

Friedman Redux: External Adjustment and Exchange Rate Flexibility*

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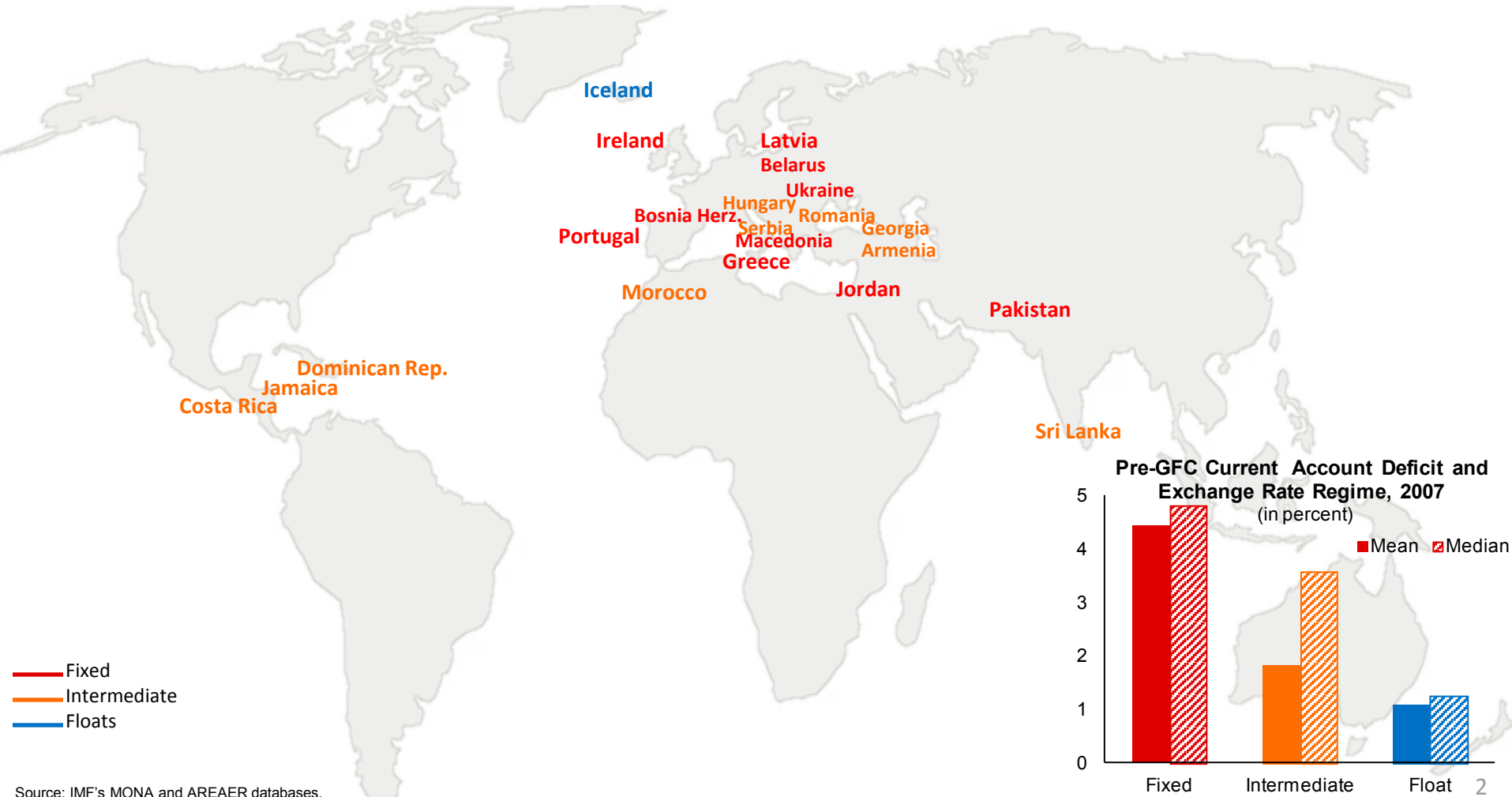
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Most Crises Under Pegged Exchange Rates...

