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Financial Exchange Rates and International Currency Exposures

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Overview

- Valuation channel of external adjustment: importance growing in line with financial globalization
- Exchange rates and valuation channel: currency composition of international balance sheets
- Empirical evidence on topic still in its infancy
- This paper tries to fill a gap – provide broad based evidence on the international financial impact of exchange rate changes

Valuation Effects

- Change in NFA comes from both flows and changes in the value of the stock

$$\Delta NFA = CA + VAL$$

- In principle, valuation effects can be split into changes in the prices (VAL^{MV}) of assets and changes in the exchange rate (VAL^{XR}) [also measurement error]

Valuation Channel and Exchange Rates

- Two strands in research on valuation channel
- Adverse balance sheet impact of depreciation in emerging market economies
  - Eichengreen and Hausmann (2005), Goldstein and Turner (2005)
- Gains to United States from dollar depreciation
  - Lane and Milesi-Ferretti (2001, 2003, 2005, 2007a, 2007b); Tille (2003, 2005); Gourinchas and Rey (2007);
- Full profile of currency exposures lacking for a large number of countries

Contribution

- Calculate currency exposures in international balance sheet by country over time
  - Compare trade and finance weighted exchange rates
  - Consider countries' aggregate currency exposures
    - And changes over the last decade
  - Consider size and importance of valuation shocks
    - Persistence, correlation of VAL^{MV} and VAL^{XR}, magnitudes

Previous Empirical Work

- Lane and Milesi-Ferretti (2001, 2007a, 2007b) highlighted aggregate role of valuation channel in driving net foreign asset positions
- Lane and Milesi-Ferretti (2003, 2005, 2007c): exchange rate and valuation channel
- Tille (2003): valuation impact of dollar movements on the US external position
- Gourinchas and Rey (2007): valuation channel a stabilizing force for US external position; external imbalance a predictor for the dollar.

Data Constraint

- IIP data typically do not contain information on currency composition of foreign assets and liabilities
- United States an exception but also atypical: sui generis position in issuing debt in its own currency and the international standard role of the dollar
- Dollar exposures for selected other countries: Warnock (2006), Lane and Milesi-Ferretti (2007c)
- Full list of currency exposures desirable
- We tackle this data gap over 1990-2004 for 117 countries

Method

- The currency exposures are generated by both combining numerous sources and filling in data with a variety of models and assumptions where necessary.
- Generate currency exposure by asset class and then combine
- Caveats:
  - Hedging
    - Intra country hedging is moot, may also only hedge L making A&L even more unmatched
  - Offsets of VAL^{XR} and VAL^{MV}
    - Partial

Method: ASSETS – portfolio equity

- **Portfolio Equity Assets**:
  - Assume destination equals currency
  - CPIS data on a limited number of reporters
  - Exclude Offshores
  - Use LMF- IIP model of equity holdings (distance, size, etc) to predict positions of missing countries

Method: ASSETS - FDI

- **FDI**:
  - Again, assume destination equals currency
  - Use UNCTAD data on FDI outward and inward stocks.
  - Missing data: inferences based on inward reporting by other countries
    - For a limited number of countries more *ad hoc* process relying on flows data

Method: ASSETS – portfolio debt

- **Portfolio Debt Assets**:
  - Destination does **not** equal currency
  - Use gravity augmented CPIS data to generate geographical holdings.
  - Then use BIS issuance data, national sources, and World Bank external debt data to calculate currency by geographical location.
  - Use national sources (US, ECB, BoJ) to remove major currency investor holdings, then use residuals for rest of world
    - That is, subtract US holdings by country by currency from the issuance of each country before calculating the average currency profile by destination.

Method: Assets – Other Debt

- **Other Debt Assets**:
  - use BIS data on bank assets and liabilities. Gives us geographical distribution as well as home vs. foreign breakdown.
  - Using both A & L, we can triangulate towards currency.

