A Stable International Monetary System Emerges: Inflation Targeting as Bretton Woods, Reversed

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Motivation #1

- Much Discussion on Current Account Sustainability

  o Is there a "Revived Bretton Woods" system of fixed

    exchange rates?

  o Focus on East Asia (especially China vis-à-vis USA)

- Here: same question (sustainability), different focus

Motivation #2

- Many Currency Crises through end of 20$^{\text{th}}$ century

- (Many) Fewer Now

- Good Luck or Good Policy?

  o Are International Financial Crises a Relic of an

  Archaic "System" that is Disappearing?

My Focus: Inflation Targeters

- 14 (of 30) OECD countries have inflation targets (IT)

    o Population > 430 million

    o 12 OECD in EMU, closet inflation targeter

        ▪ 2 more (Denmark, Slovakia) waiting to join

    o US another closet IT (Goodfriend); Japan soon?

- 10 developing countries (> 750 mn) also target inflation

- Arguably most important, successful monetary framework

    o Spreading quickly

The International Financial System

- Collective interaction of national monetary policies is international monetary system
    - o Ex: Bretton Woods was fixed exchange rate policy
    - o Now fixing is rare; but floating is not a well-defined monetary policy
- What are the consequences of IT for international financial regime?

Definition of Inflation Targeting

Mishkin's 5 IT components:

1. Numerical, public medium-term inflation target
2. Price stability as primary goal of monetary policy
3. Information-inclusive strategy to set instrument(s)
4. High transparency of monetary policy strategy
5. High accountability of central bank for IT

Inflation Targeting Countries through 2004

	Default Start Date	Mexico	January, 1999
Australia	March, 1993	**New Zealand**	March, 1990
Brazil	June, 1999	**Norway**	March, 2001
Canada	February, 1991	**Peru**	January, 2002
Chile	January, 1991	**Philippines**	January, 2002
Colombia	September, 1999	**Poland**	September, 1998
Czech Republic	January, 1998	**South Africa**	February, 2000
Finland*	February, 1993	**Spain***	January, 1995
Hungary	June, 2001	**Sweden**	January, 1993
Iceland	March, 2001	**Switzerland**	January, 2000
Israel	January, 1992	**Thailand**	May, 2000
Korea	April, 1998	**United Kingdom**	October, 1992

* joined EMU, January 1999

After 2004:

Indonesia	July, 2005	**Slovak Republic**	January, 2005
Romania	August, 2005	**Turkey**	January, 2006

Countries Tend to Adopt IT after Exchange Rate Crises

- Brazil, Czech Republic, Finland, Indonesia, Korea, Mexico, Philippines, Sweden, Thailand, Turkey, United Kingdom

Only 3 Crisis Countries have not switched to IT (yet):

- Argentina, Malaysia, Russia

Inflation Targeting Entails Floating Exchange Rate

- Formal intermediate target is inflation forecast (not exchange rate/money growth rate)
- Many IT countries float freely
  - No intervention by Canada since 9/'98; Norway (1/'99); Israel (6/'97); UK (once since 9/'97)
  - NZ has intervened only once in over 20 years!

Floats Sometimes Managed, at least initially

- Some intervention by Australia, LDCs … usually to hit IT, not maintain fix (though some initial dual targets)

- But exchange rate gradually lost importance as indicator or target of monetary policy for IT countries (e.g., Chile, Israel, NZ)

IMF *De Facto* Classification of Monetary Policy

As of December 31, 2005, among Inflation Targeters:

- "Pegged exchange rates": Hungary, Slovakia (EU/EMU)

- "Managed Floating": Colombia, Czech Rep, Peru, Romania and Thailand

- "Independently floating": Australia, Brazil, Canada, Chile, Iceland, Israel, Korea, Mexico, New Zealand, Norway, Philippines, Poland, South Africa, Sweden, Turkey, and UK

Existing Literature

- Theoretical work on normative properties

  ○ Ex: Benigno and Benigno, Obstfeld and Rogoff

- Empirical work on domestic aspects of IT

  ○ Ex: Ball and Sheridan: does IT matter?

  ○ Ex: Siklos: did inflation process change?