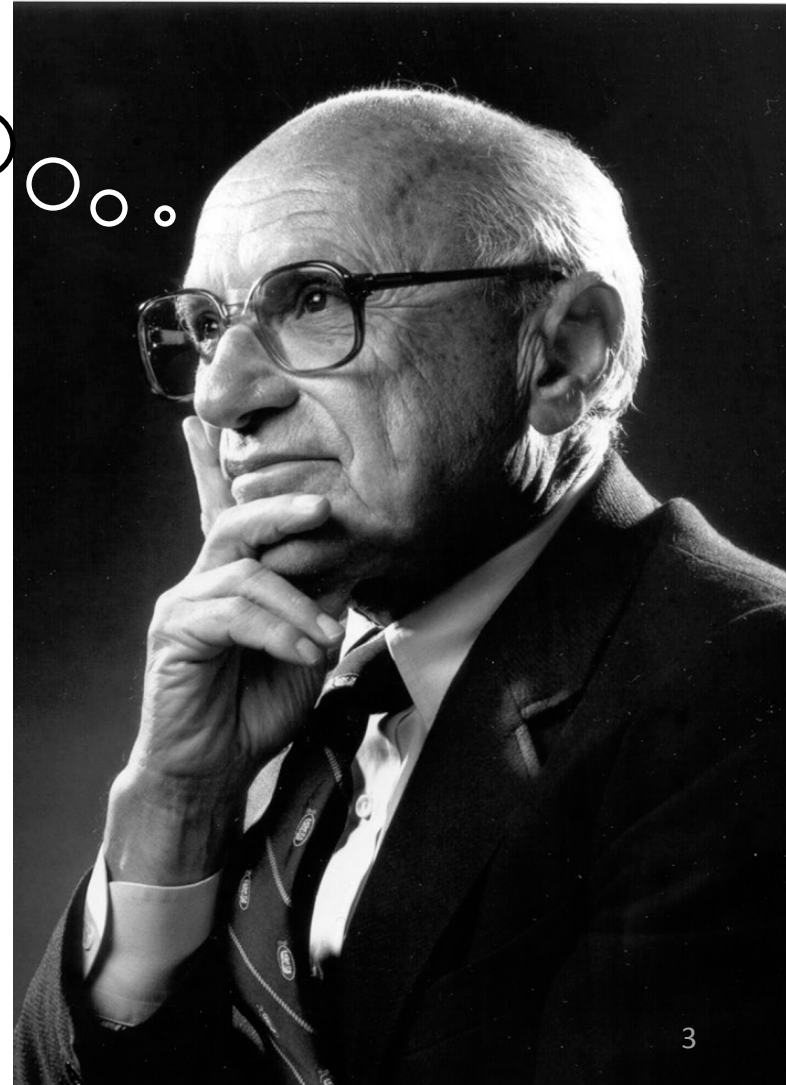
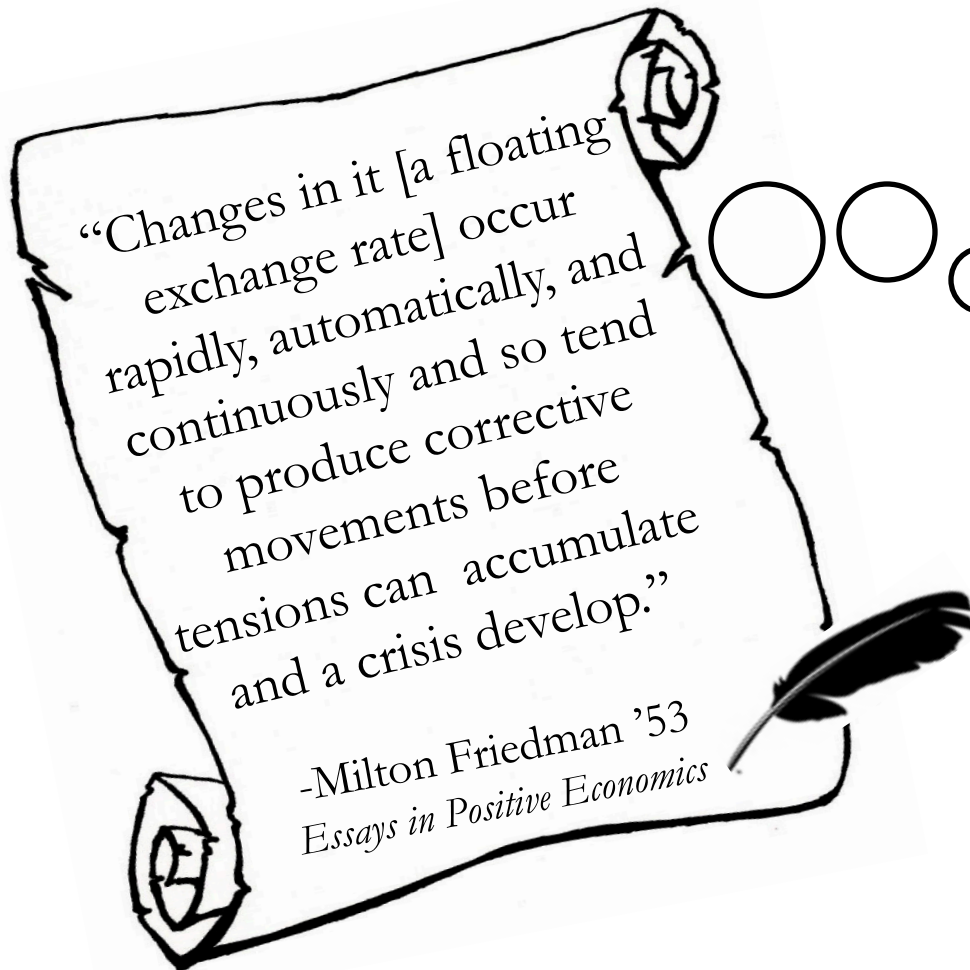
Post-Crisis IMF Arrangements in Advanced and EM Countries, and Pre-Crisis Exchange Rate Regime
Sep 2008-Dec 2011*



Source: IMF's MONA and AREAER databases.