Method: Assets - reserves

- **Reserves**:
  - Begin with COFER database on world currency breakdown by year.
  - Use regression results from Eichengreen and Mathieson on confidential individual country data to back out currency composition of reserves.
    - Using time varying constants to match COFER annual world totals
  - Use evidence from Truman and Wong to fill in some actual data for ~20 countries for 2000-2004
  - Output is matched to a variety of sources and individual country reports.
    - Country announcements
    - Lim (2006)

Method: Liabilities

- Equity and FDI liabilities are considered to be in the local (ie home) currency.
- World Bank data gives a combined breakdown for external debt that pools portfolio debt, bank debt, and official lending.
- For industrial countries BIS issuance data and BIS banking data are combined to generate the equivalent series.

Method: weights

- A, L, Gross, and Net weights are created using these currency weights across the asset classes.
  - $$\omega_{ijt}^{A} = \sum_{k=1}^{k=N} \lambda_{it}^{Ak} * \omega_{ijt}^{Ak}$$
  - where ω^{Ak} is the currency weight for a given asset class and λ^{Ak} is the asset class weight within assets.
  - EWN data is used to create the λ^{Ak}
  - Same construction is done for liabilities

Weights: cont

- NET financial weights show the overall exposure of a country to a particular currency:

$$\omega_{ijt}^{F} = \omega_{ijt}^{A} \frac{A}{A+L} - \omega_{ijt}^{L} \frac{L}{A+L}$$

$$\frac{\partial VAL_{it}}{\partial E_{ijt}} = \omega_{ijt}^{F} * (A_{it-1} + L_{it-1})$$

Index Construction

- We create exchange rate indices based on these weights.
  - They are approximations of geometric indices based on summing the percentage changes across partner countries
    - In this manner changing weights do not change index on their own
    - Negative is an appreciation
  - Under our construction, if a country hyperinflates, the value for that country in all other countries will head towards zero, rather than take an outsized role.
  - $$I_{it}^{A} = I_{it-1}^{A} * (1 + \sum \omega_{ijt}^{A} * \%\Delta E_{ijt})$$

Index Construction (continued)

- This allows us to write:

$$VAL_{it}^{XR} = \%\Delta I_{it}^{A} * A_{t-1} - \%\Delta I_{it}^{L} * L_{t-1}$$

  - Where A and L are as % of GDP

- As well as create a NET index

$$I_{it}^{F} = I_{it-1}^{F} * \left(\%\Delta I_{it}^{A} * \frac{A_{t-1}}{A_{t-1} - L_{t-1}} - \%\Delta I_{it}^{L} * \frac{L_{t-1}}{A_{t-1} - L_{t-1}} \right)$$

$$VAL_{it}^{XR} = \%\Delta I_{it}^{F} * (A_{t-1} + L_{t-1})$$

Quick comment on NET

- The NET weights and index are a bit different than normal indices
- NET weights can be negative
- NET weights do NOT necessarily sum to 1
  - A country can have perfect balance (they sum to zero), or be long or short
- The NET index can be stable if you are balanced even if E is moving.

Aggregate Foreign Currency Exposures

- Optimal portfolios in DSGE open-economy models: new wave in the literature
  - Key issue: optimal pattern in foreign currency exposure (long or short rest of world)
- Define foreign currency exposure by:

$$FX_{it}^{AGG} = \omega_{it}^{A} s_{it}^{A} - \omega_{it}^{L} s_{it}^{L}$$

  - Where ω^A is the share of foreign assets in foreign currencies and s^A is the share of assets in A+L
- In turn, the impact can be summarized by:

$$NETFX_{it}^{AGG} = FX_{it}^{AGG} * IFI_{it-1}$$

RESULTS

- We will examine:
  - Do “financial” exchange rates look different
    - Correlation with trade indices
  - Are countries positions mismatched ?
    - Correlation of A & L indices
  - Aggregate foreign currency exposures
    - Net weight vs. rest of the world
    - How has it changed ?
  - What are the general properties of VAL^{XR}

