

**Inflation Targeting Twenty Years On:
Where? Why? Which Results? What lies ahead?**

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“The ability to deal with demand shocks and financial crises can be enhanced by a commitment to an explicit (inflation) target”

Walsh (2009)

“Today, inflation targeting is being put to the test – and it will almost certainly fail”

Stiglitz (2008)

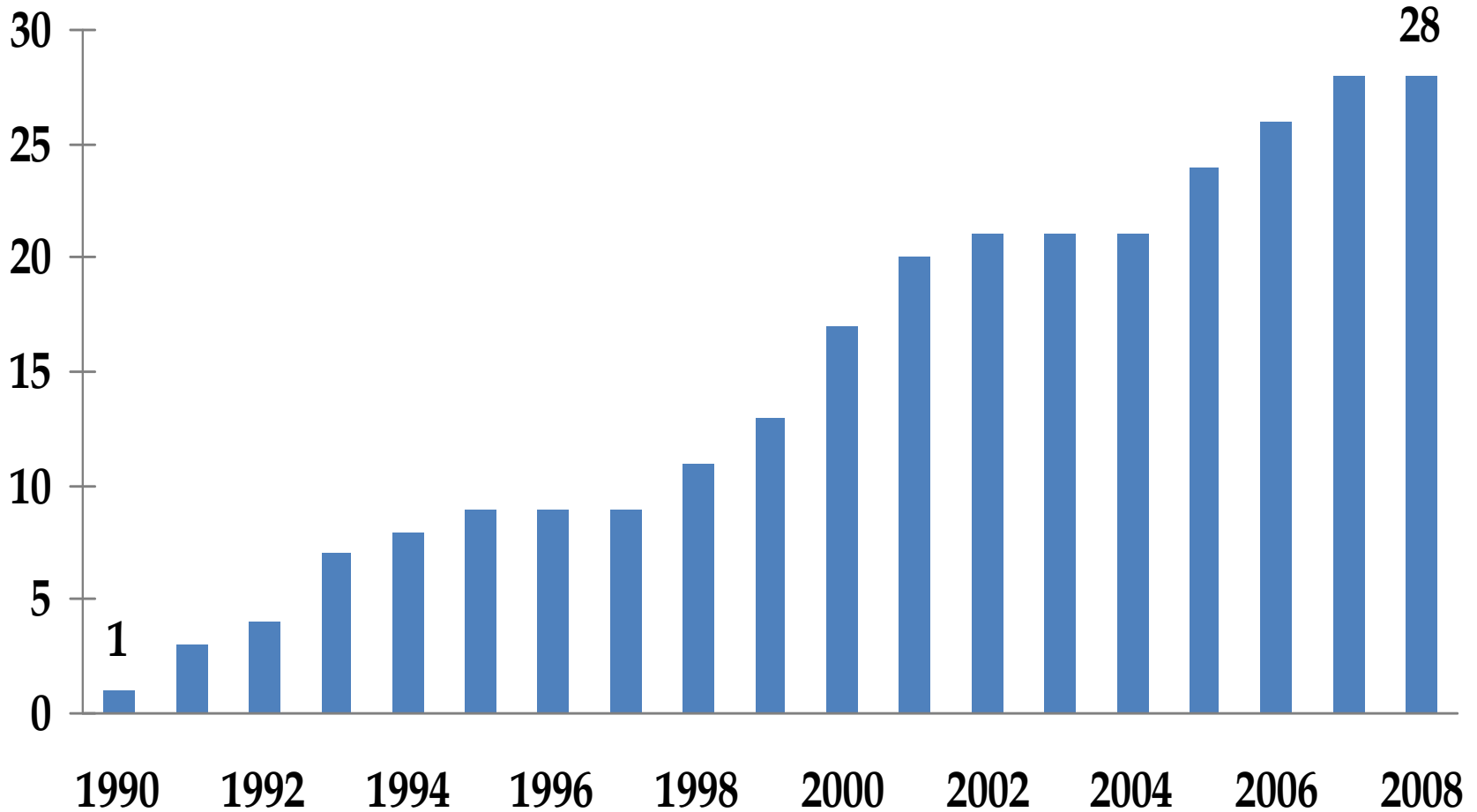
Outline

- 1. Where and when?**
- 2. Why IT?**
- 3. Inflation Deviations from Targets**
- 4. Inflation Levels**
- 5. Monetary Policy Efficiency**
- 6. Central Bank Transparency**
- 7. Current Challenges to IT**
- 8. Conclusion**