Durability of IT Regimes

- 27 countries have IT

  o Only 2 have left (Finland, Spain joined EMU)

  o Neither under duress

- *Big contrast to alternative monetary regimes*

Enough Data to Compare IT and Alternatives?

• NZ adopted IT first, only in 1990

• Is (short) span of data long (enough)?

Perhaps …

- Obstfeld and Rogoff in "Mirage of fixed exchange rates":

  few fixed exchange rates last 5 years!

  o Bretton-Woods lasted only 1/'59 through 8/'71

    ▪ Even this had many de/revaluations

  o Money-growth target regimes even shorter

Can't Estimate Reasons/Duration for Crashes from IT

- To repeat: *no* IT regime has *ever* crashed

But *Can* Estimate Duration of *Other* Monetary Regimes

- Need to form a control group, comparable to IT countries
  - Use same period of time (IT began early 1990)
  - Require real GDP per capita at least that of poorest IT country in 2000 (using PWT6.1 data)
  - Require population at least that of smallest IT country
    - 2 options: with and without Iceland

Control Group

	# LYS5	# RR
Algeria	6	2
Argentina	3	2
Belarus	7	0
Bulgaria	2	1
Cape Verde*	5	n/a
China	0	2
Costa Rica*	5	1
Croatia	8	1
Denmark	0	1
Dominican Republic	8	2
Egypt	7	1
Estonia*	0	1
Georgia	1	2
Guatemala	7	1
Hong Kong, China	0	0
Indonesia	6	2
Iran	5	2
Jamaica*	11	5
Japan	0	0
Jordan	5	2
Kazakhstan	5	1

	# LYS5	# RR
Latvia*	0	1
Lebanon	3	2
Lithuania*	2	1
Macao, China*	0	n/a
Macedonia*	5	2
Mauritius*	7	1
Morocco	0	0
Paraguay	11	2
Romania	9	2
Russia	5	3
Singapore	9	1
Slovakia	8	3
Slovenia*	6	1
Syria	0	0
Trinidad & Tobago*	9	n/a
Tunisia	11	0
Turkey	6	2
Ukraine	6	4
Uruguay*	5	3
USA	0	0
Venezuela	10	3

* smaller population than NZ, bigger than Iceland

De Facto Measures of Exchange Rate Regimes

- Use Levy-Yeyati and Sturzenegger (2003) "LYS"

  o use exchange rates and intervention to create annual

    (5- and 3-way) classifications of regimes through 2004

- Also use Reinhart-Rogoff (2004) "RR"

  o use parallel markets to create monthly 14-way

    classification of regimes through 2001

Parenthetically:

IMF *De Jure* Measure of Exchange Rate Regime (GGW)

- 45 fixes of exchange rate from 1990 onwards

  o 23 ended

  o 22 have not ended yet

    ▪ 3 Dollarizations (Ecuador, El Salvador, Timor Leste)

    ▪ 4 European Currency Boards (Bulgaria, Estonia, Latvia, Lithuania)

    ▪ 12 young (since 2000) fixes (Belarus, Iraq, Lebanon, Libya, Mauritania, Pakistan, Solomon Islands, Trinidad & Tobago, Turkmenistan, Ukraine, Venezuela, Vietnam), usually with controls

    ▪ Others: (China, Guinea-Bissau, Morocco), also with controls

Issues with *De Facto* Regime Classifications

- Samples differ, incomplete

- Classifications do not coincide

  - Ex: LYS have 7 switches for Belarus '90 to '04; RR have none '90 to '01 ("freely falling" throughout)

- Some switches may not be reflected

  - Would like *monetary*, not *exchange rate* regimes

    - Ex: floater that switches in and out of money growth rate wouldn't show up in LYS/RR

    - Result is *over-estimation* of stability

Still, Exchange Rate Regimes Typically Short

- Ex: Jamaica switched regimes 11 times in 15 years (LYS)

- 5 countries experienced no changes with both schemes

  o Morocco targets M1 growth, with peg against secret multilateral basket, and many capital controls

  o Syria has peg with many controls, multiple exchange rates

  o HK has successful currency board

  o US and Japan have "no explicit nominal anchor, monitor various indicators to conducting policy"