Correlation of Indices

Table 1: Correlations between Financial and Trade-Weighted Exchange Rate Indices

Group	Statistic	Assets Liabilities	Assets Trade	Liabilities Trade	Net Finance Trade	Exports Imports
All	mean	0.96	0.90	0.86	-0.30	0.95
	median	0.98	0.95	0.92	-0.72	0.98
Advanced	mean	0.97	0.92	0.88	0.41	0.97
	median	0.98	0.93	0.89	0.70	0.98
Dev. & Emging	mean	0.96	0.90	0.86	-0.47	0.95
	median	0.99	0.96	0.95	-0.82	0.98
Developing	mean	0.96	0.88	0.84	-0.61	0.94
	median	0.99	0.95	0.94	-0.89	0.97
Emerging	mean	0.94	0.93	0.88	-0.13	0.98
	median	0.97	0.97	0.95	-0.37	0.99

Correlations between the percentage change in monthly Financial and Trade-weighted Exchange Rates Indices. Monthly data, 1990.1-2004.12. Full sample of countries.

Mean and median across countries where correlation is done within country

- TRADE and NET are negatively correlated, (other indices highly correlated)
  - TRADE may miss important information for many countries
- A & L are highly correlated. Currency "mismatch" not strong in the indices

Stability of the indices

Table 2

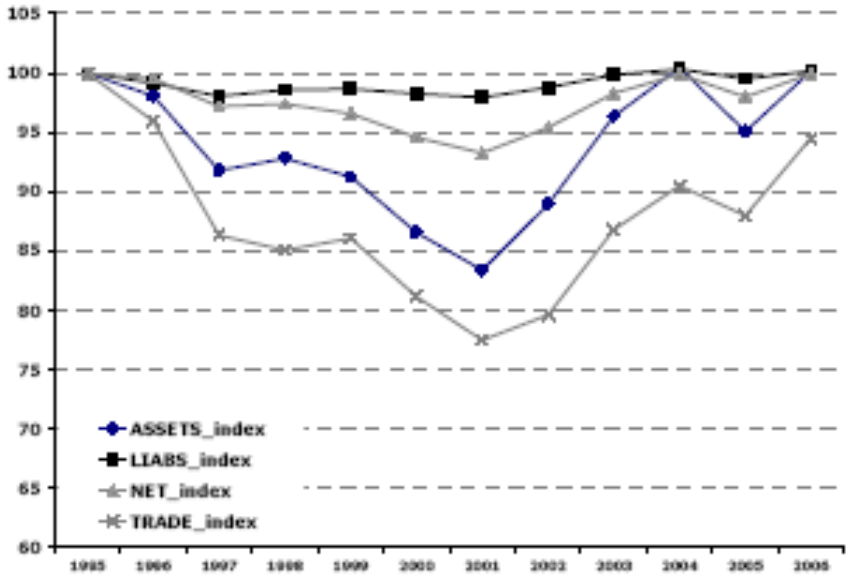
Group	Statistic	Trade	Net	Assets	Liabilities
All	Mean	0.123	0.050	0.140	0.105
	Median	0.066	0.023	0.067	0.055
Advanced	Mean	0.050	0.013	0.058	0.035
	Median	0.046	0.010	0.053	0.034
Dev. & Emging	Mean	0.140	0.058	0.159	0.122
	Median	0.081	0.028	0.071	0.068
Developing	Mean	0.133	0.069	0.153	0.121
	Median	0.071	0.035	0.064	0.068
Emerging	Mean	0.158	0.036	0.173	0.123
	Median	0.090	0.021	0.101	0.071
Sudden Stops	mean % Δ	44%	-8%	54%	41%
Big Change	mean % Δ	88%	-30%	107%	88%