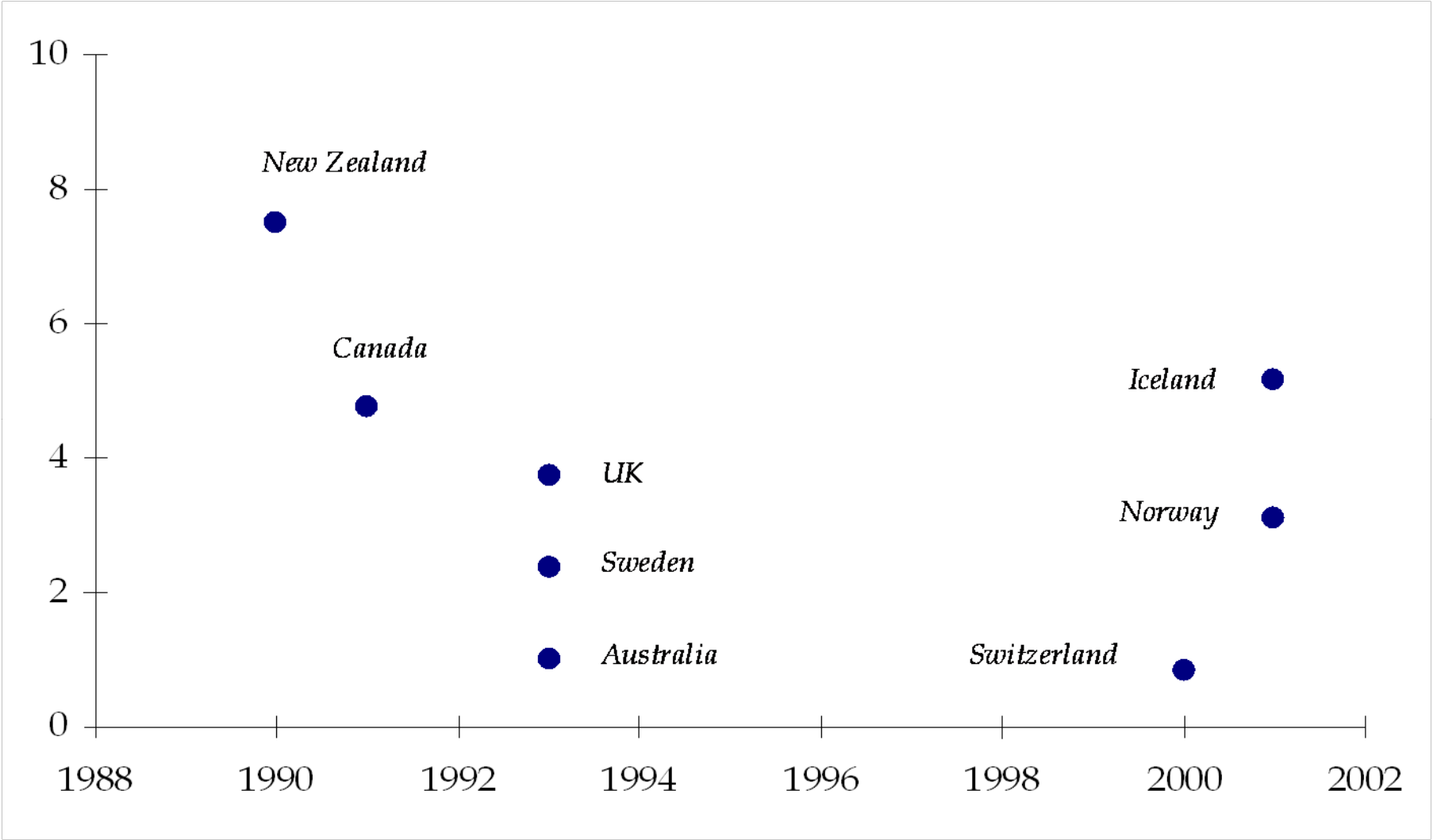
References

1. Where and when?