Statistical Techniques Imply Short Durations

- Estimate standard measures of duration

- Use 3 measures of ER regimes

- All imply short durations

Durability of Exchange Rate Regimes for Control Group

Average Probability of Regime Change

	All Observations	Excluding Small Countries
LYS 3-regime	.27 annually	.27 annually
LYS 5-regime	.32 annually	.33 annually
RR	.01 monthly	.01 monthly

Average Time Between Regime Changes

	All Observations	Excluding Small Countries
LYS 3-regime	3.0 years	2.9 years
LYS 5-regime	2.6 years	2.5 years
RR	51.8 months (4.3 years)	58.2 months (4.9 years)

Spell-Weighted Average Time Between Regime Changes

	All Observations	Excluding Small Countries
LYS 3-regime	6.3 years	6.1 years
LYS 5-regime	6.0 years	5.7 years
RR	55.4 months (4.6 years)	67.0 months (5.6 years)

Consistently, Survival of Regimes Also Low

Treating Multiple Regimes as Country-Specific

	To 2 yrs	To 4 yrs	To 6 yrs	To 8 yrs
LYS 3-regime	.71	.42	.27	.13
LYS 3-regime, without small	.64	.39	.28	.13
LYS 5-regime	.69	.37	.20	.08
LYS 5-regime, without small	.61	.34	.20	.07
RR	.73	.49	.35	.20
RR, without small	.76	.58	.47	.29

Treating Multiple Regimes Independently

	To 2 yrs	To 4 yrs	To 6 yrs	To 8 yrs
LYS 3-regime	.35	.21	.13	.09
LYS 3-regime, without small	.32	.20	.12	.08
LYS 5-regime	.25	.16	.10	.07
LYS 5-regime, without small	.23	.14	.09	.06
RR	.64	.40	.28	.19
RR, without small	.65	.45	.37	.25

Allowing Each Country to have only Starting Regime

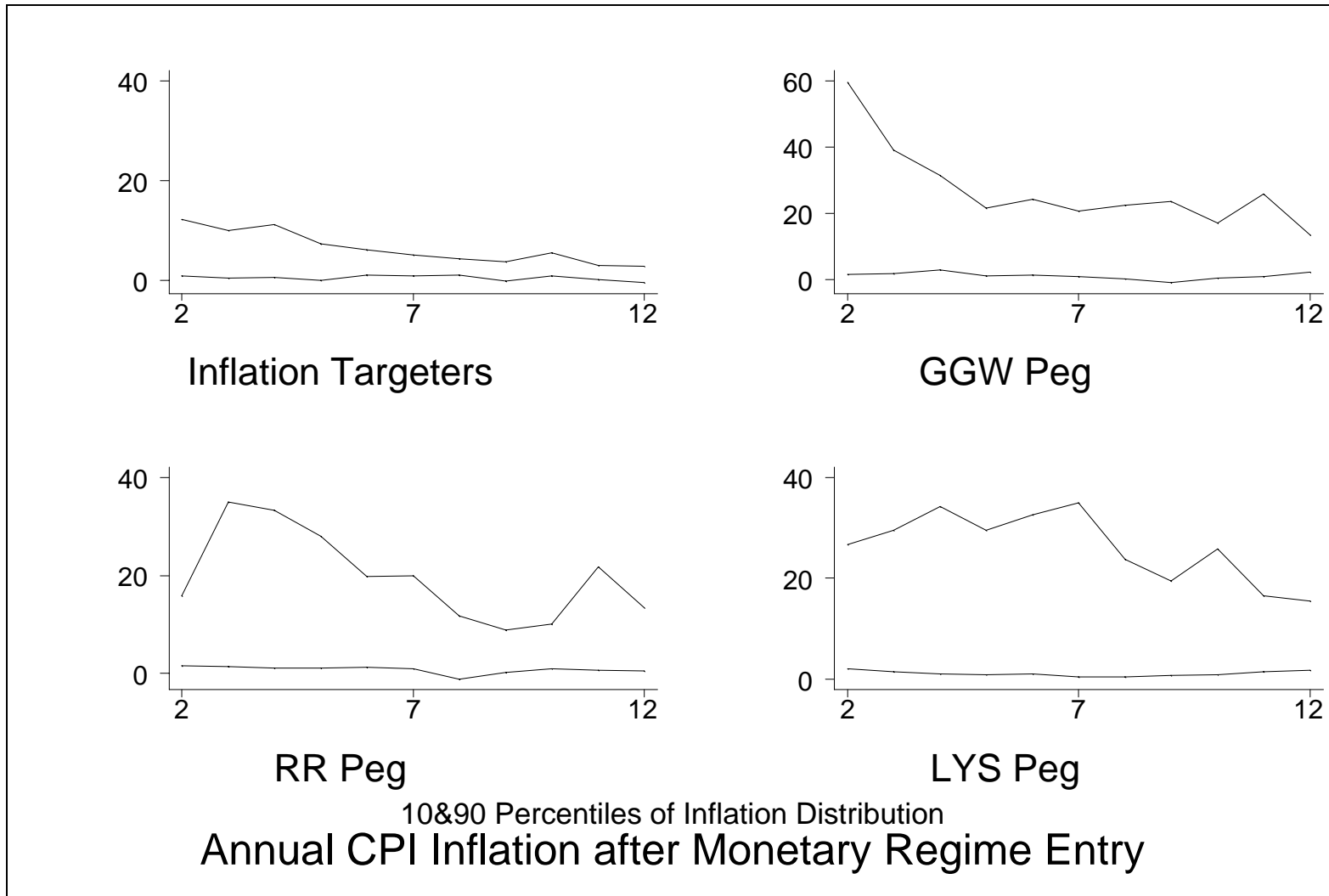|	To 2 yrs	To 4 yrs	To 6 yrs	To 8 yrs
LYS 3-regime	.91	.73	.48	.39
LYS 3-regime, without small	.88	.71	.50	.38
LYS 5-regime	.91	.72	.47	.38
LYS 5-regime, without small	.87	.70	.48	.35
RR	.72	.56	.41	.26
RR, without small	.73	.63	.53	.33