Std deviation of the percentage change by country

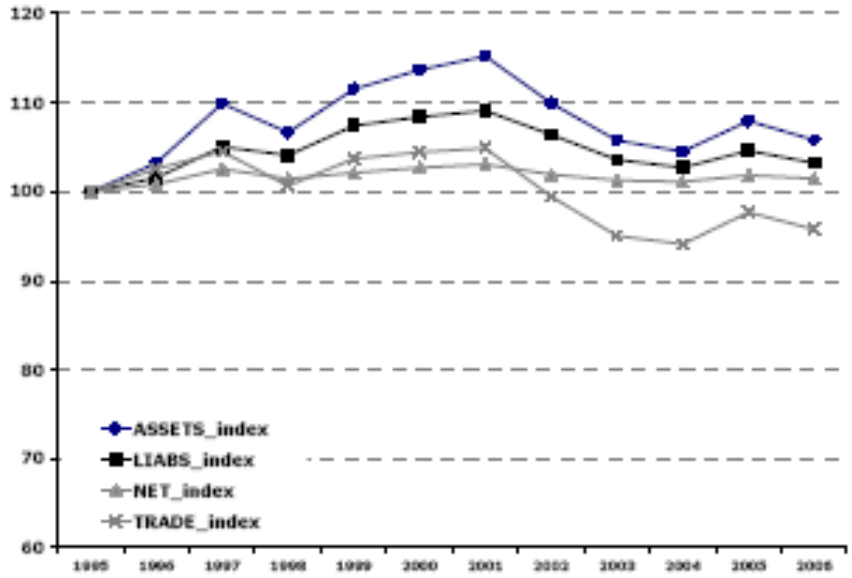
- Net indices are much more stable than the others.
- Liability indices are more stable than Asset
  - despite their high correlation, they are not moving one for one with one another