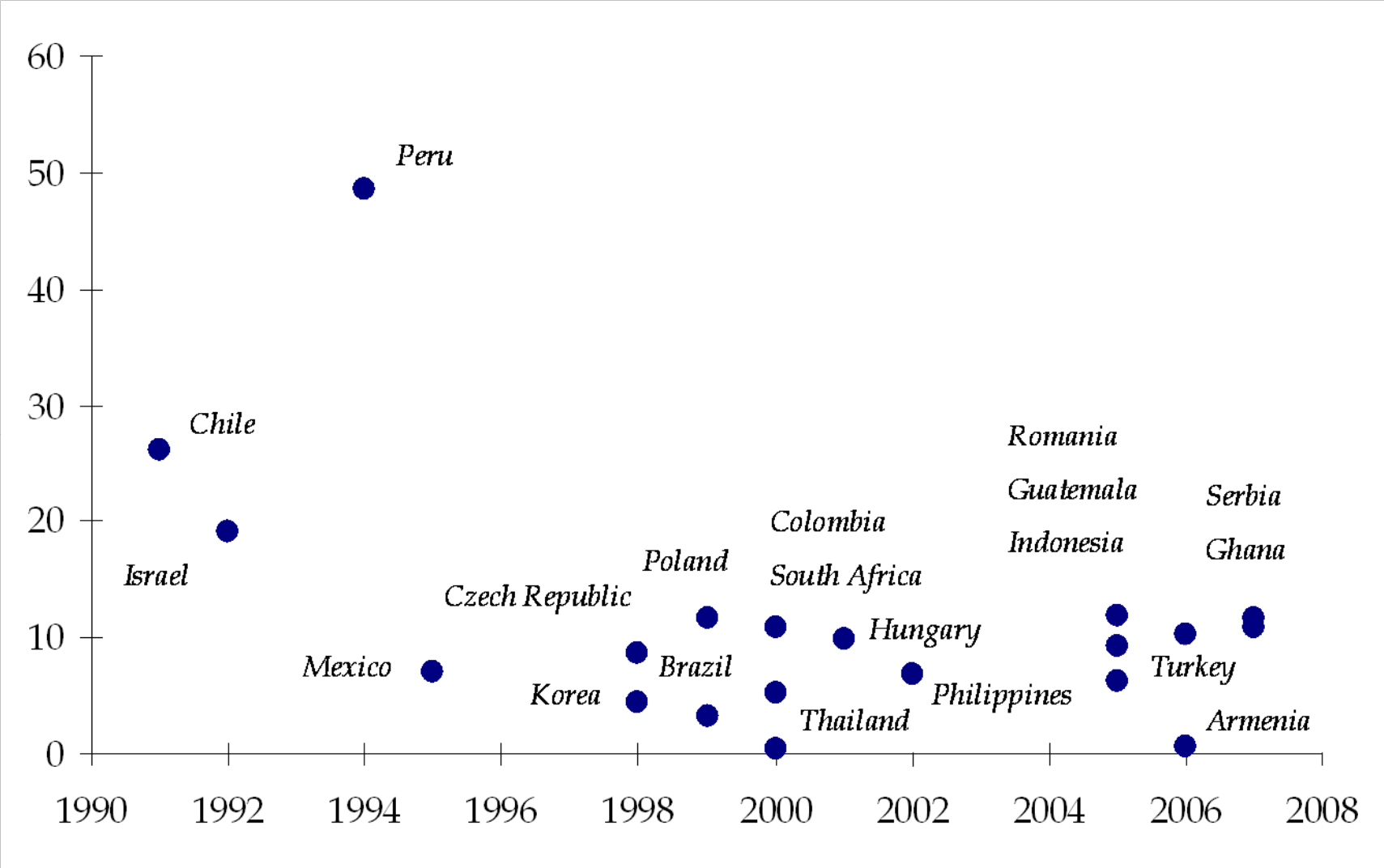
Number of Inflation Targeters, 1990-2008