* Excludes precautionary arrangements where Fund resources have not been drawn. Multiple arrangements with the same country over the period are counted once. Exchange rate regime is of 2007. Fixed=currency union, currency board, dollarized, single currency peg; Intermediate=basket pegs, crawls, horizontal bands, managed floats; Float=independent floats.

Friedman's Explanation



But little evidence of slower adjustment under pegs

- Exchange rate regime (ERR) matters for external adjustment seems intuitive and obvious...
 - Latin American debt crisis of the 1980s
 - East Asian financial crisis in the 1990s
 - Argentina (2001), Latvia (2008), Eurozone periphery (2010-), etc.
- But empirical evidence is surprisingly contradictory
 - Chinn and Wei (C&W, 2008) find no strong or robust relationship between exchange rate regime flexibility and the rate of current account reversion
 - Ghosh et al. (2010) find evidence of asymmetric threshold effects
 - Others argue that C&W's results are sample-specific, driven by the discrete nature of the ERR classification, or the estimation methodology (Herrmann, 2009; Ghosh et al., 2013; Tippkötter, 2010)

The Chinn Wei Regression

- Baseline specification

$$TB_{it} = \gamma_0 + \gamma_1 TB_{it-1} + \gamma_2 XRR_{ijt} + \gamma_3 (TB_{it-1} \times XRR_{it}) + \nu_i + \lambda_t + \eta_{it}$$

where TB: trade balance to total trade

XRR: Nominal exchange rate regime (0=Fixed; 0.5=Intermediate; 1=Float)

TB \times XRR: Interaction term between the exchange rate regime and lagged current account

γ_3 : Autoregressive parameter (values closer to 1 indicating slower adjustment)

- Slower external adjustment under pegs would imply $\gamma_3 < 0$

External Adjustment: Aggregate ERR Does Not Matter...

Estimation Results with Aggregate Exchange Rate Regime Classifications, 1980-2011

	IMF DJ classification 1/			IMF DF classification 2/			RR classification 3/			LYS classification 4/		
	OLS	FE	FE/TE	OLS	FE	FE/TE	OLS	FE	FE/TE	OLS	FE	FE/TE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All countries												
TB _{t-1}	0.932***	0.744***	0.737***	0.934***	0.748***	0.743***	0.947***	0.762***	0.757***	0.924***	0.651***	0.647***
	(0.011)	(0.025)	(0.025)	(0.010)	(0.023)	(0.022)	(0.009)	(0.023)	(0.022)	(0.015)	(0.033)	(0.033)
Regime _t	0.001	0.007	0.006	0.002	0.004	0.003	-0.002	-0.011	-0.006	0.005	0.014*	0.011
	(0.003)	(0.007)	(0.007)	(0.003)	(0.008)	(0.008)	(0.004)	(0.010)	(0.010)	(0.003)	(0.007)	(0.007)
TB _{t-1} * Regime _t	-0.002	-0.017	-0.007	-0.011	-0.037	-0.033	-0.045	-0.073	-0.070	-0.004	0.070	0.073
	(0.022)	(0.038)	(0.037)	(0.023)	(0.045)	(0.043)	(0.030)	(0.057)	(0.057)	(0.032)	(0.045)	(0.045)
Observations	4,460	4,460	4,460	4,460	4,460	4,460	3,885	3,885	3,885	2,419	2,419	2,419
R-squared	0.872	0.557	0.571	0.872	0.557	0.571	0.884	0.568	0.582	0.863	0.476	0.498
No. of countries	180	180	180	180	180	180	180	180	180	174	174	174

Notes: Dependent variable is trade balance scaled by total trade (TB_t). TB_{t-1} is lagged TB. Years in which the exchange rate regime switches are excluded from the sample. Constant included in all specifications. Standard errors, reported in parentheses, are clustered at the country level in all specifications. ***, **, * indicate significance at the 1, 5, and 10 percent levels, respectively.

1/ Regime is IMF's de jure classification regime (0=fixed; 0.5=intermediate; 1=float).

2/ Regime is IMF's de facto classification regime (0=fixed; 0.5=intermediate; 1=float).