Some examples

United States



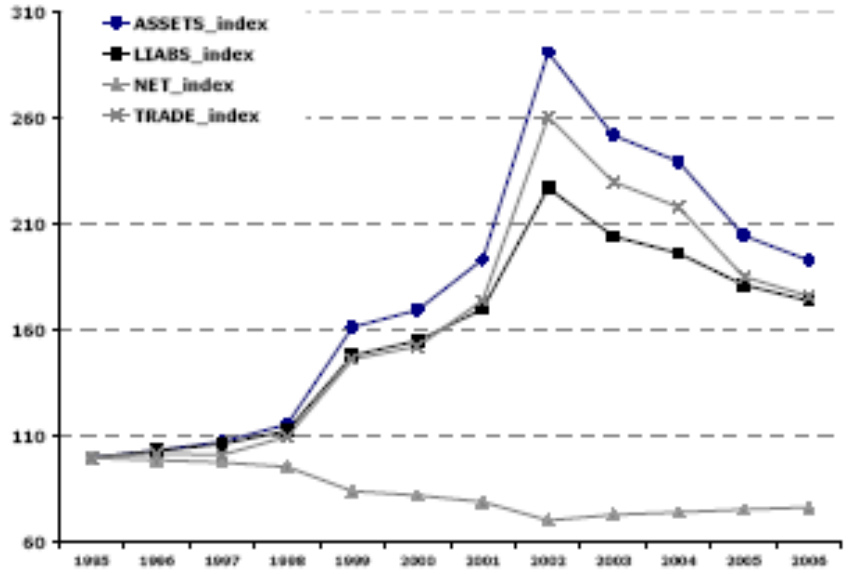
France



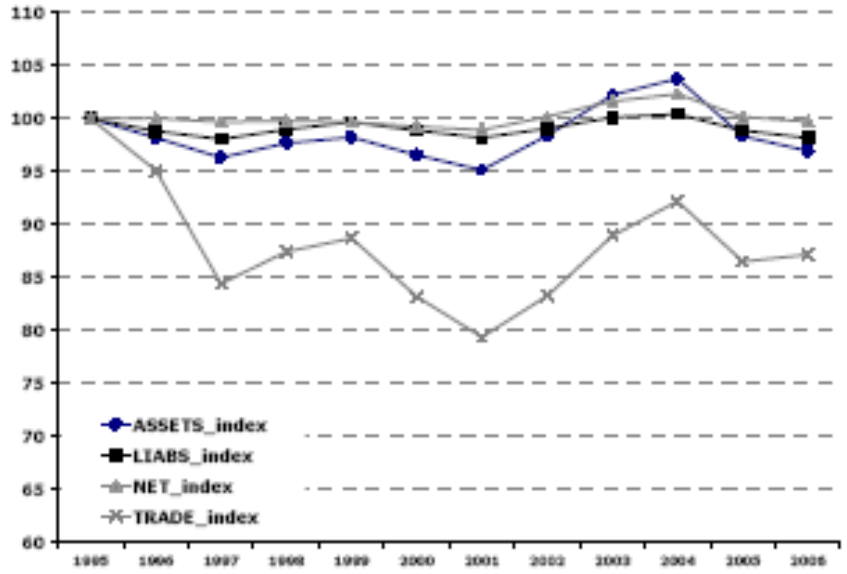
- US liabilities index is stable.
- France A&L indices move together, but post-euro, all are stable

Examples

Brazil



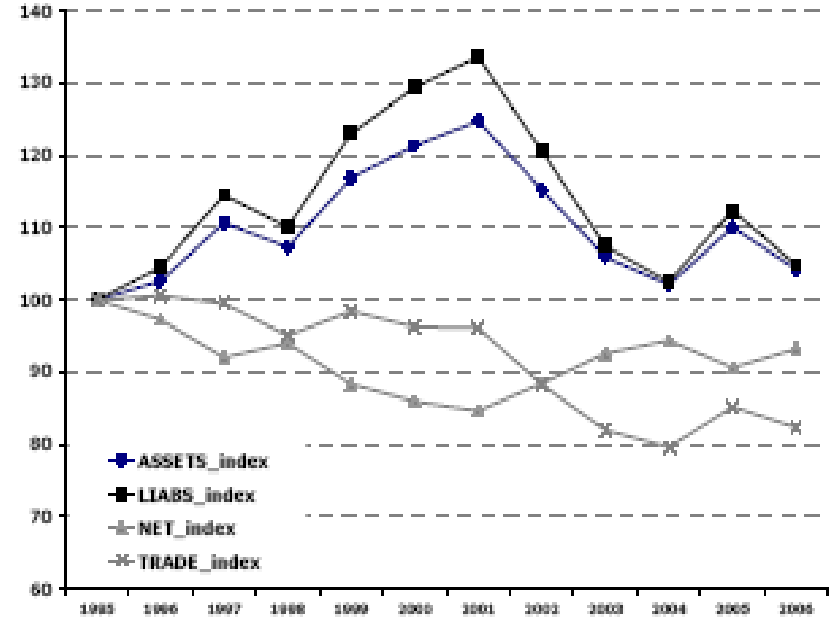
China



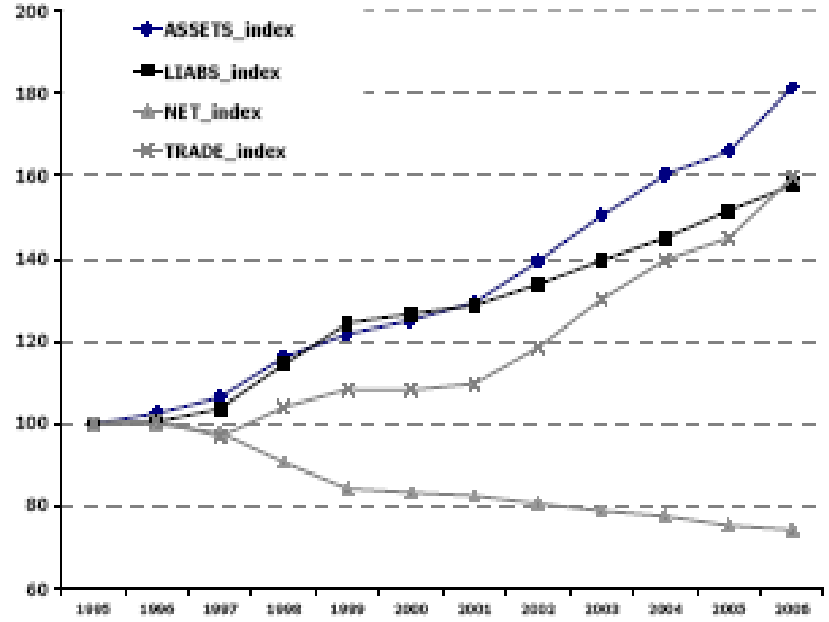
- Brazil: A, L, Trade indices all depreciate while net falls (net debtor: capital losses).
- China: dollar peg stabilized all financial indices