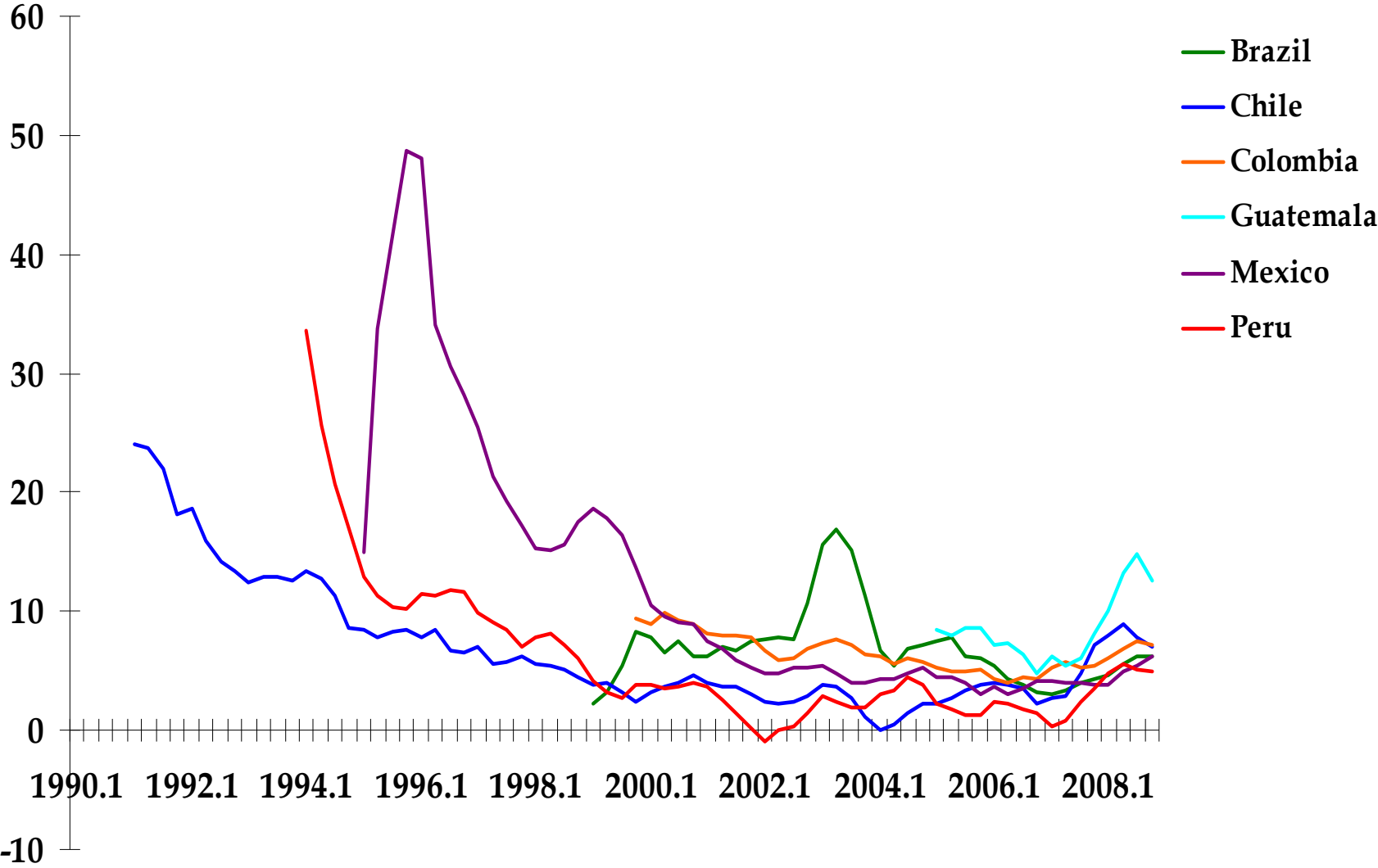
Dates of IT Adoption and Annual Inflation (%) before IT Adoption in Industrial Economies, 1990-2001