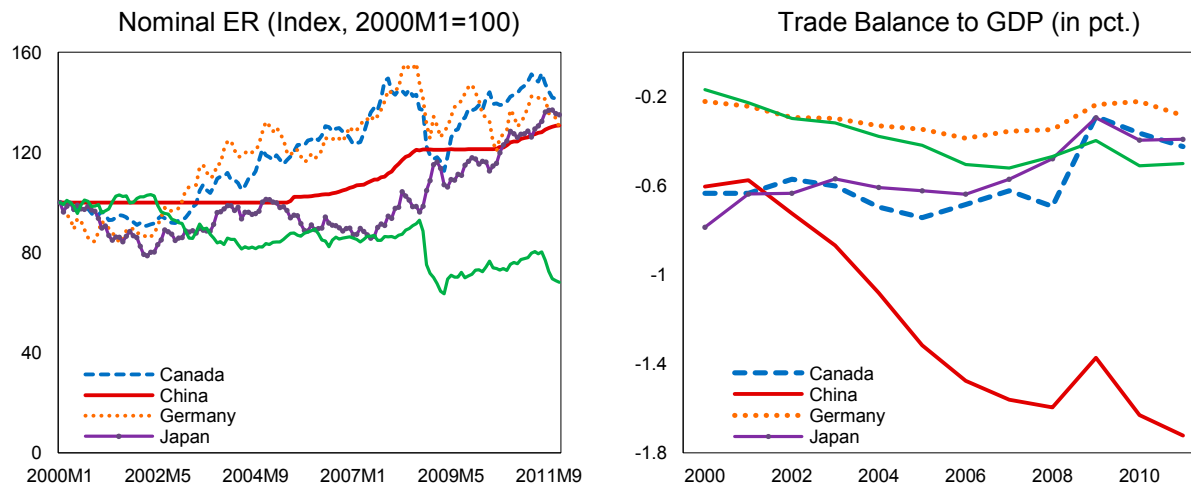
3/ Regime is Reinhart and Rogoff's (2004) de facto classification regime (0=fixed; 0.5=intermediate; 1=float).

4/ Regime is Levy-Yeyati and Sturzenegger's (2003) de facto classification regime (0=fixed; 0.5=intermediate; 1=float).

Our Explanation

- Problem with the aggregate nature of existing ERR classifications
 - Clearly, the U.S. dollar floats, but its exchange rate against some of the major trading partners (e.g., China) does not adjust freely
 - If exchange rate flexibility matters, then the behavior of US-China bilateral trade balance should be different from that of other US bilateral relationships...

US Trade Balance and Nominal Exchange Rate with Key Trading Partners, 1980-2011



Source: IMF's IFS and INS databases.

US deficits against other trading partners have tended to fluctuate, but the deficit with China has persistently deteriorated, tripling over the last decade

- ⇒ US' exchange rate relevant to external dynamics, thus, does not float as freely as, e.g., the NZ dollar—though existing aggregate ERR classifications categorize both as floats
- ⇒ ..and indeed autoregressive coefficient of NZ CA is around one-half that of the US CA.

Our Explanation

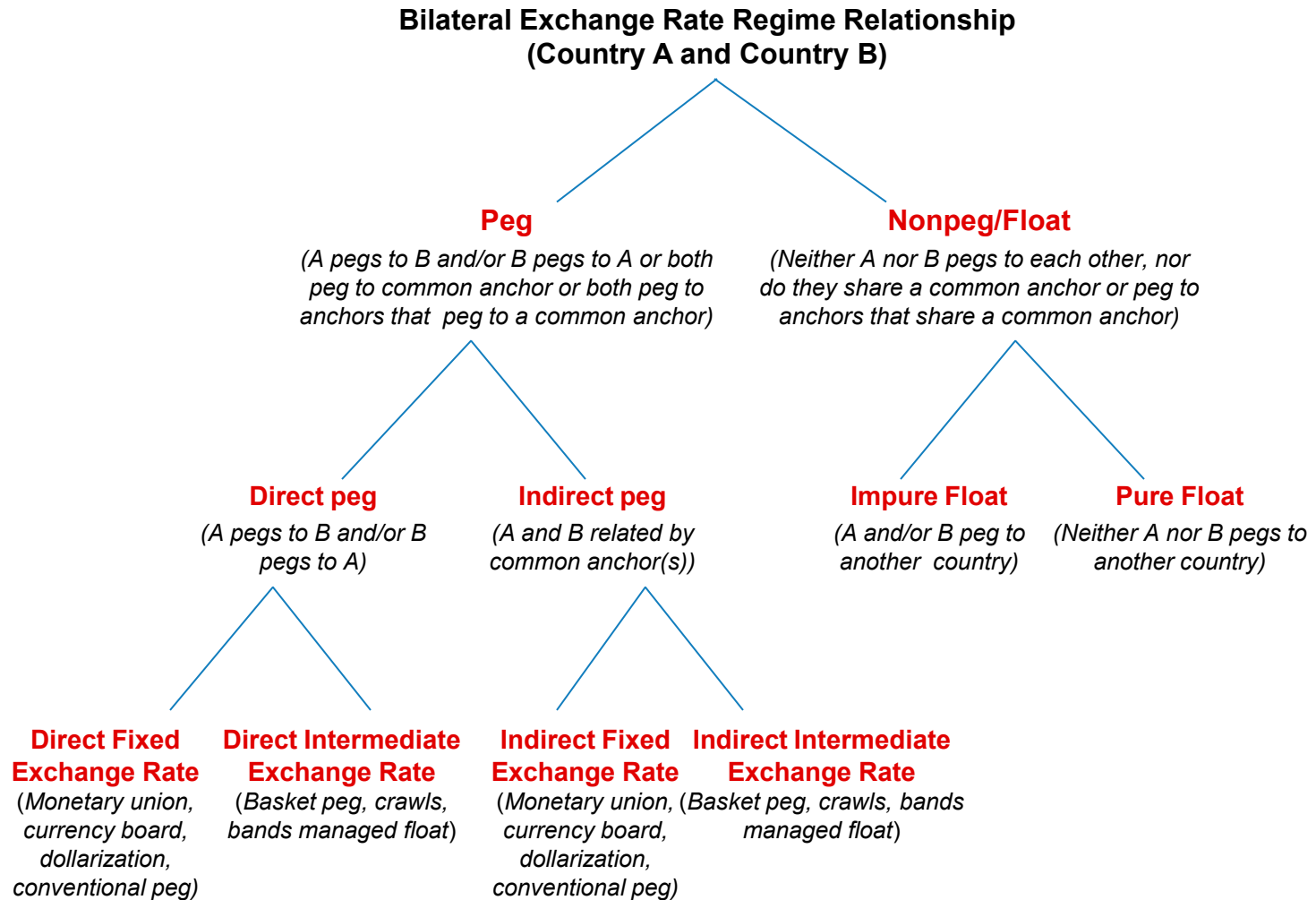
- Similarly, in aggregate ERR classifications...
 - Eurozone members are classified as floats (but around 60 pct. of their trade is with each other), or as fixed (but 40 pct. of their trade is with countries against which they float)
 - Countries that peg against an anchor currency are classified as a peg, though their ER may fluctuate against other important trading partners
- Ignoring the very heterogeneous bilateral relationships can yield misleading conclusions about ERR-external adjustment relationship