Examples

Benin

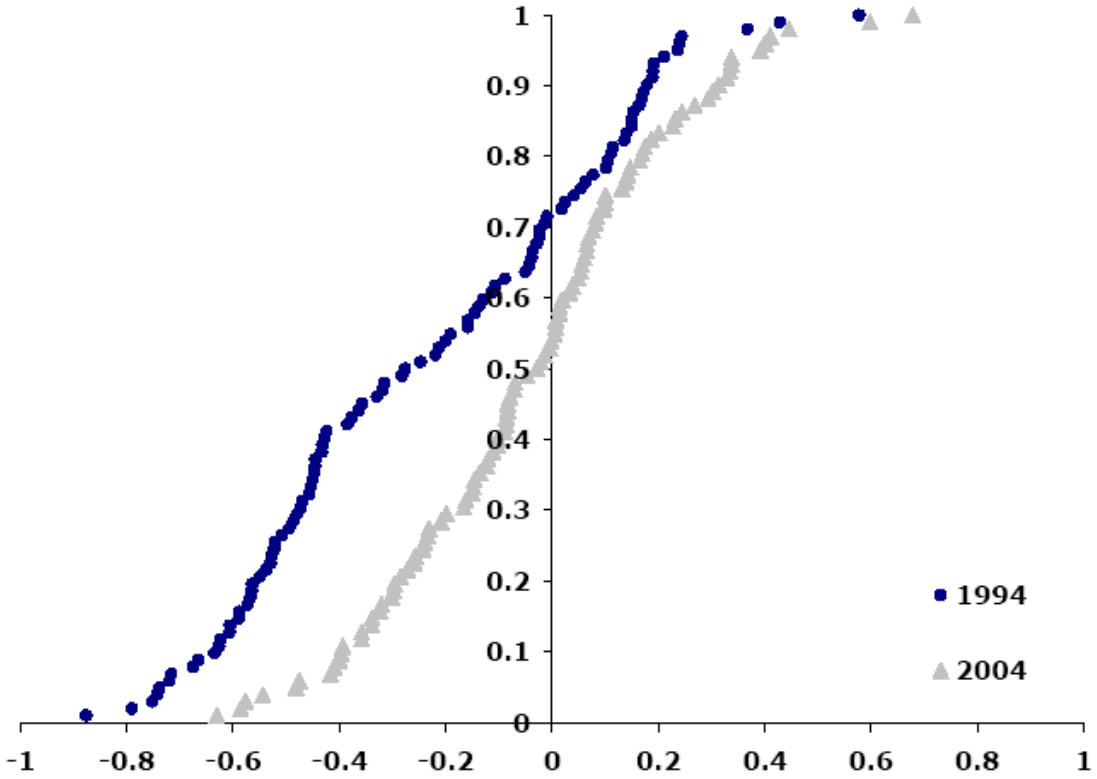


Bangladesh



- Benin: trade and finance moving differently ($ vs euro).
- Bangladesh: L starting to flatten
- IN GENERAL: Trade weighted index is not a good summary of what is going on financially