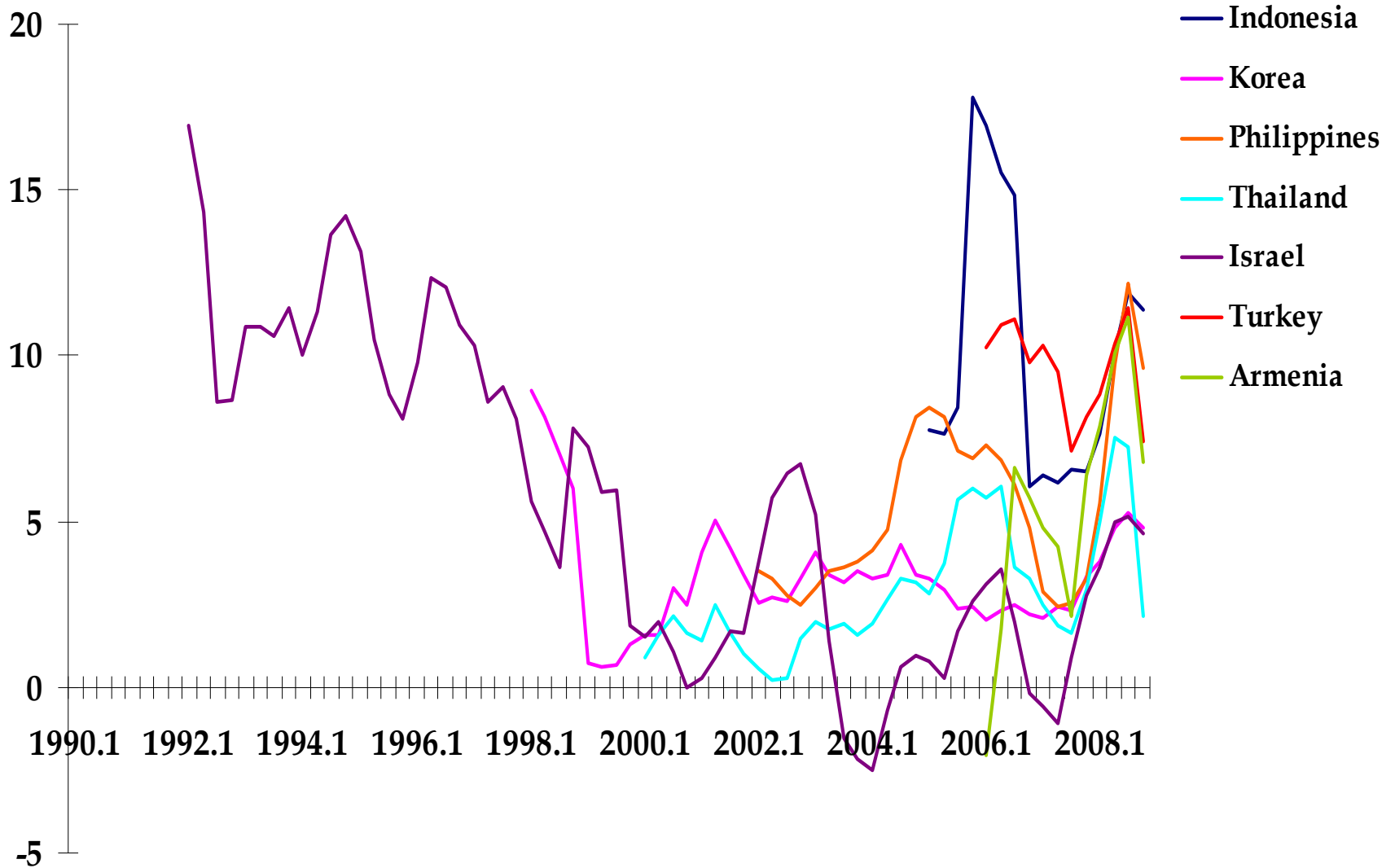
Dates of IT Adoption and Annual Inflation (%) before IT Adoption in Emerging Market Economies, 1991-2007