- Treating countries independently, p-value of all IT countries having survived ≈ 0 if use these durations

- Mihov-Rose (2007) extend this to alternative monetary regimes, same conclusions

Does Regime Duration Matter?

- Are Old Regimes Better than New?

  o Would expect so; failed regimes are discarded

- Mihov-Rose (2007) show that older regimes are more successful in keeping inflation low, stable *ceteris paribus*

- Annual effect of duration on cumulative success of keeping inflation within (0,4%):

Inflation Target	Fixed Exchange Rate	Money Growth Target
.729	.524	.327
(.039)	(.022)	(.033)

But Inflation Targets more likely to survive!

10&90 Percentiles of Inflation Distribution
Annual CPI Inflation after Monetary Regime Entry

Inflation after Regime Entry, Default Sample

Conclusion

- IT is far more durable than Exchange Rate Regimes!

    o Durability matters; older regimes more successful

- Durability a big Contrast with Previous Systems

Many Contrasts with Bretton Woods System

		Bretton Woods	Inflation Targeting
1	Regime Durability	Low	High
2	Exchange Rate Regime	Fixed	Floating
3	Focus of Monetary Policy	Partly International	Wholly Domestic
4	Intermediate Target	Exchange Rate	None/Inflation Forecast
5	Capital Mobility	Controlled	Relatively unrestricted
6	Current Acc. Imbalances	Limited	High
7	System Design	Planned	Unplanned
8	International Cooperation	Necessary	Not required
9	Role of IMF	Key in principle	Small
10	Role of Gold	Key in principle	Negligible
11	Role of US as Center	Key in practice	Small
12	Key Members	Large, Northern	OECD/LDCs, often small
13	Central Banks	Dependent, Unaccountable	Independent, Accountable
14	Transparency	Low	High
15	Alignment with Academics	Worrisome	High

Essentially Bretton Woods *Reversed*!

Do IT Countries Have Higher Exchange Rate Volatility?