FX^{AGG} in 1994 and 2004



- The number of countries with negative positions has gone down from 71% to 54%.
- The number of countries below -.5 has gone down from 30% to <10%

Aggregate Foreign Currency Exposure

Table 4

	1994		2004	
	mean	median	mean	median
		FX^{agg}		
All	-0.24	-0.26	-0.04	-0.03
Advanced	0.04	0.08	0.11	0.09
Dev. & Emging	-0.31	-0.43	-0.08	-0.10
Developing	-0.42	-0.47	-0.15	-0.18
Emerging	-0.11	-0.07	0.04	0.06
		$NETFX$		
All	-0.31	-0.22	0.11	-0.04
Advanced	0.17	0.08	0.51	0.36
Dev. & Emging	-0.45	-0.36	0.00	-0.13
Developing	-0.73	-0.52	-0.21	-0.22
Emerging	0.06	-0.08	0.38	0.06

- Bulk of developing countries are not hedged against depreciation. Shift towards positive position over time.
- SIZE of exposure growing in industrial countries

Quick note

- Recall: $\frac{\partial VAL_{it}}{\partial E_{ijt}} = \omega_{ijt}^{F} * (A_{it-1} + L_{it-1})$
- So, a net weight of -.50 on the rest of the world implies that a 10% depreciation against the rest of the world will generate a loss of 5% times (A+L)
- A country with mean A+L (=200% of GDP) will therefore suffer a 10% of GDP wealth loss from a 10% depreciation if it has a -.5 weight.

What shifted as FX^{AGG} moved ?

Quartile	obs	mean	min	max	Δs_{it}^{A}	$\Delta \omega_{it}^{A}$	$\Delta \omega_{it}^{L}$	EMU	Non-EMU
1	25	-0.09	-0.34	0.04	-0.07	-0.15	-0.17	0.28	0.12
2	25	0.12	0.06	0.19	0.05	-0.06	-0.08	0.12	0.12
3	26	0.26	0.19	0.34	0.07	0.01	-0.21	0.00	0.15
4	26	0.48	0.34	0.92	0.16	-0.02	-0.29	0.04	0.04
All	102	0.20	-0.34	0.92	0.06	-0.05	-0.19		
Advanced	22	0.08	-0.14	0.50	0.03	-0.25	-0.24		
EMU	11	-0.001	-0.14	0.41	0.01	-0.52	-0.42		
Non-EMU	11	0.15	-0.04	0.50	0.06	0.02	-0.07		
Dev. & Emging	80	0.23	-0.34	0.92	0.06	0.00	-0.17		
Developing	52	0.27	-0.26	0.92	0.08	0.00	-0.17		
Emerging	28	0.15	-0.34	0.63	0.03	0.00	-0.18		

- Change in NFA position (change in s^{A}) is crucial for improvement
- Change in share of liabilities that are foreign is also important
- Drop in A and L foreign currency shares comes from EMU

What shifted as FX^{AGG} moved ?

		$\Delta Res/\Delta A$		ΔNFA^{priv}		$\Delta(\lambda_{Lit}^{PEQ}+\lambda_{Lit}^{FDI})$		$\Delta DebtL^{FC}$	
quartile	obs	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1	25	0.21	0.05	-0.18	-0.18	0.09	0.08	-0.13	-0.01
2	25	0.30	0.36	0.08	0.02	0.02	0.03	-0.08	0.00
3	26	0.42	0.46	0.14	0.03	0.21	0.20	-0.01	0.00
4	26	0.50	0.58	0.43	0.37	0.27	0.26	-0.03	0.00
All	102	0.37	0.41	0.12	0.04	0.15	0.15	-0.06	0.00
Advanced	22	0.02	0.00	0.03	0.05	0.07	0.05	-0.27	-0.20
EMU	11	-0.02	-0.01	-0.01	0.01	0.07	0.04	-0.53	-0.51
non-EMU	11	0.07	0.03	0.08	0.09	0.08	0.05	-0.01	-0.02
Dev. & Emging	80	0.47	0.52	0.15	0.04	0.17	0.16	0.00	0.00
Developing	52	0.51	0.54	0.28	0.15	0.17	0.16	0.00	0.00
Emerging	28	0.40	0.46	-0.07	-0.06	0.18	0.18	-0.01	0.00

- Reserves went up, Private NFA improved in developing countries, FDI & Equity grew, but not "sin" going away.