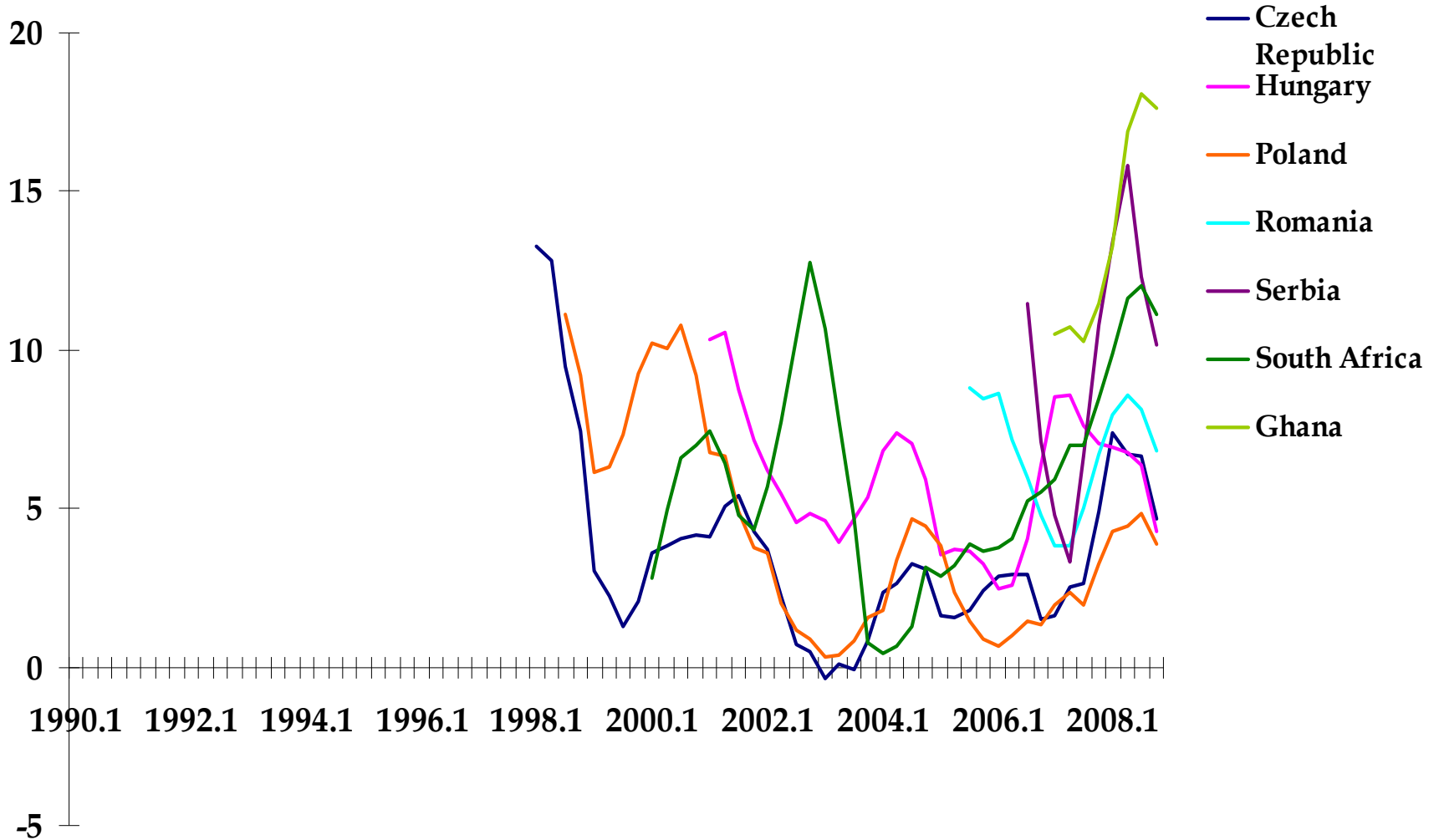
Quarterly Inflation (%) in Latin American Economies, 1991-2008



Quarterly Inflation (%) in Asian Economies, 1992-2008



Quarterly Inflation (%) in Central-Eastern European and African Economies, 1998-2008



2. Why IT?

On the Decision of Adopting IT

Determinants of IT Regime Likelihood

(Calderón and Schmidt-Hebbel, 2008, and Leyva, 2008)

Data:

- Country sample: 98 countries
- Time sample: annual data for 1975-2005

Estimation methods:

- Discrete-choice panel data econometric techniques for modeling IT adoption

On the Decision of Adopting IT

Main equation (discrete-choice panel data regressions):

$$y_{i,t} = 1(x_{i,t}'\beta + u_i + \varepsilon_{i,t} \geq 0)$$

$y_{i,t}$ = 1 if the argument is non-negative, and 0 otherwise

$x_{i,t}$ = ($K \times 1$) vector of potential IT choice determinants

u_i = country effect (country dummy)

