

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

**Andrew K. Rose**  
**UC Berkeley, CEPR and NBER**

## Motivation #1

- Much Discussion on Current Account Sustainability
  - Is there a “Revived Bretton Woods” system of fixed exchange rates?
  - 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<sup>th</sup> century
- Fewer Now
- 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)
  - Population > 430 million
  - 12 OECD in EMU, closet inflation targeter
    - 2 more (Denmark, Slovakia) waiting to join
  - US another closet IT (Goodfriend); Japan soon?
- 10 developing countries (> 750 mn) also target inflation
- Arguably most important, successful monetary framework
  - Spreading quickly

# The International Financial System

- Collective interaction of national monetary policies is international monetary system
  - Ex: Bretton Woods was fixed exchange rate policy
  - 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**

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

\* joined EMU, January 1999

### **After 2004:**

<b>Indonesia</b>	July, 2005	<b>Slovak Republic</b>	January, 2005
<b>Romania</b>	August, 2005	<b>Turkey</b>	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 hasn't intervened 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 losing 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, Guatemala, 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 had IT by mid-2006
  - Only 2 have left (Finland, Spain joined EMU)
  - Neither under duress
- *Big contrast to alternative monetary regimes*

## **Enough Data to Compare IT and Alternatives?**

- NZ adopted IT first, only in 1990
- Is 16 years long (enough)?

## Perhaps ...

- Obstfeld and Rogoff in “Mirage of fixed exchange rates”:  
few fixed exchange rates last 5 years!
  - Bretton-Woods lasted only 1/’59 through 8/’71
    - Even this had many de/revaluations
  - 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
<b>Algeria</b>	6	2
<b>Argentina</b>	3	2
<b>Belarus</b>	7	0
<b>Bulgaria</b>	2	1
<b>Cape Verde*</b>	5	n/a
<b>China</b>	0	2
<b>Costa Rica*</b>	5	1
<b>Croatia</b>	8	1
<b>Denmark</b>	0	1
<b>Dominican Republic</b>	8	2
<b>Egypt</b>	7	1
<b>Estonia*</b>	0	1
<b>Georgia</b>	1	2
<b>Guatemala</b>	7	1
<b>Hong Kong, China</b>	0	0
<b>Indonesia</b>	6	2
<b>Iran</b>	5	2
<b>Jamaica*</b>	11	5
<b>Japan</b>	0	0
<b>Jordan</b>	5	2
<b>Kazakhstan</b>	5	1

\* smaller population than NZ, bigger than Iceland

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

## **De Facto Measures of Exchange Rate Regimes**

- Use Levy-Yeyati and Sturzenegger (2003) “LYS”
  - use exchange rates and intervention to create annual (5- and 3-way) classifications of regimes through 2004
- Also use Reinhart-Rogoff (2004) “RR”
  - 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
  - 23 ended
  - 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
  - Morocco targets M1 growth, with peg against secret multilateral basket, and many capital controls
  - Syria has peg with many controls, multiple exchange rates
  - HK has successful currency board
  - 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
<b>LYS 3-regime</b>	.27 annually	.27 annually
<b>LYS 5-regime</b>	.32 annually	.33 annually
<b>RR</b>	.01 monthly	.01 monthly

## Average Time Between Regime Changes

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

## Spell-Weighted Average Time Between Regime Changes

	All Observations	Excluding Small Countries
<b>LYS 3-regime</b>	6.3 years	6.1 years
<b>LYS 5-regime</b>	6.0 years	5.7 years
<b>RR</b>	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
<b>LYS 3-regime</b>	.71	.42	.27	.13
<b>LYS 3-regime, without small</b>	.64	.39	.28	.13
<b>LYS 5-regime</b>	.69	.37	.20	.08
<b>LYS 5-regime, without small</b>	.61	.34	.20	.07
<b>RR</b>	.73	.49	.35	.20
<b>RR, without small</b>	.76	.58	.47	.29

### Treating Multiple Regimes Independently

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

### Allowing Each Country to have only Starting Regime

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

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

## **Conclusion**

- IT is far more durable than Exchange Rate Regimes!
- Durability a big Contrast with Previous Systems

## ***Many Contrasts with Bretton Woods System***

		<b>Bretton Woods</b>	<b>Inflation Targeting</b>
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
  - 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
  - Nominal for 45 IT and Control-Group countries
  - Real (CPI) for 42
- Estimate standard deviations of logs over non-overlapping intervals
  - Four 4-year periods (1/'90 to 12/'93, etc)
  - Two 8-yr periods
  - One 16-yr period
  - Drop data for IT countries before IT began

## Regression Framework

- Regress volatility on:
  - Dummy for IT countries (key coefficient tabulated)
  - Controls from WDI:
    - Current account (% GDP)
    - Log Openness (Trade, % GDP)
    - Log Population
    - Log real GDP per capita (PPP)
  - Intercept, time effects