Changes in NETFX

	obs	mean	min	max	ΔFX_{it}^{AGG}	ΔIFI
All	96	0.41	-0.52	3.11	0.20	0.57
Advanced	22	0.30	-0.52	1.40	0.07	2.18
EMU	11	0.14	-0.52	0.91	0.00	2.89
Non-EMU	11	0.46	0.11	1.40	0.15	1.47
Dev. & Emging	74	0.45	-0.25	3.11	0.23	0.09
Developing	48	0.52	-0.14	3.11	0.27	-0.21
Emerging	26	0.32	-0.25	2.53	0.15	0.64

- Developing countries are both increasing FX^{AGG} and reducing scale.
- Advanced are rapidly increasing scale (especially EMU)

Characteristics of VAL^{XR}

- VAL^{XR} is sizable:
  - 75^{th} percentile abs value is 4.3% of GDP, 90^{th} is 11.2%
- VAL^{XR} moves with VAL (not fully offset)
- VAL^{XR} effects do not reverse
  - slight positive autocorrelation
  - Only a handful of countries show reversals in individual country regressions

Size of VAL^{XR}

	Mean	Median	75%	90%
All	5.0	1.7	4.3	11.2
Advanced	2.4	1.2	2.8	5.0
Dev. & Emging	5.7	1.8	4.7	12.6
Developing	6.8	2.3	5.3	15.8
Emerging	3.4	1.2	3.8	10.0

- VAL^{XR} as a share of GDP (in percentage points)

VAL and VAL^{XR}

	(1) All	(2) Adv.	(3) Dev.	(4) Eme.
VALxr	1.071 (0.05)**	0.574 (0.14)**	1.095 (0.05)**	0.982 (0.12)**
Constant	0.724 (0.15)**	-0.969 (0.07)**	2.529 (0.25)**	-1.745 (0.18)**
N	1496	304	802	390
R^2	0.65	0.09	0.72	0.51
R^2 (no FE)	0.54	0.06	0.61	0.42

- VAL and VAL^{XR} are positively correlated. VAL^{XR} is not entirely offset by price movements

VAL, VAL^{XR} over time

	$\rho(VAL)$		$\rho(VAL^{xr})$		$\rho(VAL^{mp})$	
	Mean	Median	Mean	Median	Mean	Median
All	0.02	-0.01	0.12	0.09	0.01	0.01
Advanced	-0.01	-0.06	0.15	0.15	-0.05	-0.04
EMU	-0.02	-0.04	0.20	0.16	-0.01	-0.04
Non-EMU	0.01	-0.08	0.10	0.14	-0.09	-0.03
Developing	0.02	-0.001	0.11	0.06	0.02	0.03

- Crucial point is that the exchange rate effects do not disappear a year later

Summary

- We have the first cross-country cross-time currency exposure by country.
- We are able to show:
  - Trade and Finance weights look different
    - Trade weighted index not a good summary of valuation impact of currency movements
  - Some (especially especially developing countries) have reduced exposure by:
    - Increasing reserves and changing composition of liabilities
  - Valuation shocks are substantial as a share of GDP, and the exchange rate channel is important

Next Steps

- Examine role of VAL^{XR} in international adjustment mechanism
- Monetary Policy and VAL^{XR}
- Financial Properties of Exchange Rate Regimes
- Explore weights across asset classes
- Explore bilateral weights in more detail