- Domestic focus of monetary policy *might* result in higher exchange rate volatility

  o Mussa/Baxter-Stockman/Flood-Rose: fixers have nominal lower exchange rate volatility (and real, in short run)

- But: lower policy volatility, more stable expectations *might* result in lower exchange rate volatility

- Easy to test

Comparing Exchange Rate Volatility: IT and Control

- Use *IFS* effective exchange rate data

    o Nominal for 45 IT and Control-Group countries

    o Real (CPI) for 42

- Estimate standard deviations of logs over non-overlapping

    intervals

    o Four 4-year periods (1/'90 to 12/'93, etc)

    o Two 8-yr periods

    o One 16-yr period

    o Drop data for IT countries before IT began

Regression Framework

- Regress volatility on:

  o Dummy for IT countries (key coefficient tabulated)

  o Controls from WDI:

    ▪ Current account (% GDP)

    ▪ Log Openness (Trade, % GDP)

    ▪ Log Population

    ▪ Log real GDP per capita (PPP)

  o Intercept, time effects

	Nominal			Real		
Volatility Interval:	**4 years**	**8 years**	**16 yrs**	**4 years**	**8 years**	**16 yrs**
Default	-.05	-.14	-.32*	-.00	-.01	-.05
	(.05)	(.10)	(.15)	(.01)	(.02)	(.03)
Without Time Effects	-.06	-.15		-.00	-.01	
	(.05)	(.10)		(.01)	(.02)	
No Controls	-.10*	-.19*	-.40**	-.03*	-.04*	-.07**
	(.04)	(.08)	(.13)	(.01)	(.02)	(.02)
Without Pop & Curr Acc	-.06	-.11	-.31*	-.00	-.01	-.05
	(.05)	(.09)	(.15)	(.02)	(.02)	(.03)
Without 1.5 σ outliers	-.06	-.15	-.18*	-.00	-.01	-.03
	(.05)	(.10)	(.08)	(.01)	(.02)	(.02)
Quantile Estimation	-.01	-.04	-.14**	.02	.01	-.04*
	(.01)	(.04)	(.05)	(.01)	(.03)	(.02)
Without Small	-.07	-.17	-.38*	-.00	-.02	-.06
	(.05)	(.11)	(.16)	(.01)	(.03)	(.03)
Without Poor (< $5000)	-.04	-.13	-.27*	.00	-.01	-.04
	(.04)	(.09)	(.12)	(.01)	(.03)	(.03)
Weighted by log real GDP	-.05**	-.14**	-.32**	-.001	-.011**	-.048**
	(.01)	(.02)	(.03)	(.003)	(.004)	(.005)
Volatility of 1st-Diff of Log	-.002	-.011	-.019			
	(.007)	(.012)	(.011)			
Avg Abs 1st-Diff of Log	-.001	-.004	-.004			
	(.004)	(.005)	(.004)			

Exchange Rate Volatility Usually *Lower* for IT Countries!

- Often insignificantly different from zero

- Reasonably robust to:

    o Specification

    o Outliers

    o Sample

    o Estimator

    o Non-stationarity in neer

- 64 coefficients: only 5 positive (none significant)

    o 17 significantly negative at .05; 8 at .01

Regime Choice: A Serious Caveat?

- Simultaneity potentially serious, since countries choose their monetary policy regimes
  - o Possible that countries expecting few "exchange rate shocks" choose inflation targets
- An obvious econometric fix is to use a matching estimator
  - o Lin (2007) finds exchange rate volatility falls for OECD, but rises for developing countries

Reserves and Current Account Imbalances

- Use Annual *WDI* data, '90 through '04

  - Current Account as % GDP

  - M2/Reserves

  - Reserves in Months of Imports

- Handle Analogously to ER Volatility

  - Create country-specific averages over same samples

- Simply compare reserves and current accounts

  - Compare IT and control-group countries

  - No regression model

Reserves and Current Account Similar for IT, Controls

- Average values generally similar

  o M2/Reserves smaller for IT in mid-'90s

    ▪ Similar in other samples

  o Similar for Reserves/Imports

  o Similar for Current Accounts

- Much dispersion across countries within groups

  o Hence use non-parametric Kolmogorov-Smirnov tests for equality of distribution

  o Almost never reject equality

M2/Reserves

Averages	1990-93	1994-97	1998-01	2002-04	1990-97	1998-04	1990-04
IT	10.2	11.1	6.3	5.6	10.8	5.6	5.8
Control	8.7	5.2	5.2	4.4	6.1	4.9	5.5
|t-test|	.4	1.7	.7	.9	1.4	.5	.2
KS- P-value	.13	.02*	.08	.07	.03*	.28	.40