	Nominal			Real		
<b>Volatility Interval:</b>	<b>4 years</b>	<b>8 years</b>	<b>16 yrs</b>	<b>4 years</b>	<b>8 years</b>	<b>16 yrs</b>
<b>Default</b>	-0.05 (.05)	-0.14 (.10)	-0.32* (.15)	-0.00 (.01)	-0.01 (.02)	-0.05 (.03)
<b>Without Time Effects</b>	-0.06 (.05)	-0.15 (.10)		-0.00 (.01)	-0.01 (.02)	
<b>No Controls</b>	-0.10* (.04)	-0.19* (.08)	-0.40** (.13)	-0.03* (.01)	-0.04* (.02)	-0.07** (.02)
<b>Without Pop &amp; Curr Acc</b>	-0.06 (.05)	-0.11 (.09)	-0.31* (.15)	-0.00 (.02)	-0.01 (.02)	-0.05 (.03)
<b>Without 1.5 <math>\sigma</math> outliers</b>	-0.06 (.05)	-0.15 (.10)	-0.18* (.08)	-0.00 (.01)	-0.01 (.02)	-0.03 (.02)
<b>Quantile Estimation</b>	-0.01 (.01)	-0.04 (.04)	-0.14** (.05)	.02 (.01)	.01 (.03)	-0.04* (.02)
<b>Without Small</b>	-0.07 (.05)	-0.17 (.11)	-0.38* (.16)	-0.00 (.01)	-0.02 (.03)	-0.06 (.03)
<b>Without Poor (&lt; \$5000)</b>	-0.04 (.04)	-0.13 (.09)	-0.27* (.12)	.00 (.01)	-0.01 (.03)	-0.04 (.03)
<b>Weighted by log real GDP</b>	-0.05** (.01)	-0.14** (.02)	-0.32** (.03)	-0.001 (.003)	-0.011** (.004)	-0.048** (.005)
<b>Volatility of 1<sup>st</sup>-Diff of Log</b>	-0.002 (.007)	-0.011 (.012)	-0.019 (.011)			
<b>Avg Abs 1<sup>st</sup>-Diff of Log</b>	-0.001 (.004)	-0.004 (.005)	-0.004 (.004)			

## Exchange Rate Volatility Usually *Lower* for IT Countries!

- Often insignificantly different from zero
- Reasonably robust to:
  - Specification
  - Outliers
  - Sample
  - Estimator
  - Non-stationarity in neer
- 64 coefficients: only 5 positive (none significant)
  - 17 significantly negative at .05; 8 at .01

## 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
  - M2/Reserves smaller for IT in mid-‘90s
    - Similar in other samples
  - Similar for Reserves/Imports
  - Similar for Current Accounts
- Much dispersion across countries within groups
  - Hence use non-parametric Kolmogorov-Smirnov tests for equality of distribution
  - Almost never reject equality

### M2/Reserves

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

### Reserves in Months of Imports

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

### Current Account, %GDP

<b>Averages</b>	<b>1990-93</b>	<b>1994-97</b>	<b>1998-01</b>	<b>2002-04</b>	<b>1990-97</b>	<b>1998-04</b>	<b>1990-04</b>
<b>IT</b>	-2.5	-1.6	.3	.4	-1.7	.4	.1
<b>Control</b>	-.3	-1.8	-1.3	-.1	-1.5	-.7	-.9
<b> t-test </b>	2.7*	.2	1.0	.3	.2	.7	.7
<b>KS P-value</b>	.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
  - Simple tests of frequency equality (equivalent to chi-square tests)
  - Note: sudden stops are rare, so would like larger sample for good test

### **Calvo, Izquierdo, and Mejía (2004) sudden stops**

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

### **Calvo, Izquierdo and Talvi (2006) systematic sudden stops**

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

### **Eichengreen, Gupta and Mody (2006) sudden stops**

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

**Frankel and Cavallo (2004) sudden stops**

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

**Frankel and Wei (2004) sudden stops**

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

**Hypothesis Tests for Equality of Sudden Stops between IT and Controls**

<b>Sudden Stop Def.</b>	<b>CIM (2004)</b>	<b>CIT (2006)</b>	<b>EGM (2006)</b>	<b>FC (2004)</b>	<b>FW (2004)</b>
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
  - Fixed exchange rates
  - Money growth targets
  - Hybrid/Ill-defined strategies
  - Inflation Targets; the focus

## Characteristics of Inflation Targeters

- Floating exchange rates
  - Often without interventions or capital controls
  - But ER volatility actually *lower* than non-IT
  - *No* observable consequences for reserves/current accounts
  - 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?