What Do We Do?

- Examine the regime-adjustment nexus through the prism of *bilateral* ERR relationships between trading partners
 - US-China trade relationship is treated differently from US-Germany relationship
 - This is like using gravity model to identify effect of currency union/FTA—need to use data on countries with which we actually have a CU/FTA. Likewise, need bilateral data on countries to which we actually peg to identify the effect of fixed exchange rate on adjustment.
- Construct a unique and comprehensive bilateral ERR classification dataset covering 181 countries over 1980–2011
 - Use detailed information on de jure and de facto ERR, as well as “anchor” currencies from the IMF’s *AREAER*
 - Create a three-way classification—fixed, intermediate, and floating regimes—and generate direct and indirect peg relationships
- Use the rich bilateral dataset to estimate the conventional autoregressive model and conduct “natural experiments” of exogenous ERR changes

Bilateral Exchange Rate Relationships

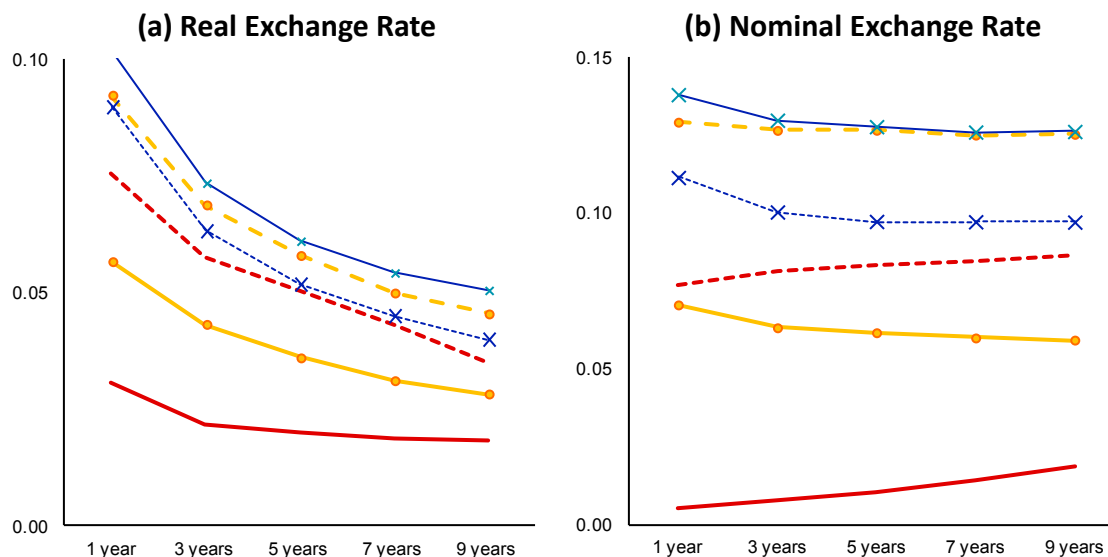
Possible Configurations



Bilateral Exchange Rate Volatility and Regimes

- A priori, we would expect real exchange rate flexibility to be the
 - Lowest under *direct* pegs
 - Highest under *pure* floats

Bilateral Exchange Rate Volatility and Exchange Rate Regimes, 1980-2011



Note: Exchange rate (V) volatility between countries i and j at horizon n is defined as $|(E_{ij}/E_{ij-t-n})^{1/n}-1|$; where E is the bilateral exchange rate.



