reserves
Latvia	35.85%	22.22%	-13.62%
Uganda	34.52%	20.68%	-13.84%
Kazakhstan	32.54%	25.02%	-7.52%
Togo	32.04%	23.47%	-8.58%
Georgia	31.96%	19.15%	-12.81%
Peru	31.95%	15.66%	-16.29%
Tunisia	30.37%	23.93%	-6.44%
Moldova	29.45%	9.78%	-19.67%
Finland	27.99%	23.44%	-4.55%
Netherlands	27.09%	23.44%	-3.66%
Canada	23.06%	23.30%	0.25%
Venezuela, Rep. Bol.	22.89%	0.00%	-22.89%
Pakistan	21.81%	11.72%	-10.09%
Spain	21.29%	23.44%	2.15%
Singapore	18.98%	12.41%	-6.57%
Argentina	18.41%	17.55%	-0.86%
Switzerland	16.81%	12.38%	-4.43%
Dominican Republic	15.55%	3.32%	-12.23%
Uruguay	15.12%	23.70%	8.58%
Italy	14.40%	23.44%	9.04%
Chile	13.69%	18.49%	4.80%
Brunei Darussalam	11.41%	12.41%	1.00%
Yemen, Republic of	11.34%	0.19%	-11.16%
Tanzania	11.34%	11.89%	0.55%
Qatar	11.10%	0.00%	-11.10%
Egypt	10.31%	5.47%	-4.84%
Nicaragua	8.44%	2.88%	-5.56%
Guatemala	7.80%	7.67%	-0.13%
United States	7.05%	0.00%	-7.05%
Philippines	6.97%	7.59%	0.62%
Denmark	3.65%	23.22%	19.57%
Angola	3.17%	0.93%	-2.24%
Costa Rica	3.12%	2.48%	-0.64%
Bangladesh	-0.30%	0.55%	0.86%
Thailand	-0.58%	7.53%	8.10%
China,P.R.: Mainland	-3.63%	0.00%	3.63%
Bolivia	-4.21%	-0.99%	3.23%
Israel	-5.10%	19.88%	24.98%
Saudi Arabia	-5.31%	0.00%	5.31%
Panama	-5.42%	0.00%	5.42%
El Salvador	-6.92%	0.00%	6.92%
Japan	-9.99%	-9.67%	0.33%
Hong Kong S.A.R. of China	-12.97%	-0.64%	12.32%
Jordan	-13.09%	0.00%	13.09%
Oman	-18.41%	0.00%	18.41%
Kuwait	-25.33%	7.41%	32.74%
Lebanon	-26.39%	0.00%	26.39%