$\varepsilon_{i,t}$ = error term

On the Decision of Adopting IT

	Fixed effects Logit		Random effects Logit					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation	-130.026 *** (2.95)	-117.311 *** (3.18)	-35.392 *** (5.10)	-36.295 *** (5.46)	-43.349 *** (6.13)	-36.421 *** (5.88)	-39.508 *** (6.63)	-33.487 *** (6.46)
Government budget balance	-25.066 (1.45)	- -	19.307 ** (2.07)	20.685 ** (2.31)	15.040 ** (1.98)	17.909 ** (2.53)	- -	- -
Financial development	19.872 *** (3.07)	16.881 *** (3.39)	0.775 (0.55)	- -	3.299 *** (3.19)	3.186 *** (3.40)	2.633 *** (2.99)	2.677 *** (3.22)
Exchange rate regime	-20.320 *** (3.03)	-17.824 *** (3.22)	-4.958 *** (5.27)	-5.068 *** (5.54)	-4.978 *** (7.04)	-4.464 *** (7.20)	-3.990 *** (7.74)	-3.655 *** (7.49)
GDP per capita	104.027 *** (3.19)	90.130 *** (3.56)	5.042 *** (4.78)	5.249 *** (5.29)	4.605 *** (5.08)	3.478 *** (3.49)	4.822 *** (5.90)	3.829 *** (4.19)
Trade openness	46.763 *** (2.83)	42.343 *** (3.03)	1.156 (0.82)	- -	2.289 ** (2.06)	0.837 (0.68)	3.185 *** (4.01)	2.134 ** (2.53)
Money growth volatility	- -	- -	-0.142 (0.44)	-0.126 (0.39)	- -	- -	- -	- -
Terms of trade volatility	- -	- -	1.760 (0.28)	0.959 (0.15)	- -	- -	- -	- -
Dummy LAC	- -	- -	6.986 *** (3.84)	6.741 *** (4.11)	7.789 *** (4.63)	- -	7.433 *** (4.85)	- -
Constant	- -	- -	-45.403 *** (5.01)	-45.517 *** (5.27)	-43.798 *** (5.68)	-30.343 *** (3.44)	-47.961 *** (7.01)	-36.263 *** (4.57)
Observations	491	554	1143	1163	1854	1854	2305	2305
Number of countries	19	24	71	71	76	76	98	98
Countries with the IT regime	19	24	19	19	19	19	24	24
Countries without the IT regime (control group)	0	0	52	52	57	57	74	74
LR statistic	450.19	499.19	76.03	75.10	126.91	126.90	177.77	161.95
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Absolute value of z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

On the Decision of Adopting IT

Significant and robust determinants of the likelihood of having an IT regime in place:

1. Inflation (-)
2. Fiscal position (+)
3. Financial development (+)
4. Non-flexible exchange rate regime (-)
5. GDP per capita (+)
6. Trade openness (+)
7. Regional dummy for Latin America (+)

On the Decision of Adopting IT

Table 12: Marginal Contribution of Key Determinants to IT Regime Likelihood

Variable	Marginal contribution	Measure	Impact of ...
CPI inflation rate	13.19%	$\pi^n = \pi / (1 + \pi)$	a reduction of π^n by 10 percentage points (p.p.) which amounts roughly a reduction of π from 17% to 5%
Financial development	6.79%	ratio	an increase of the indicator by 10 p.p.
GDP per capita	65.64%	in logs	an increase of the log of GDP per capita by 1.2 which accounts for passing from 2 (8.1 Indonesia) to 3 (9.3 Poland) in income category
Trade openness	8.82%	ratio	an increase of the indicator by 10 p.p.

The figures for Indonesia and Poland correspond to averages of the log of GDP per capita computed over the period 2001-2005. For income categories see table 5.