- If Friedman's hypothesis holds, adjustment would be faster under a float than under a peg, and faster when the peg is indirect than when it is direct

Bilateral Regime Classification

- Three steps
 - Use IMF's de jure and de facto aggregate ERR classification over 1980-2011 for 181 countries, and group as fixed, intermediate and floating regimes
 - Combine the ERR information for each country with that of its anchor currency to generate direct bilateral ERR
 - Include explicit exchange rate anchors
 - Basket pegs: top five trading partners as anchors
 - Pegs to Special Drawing Rights (SDRs): Currencies in the SDR basket as anchors
 - Participant and non-participant countries in the ERM: currencies in the European Currency Unit (pre-1999); all Eurozone member countries (post-1999) as anchors
 - Create possible indirect ERR relationships generated because of pegging with an anchor currency

Estimation Results

External Dynamics and ERR

- Baseline specification

$$TB_{ijt} = \gamma_0 + \gamma_1 TB_{ijt-1} + \gamma_2 XRR_{ijt} + \gamma_3 (TB_{ijt-1} \times XRR_{ijt}) + v_{ij} + \lambda_t + \eta_{ijt}$$

where TB: trade balance to total trade

XRR: Nominal exchange rate regime (0=Fixed; 0.5=Intermediate; 1=Float)

TB × XRR: Interaction term between the exchange rate regime and lagged current account

γ_3 : Autoregressive parameter (values closer to 1 indicating slower adjustment)

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All countries												
TB _{t-1}	0.932*** (0.011)	0.744*** (0.025)	0.737*** (0.025)	0.934*** (0.010)	0.748*** (0.023)	0.743*** (0.022)	0.947*** (0.009)	0.762*** (0.023)	0.757*** (0.022)	0.924*** (0.015)	0.651*** (0.033)	0.647*** (0.033)
Regime _t	0.001 (0.003)	0.007 (0.007)	0.006 (0.007)	0.002 (0.003)	0.004 (0.008)	0.003 (0.008)	-0.002 (0.004)	-0.011 (0.010)	-0.006 (0.010)	0.005 (0.003)	0.014* (0.007)	0.011 (0.007)
TB _{t-1} * Regime _t	-0.002 (0.022)	-0.017 (0.038)	-0.007 (0.037)	-0.011 (0.023)	-0.037 (0.045)	-0.033 (0.043)	-0.045 (0.030)	-0.073 (0.057)	-0.070 (0.057)	-0.004 (0.032)	0.070 (0.045)	0.073 (0.045)
Observations	4,460	4,460	4,460	4,460	4,460	4,460	3,885	3,885	3,885	2,419	2,419	2,419
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But Bilateral Does!

Estimation Results with Bilateral Exchange Rate Regime Classification, 1980-2011

	De Jure Classification				De Facto Classification			
	OLS	CFE	CPFE	CPFE/TE	OLS	CFE	CPFE	CPFE/TE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All countries								
TB _{t-1}	0.886*** (0.010)	0.866*** (0.011)	0.553*** (0.018)	0.552*** (0.018)	0.879*** (0.010)	0.858*** (0.011)	0.543*** (0.018)	0.542*** (0.018)
Regime _t	0.001 (0.004)	0.025*** (0.006)	-0.029*** (0.010)	-0.027*** (0.010)	0.002 (0.004)	0.026*** (0.006)	-0.030*** (0.010)	-0.028*** (0.010)
TB _{t-1} × Regime _t	-0.128*** (0.010)	-0.138*** (0.011)	-0.109*** (0.018)	-0.108*** (0.018)	-0.121*** (0.010)	-0.130*** (0.011)	-0.098*** (0.018)	-0.097*** (0.018)
Observations	258,075	258,075	258,075	258,075	258,075	258,075	258,075	258,075
R-squared	0.585	0.592	0.206	0.207	0.585	0.592	0.206	0.207
No. of trading pairs	12,660	12,660	12,660	12,660	12,660	12,660	12,660	12,660

Notes: Dependent variable is bilateral trade balance to the sum of bilateral exports and imports (TB). TB_{t-1} is one period lagged TB. Regime is bilateral exchange rate regime constructed using IMF's de jure and de facto aggregate classification (coded as fixed=0, intermediate=0.5, and float=1). Constant included in all specifications. Standard errors are clustered at country-pair level in all specifications. ***, **, * indicate significance at the 1, 5, and 10 percent levels, respectively.