Reserves in Months of Imports

Averages	1990-93	1994-97	1998-01	2002-04	1990-97	1998-04	1990-04
IT	2.9	3.1	3.6	4.2	3.1	4.1	4.1
Control	3.5	3.3	3.8	5.0	3.3	4.3	3.8
|t-test|	.8	.3	.4	1.1	.3	.4	.5
KS P-value	.48	.87	.66	.41	.80	.58	.48

Current Account, %GDP

Averages	1990-93	1994-97	1998-01	2002-04	1990-97	1998-04	1990-04
IT	-2.5	-1.6	.3	.4	-1.7	.4	.1
Control	-.3	-1.8	-1.3	-.1	-1.5	-.7	-.9
|t-test|	2.7*	.2	1.0	.3	.2	.7	.7
KS P-value	.03*	.82	.63	.62	.74	.19	.75

Sudden Stops

- Are IT countries more vulnerable to "sudden stops" of capital inflows?

- Use all (5) measures of sudden stops available

    o Simple tests of frequency equality (equivalent to chi-square tests)

    o Note: sudden stops are rare, so would like larger sample for good test

Calvo, Izquierdo, and Mejía (2004) sudden stops

	Control Obs.	IT Obs.	Pre-IT Obs.	Total
Tranquil Obs.	64	93	119	276
Sudden Stops	8	1	9	18
Total	72	94	128	294

Calvo, Izquierdo and Talvi (2006) systematic sudden stops

	Control Obs.	IT Obs.	Pre-IT Obs.	Total
Tranquil Obs.	201	71	102	374
Sudden Stops	9	1	6	16
Total	210	72	108	390

Eichengreen, Gupta and Mody (2006) sudden stops

	Control Obs.	IT Obs.	Pre-IT Obs.	Total
Tranquil Obs.	132	58	99	289
Sudden Stops	8	2	9	19
Total	140	60	108	308

Frankel and Cavallo (2004) sudden stops

	Control Obs.	IT Obs.	Pre-IT Obs.	Total
Tranquil Obs.	400	127	148	675
Sudden Stops	16	4	12	32
Total	416	131	160	707

Frankel and Wei (2004) sudden stops

	Control Obs.	IT Obs.	Pre-IT Obs.	Total
Tranquil Obs.	435	47	105	587
Sudden Stops	20	1	3	24
Total	455	48	108	611

Hypothesis Tests for Equality of Sudden Stops between IT and Controls

Sudden Stop Def.	CIM (2004)	CIT (2006)	EGM (2006)	FC (2004)	FW (2004)
Control=IT	2.9 (.00)	1.1 (.25)	.7 (.48)	.4 (.67)	.8 (.45)
IT=pre-IT	-2.1 (.03)	-1.4 (.16)	-1.3 (.21)	-1.7 (.10)	-.3 (.80)

Conclusion:

- Sudden stops consistently *less* frequent for IT than for control group
  - But results rarely statistically significant

Parenthetically

- No Inflation Targeter has *ever* experienced a banking crisis!
    - Ho and von Hagen (2004) survey eight sets of dates, add their own
    - Kroszner, Laeven and Klingebiel (2006)
    - No banking crises for: Australia, Canada, Chile, Israel, New Zealand, Sweden, the UK

Conclusion

- Few Monetary Strategies exist

  o Fixed exchange rates

  o Money growth targets

  o Hybrid/Ill-defined strategies

  o Inflation Targets; the focus

Characteristics of Inflation Targeters

- Floating exchange rates

    o Often without interventions or capital controls

    o But ER volatility actually *lower* than non-IT

    o *No* observable consequences for reserves/current

      accounts

    o Sudden stops *less* frequent

- IT is *highly* durable

- IT spreading quickly outside OECD (pervasive inside)

Many Aspects of Bretton Woods Completely Reversed

- Floating exchange rates

- Domestically-oriented monetary policy

- Aligned intermediate target (inflation forecast)

- Capital Mobility, capacity for big current accounts

- No role for center country, coordination, gold, IMF

- Big role for independent transparent central banks

- Unplanned system

- Aligned with most academic thinking

- Durability!

Financial Crises are not a feature of Inflation Targeters

- Are they a thing of the past?