⇒ Half-life of bilateral TB is twice as long under a direct peg than under a float (5 vs. 2.5yrs.) in OLS/CFE; and about 0.3 yrs. longer with CPFE

The Result Holds Across Subsamples

Estimation Results with Bilateral Exchange Rate Regime Classification, 1980-2011

	De Jure Classification				De Facto Classification			
	OLS	CFE	CPFE	CPFE/TE	OLS	CFE	CPFE	CPFE/TE
Advanced and EMDCs a/								
TB _{t-1}	0.875*** (0.014)	0.794*** (0.015)	0.573*** (0.019)	0.571*** (0.019)	0.868*** (0.013)	0.782*** (0.015)	0.560*** (0.019)	0.558*** (0.019)
Regime _t	-0.000 (0.007)	0.005 (0.009)	-0.037*** (0.012)	-0.033*** (0.012)	0.001 (0.007)	0.001 (0.008)	-0.042*** (0.012)	-0.038*** (0.012)
TB _{t-1} × Regime _t	-0.088*** (0.014)	-0.072*** (0.015)	-0.069*** (0.019)	-0.067*** (0.019)	-0.080*** (0.014)	-0.059*** (0.015)	-0.055*** (0.019)	-0.053*** (0.019)
Observations	106,420	106,420	106,420	106,420	106,420	106,420	106,420	106,420
R2	0.631	0.645	0.264	0.265	0.630	0.645	0.264	0.265
No. of trading pairs	4,310	4,310	4,310	4,310	4,310	4,310	4,310	4,310
Advanced countries b/								
TB _{t-1}	0.966*** (0.011)	0.947*** (0.012)	0.697*** (0.027)	0.693*** (0.028)	0.964*** (0.011)	0.946*** (0.012)	0.694*** (0.027)	0.690*** (0.028)
Regime _t	0.007* (0.004)	0.004 (0.005)	-0.019** (0.010)	-0.015 (0.010)	0.006* (0.004)	0.003 (0.005)	-0.018* (0.009)	-0.014 (0.010)
TB _{t-1} × Regime _t	-0.047*** (0.016)	-0.039** (0.017)	0.000 (0.027)	0.002 (0.027)	-0.045*** (0.016)	-0.038** (0.017)	0.004 (0.027)	0.005 (0.028)
Observations	10,896	10,896	10,896	10,896	10,896	10,896	10,896	10,896
R2	0.861	0.862	0.487	0.490	0.861	0.862	0.487	0.490
No. of trading pairs	406	406	406	406	406	406	406	406
EMDCs c/								
TB _{t-1}	0.842*** (0.021)	0.833*** (0.021)	0.536*** (0.040)	0.537*** (0.040)	0.839*** (0.021)	0.829*** (0.021)	0.527*** (0.040)	0.528*** (0.040)
Regime _t	0.025** (0.012)	0.037** (0.015)	-0.027 (0.040)	-0.035 (0.039)	0.024** (0.012)	0.040*** (0.015)	0.031 (0.038)	0.021 (0.038)
TB _{t-1} × Regime _t	-0.105*** (0.021)	-0.127*** (0.021)	-0.123*** (0.040)	-0.124*** (0.040)	-0.101*** (0.021)	-0.122*** (0.022)	-0.113*** (0.040)	-0.115*** (0.040)
Observations	139,005	139,005	139,005	139,005	139,005	139,005	139,005	139,005
R2	0.550	0.559	0.178	0.178	0.550	0.559	0.178	0.178
No. of trading pairs	7,920	7,920	7,920	7,920	7,920	7,920	7,920	7,920

a/ At least one country in the trading pair is an advanced economy.

b/ Both countries in the trading pair are advanced economies.

c/ Both countries in the trading pair are either emerging markets or developing economies.

As Well As for Indirect Pegs

Estimation Results with Bilateral Exchange Rate Regime Classification, 1980-2011

	OLS	CPFE	CPFE/TE	OLS	CPFE	CPFE/TE
	(1)	(2)	(3)	(4)	(5)	(6)
TB _{t-1}	0.888*** (0.027)	0.576*** (0.043)	0.575*** (0.043)	0.908*** (0.016)	0.561*** (0.022)	0.561*** (0.022)
Direct regime _t	0.009** (0.004)	-0.029*** (0.010)	-0.030*** (0.010)	0.005 (0.005)	-0.033*** (0.010)	-0.034*** (0.011)
TB _{t-1} × Direct regime _t	-0.123*** (0.010)	-0.105*** (0.018)	-0.104*** (0.018)	-0.130*** (0.011)	-0.101*** (0.018)	-0.100*** (0.018)
Indirect regime _t	0.039*** (0.004)	0.005 (0.006)	-0.004 (0.006)	0.033*** (0.005)	-0.001 (0.006)	-0.009 (0.006)
TB _{t-1} × Indirect regime _t	-0.009 (0.007)	-0.031*** (0.008)	-0.031*** (0.008)	-0.018** (0.008)	-0.024*** (0.009)	-0.025*** (0.009)
Impure float _t				-0.007** (0.003)	-0.008** (0.004)	-0.006* (0.004)
TB _{t-1} × Impure float _t				-0.010* (0.005)	0.008 (0.006)	0.008 (0.006)
Obs.	258,075	258,075	258,075	258,075	258,075	258,075
R-squared	0.585	0.206	0.207	0.585	0.207	0.207
No. of trading pairs	12,660	12,660	12,660	12,660	12,660	12,660
Country-pair effects	No	Yes	Yes	No	Yes	Yes
Year effects	No	No	Yes	No	No	Yes

Notes: Dependent variable is bilateral trade balance to the sum of bilateral exports and imports (TB). TB_{t-1} is one period lagged TB. Direct (indirect) regime is defined as 0, 0.5, and 1 if there is a bilateral fixed, intermediate or floating direct (indirect) regime between the trading pair. Impure float is a binary variable equal to 0 if there is an impure float relationship between the trading pair, and 1 otherwise. Constant is included in all specifications. Clustered standard errors at country-pair level reported in parentheses. ***, **, * indicate significance at the 1, 5, and 10 percent levels, respectively.

Natural Experiments...

- CFA Franc Zone
 - Pegged to French Franc since 1945
 - Euro adoption by France in 1999 implied that CFA franc became pegged to all Eurozone countries
- Lithuania
 - Change of currency board anchor from USD to euro in 2002
- Euro zone
 - Impact of common currency adoption in 1999: Move from less exchange rate flexibility to completely rigid nominal exchange rates

...Also Show Greater Persistence Under Pegs

Estimation Results with Bilateral Exchange Rate Regime Classification, 1980-2011

	CFA franc zone a/			Lithuania b/		Euro zone c/	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regime _t	0.823*** (0.021)	0.487*** (0.031)	0.487*** (0.035)	0.850*** (0.234)	0.576*** (0.081)	1.002*** (0.006)	0.799*** (0.034)
TB _{t-1} × Regime _t	-0.063*** (0.015)	-0.042 (0.039)	-0.050 (0.042)	-0.235 (0.133)	0.087** (0.036)	-0.004 (0.005)	-0.037* (0.019)
Observations	5,266	5,266	4,174	18	208	1,422	1,422
R2	0.611	0.259	0.249	0.790	0.298	0.948	0.689
No. of trading pairs	223	223	181	1	12	66	66
Country-pair effects	No	Yes	Yes	No	Yes	No	Yes
Year effects	No	Yes	Yes	No	Yes	No	Yes

Notes: Dependent variable is bilateral trade balance to the sum of bilateral exports and imports (TB). TB_{t-1} is one period lagged TB. Regime is bilateral exchange rate regime constructed using IMF's de facto aggregate classification (coded as fixed=0, intermediate=0.5, and float=1). Constant included in all specifications. Standard errors are clustered at country-pair level in all specifications (robust standard errors are reported in col. 4). ***, **, * indicate significance at the 1, 5, and 10 percent levels, respectively.

a/ Cols. (1)-(2) include CFA franc zone's trade balance with Eurozone countries (excl. France); col. (3) includes CFA franc zone's trade balance with Eurozone countries (excl. Belgium, France, Germany and Netherlands).

b/ Cols. (4) and (5) includes Lithuania's trade balance with the US and Eurozone controlling for global financial crisis (GFC) years (2007-09), respectively.

c/ Cols. (6)-(7) include Eurozone countries' trade balance with each other excluding the ERM crisis (1990-93) and the Eurozone crisis (2010-11) observations, and controlling for the GFC years.

Lithuania with US:
pre-'02=0; post-'02=1
with EZ: pre-'02=1;
post-'02=0

EZ: post-'99=0;
pre-'99=1

Some Further Extensions

- Threshold effects
 - Under floats, large deficits and surpluses (bottom/top quartiles of the bilateral TB distribution) adjust significantly faster than smaller imbalances; pegs show no such tendency
- Corrective movements in real exchange rate
 - Under floats, countries with bilateral trade deficits experience real depreciations, and vice versa; pegs show no such tendency
- Financial openness
 - Greater capital mobility weakens the ERR flexibility-adjustment relationship, but differences across regimes are significant even for more open economies
- Robustness
 - Alternate dependent variables (TB/GDP; X/M ratio; TB in goods & services); specifications; estimation methods; samples; binary regime classifications
 - Results remain strongly robust

Conclusions

- Exchange rate regime *does* matter for external adjustment
 - Bilateral framework more appropriate to capture ERR relevant for external dynamics
 - The greater the share of trade with partners to which the country pegs, the harder will be adjustment.
 - On average, half-life of trade balance is almost twice as large under fixed ERR than under floats
 - Individual case studies (with clearly exogenous ERR changes) confirm that external adjustment slows down under pegs
- Greater ER flexibility could facilitate a reduction in global imbalances
- As evident from Eurozone's experience, crisis-stricken countries trying to adjust under pegs face formidable challenges to regain competitiveness and restore external balance
- Results also raise issues about exchange rate classifications: NZ\$, US\$, €, are all floating currencies—but the role of the exchange rate in facilitating adjustment is very different between NZ, US, Germany (TB AR(1): 0.4; 0.8; 0.9)!

Thank you