Source: Leyva (2008)

3. Inflation Deviations from Targets

Inflation Deviations from Targets

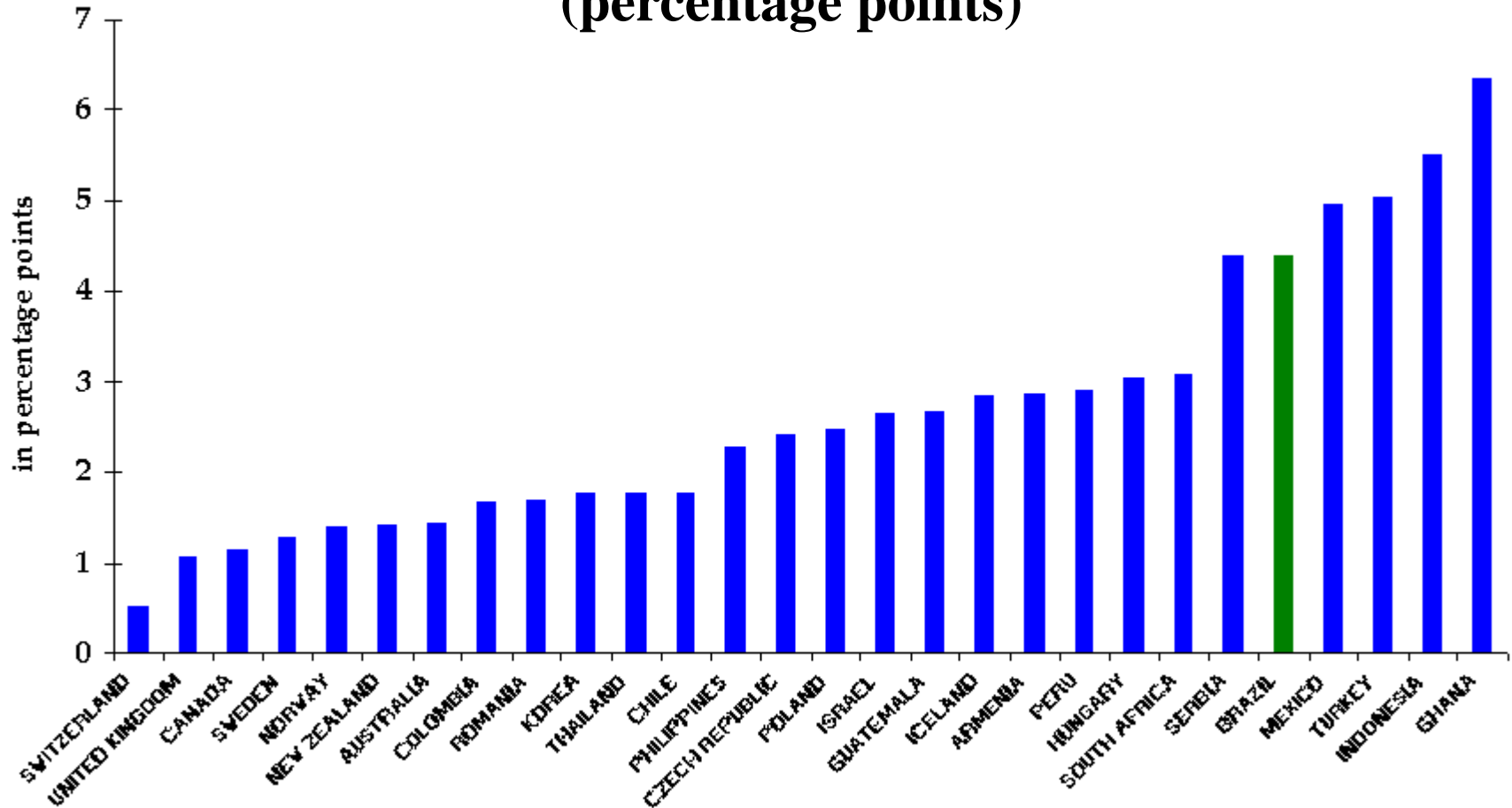
Data:

- Country sample: all 28 ITers – 8 industrial countries and 20 emerging-economy countries. Dates of adoption based on information at central bank web pages
- Time sample: quarterly data for 1990 (or from date of adoption) through 2008.4. Adoption dates from info at central bank webpages
- Quarterly inflation rates: from IFS (IMF) database
- Inflation targets: quarterly targets interpolated by assuming that the fourth-quarter inflation target is the annual inflation target announced for the corresponding year

Inflation Deviations from Targets

Root Mean Squared Deviation, RMSD

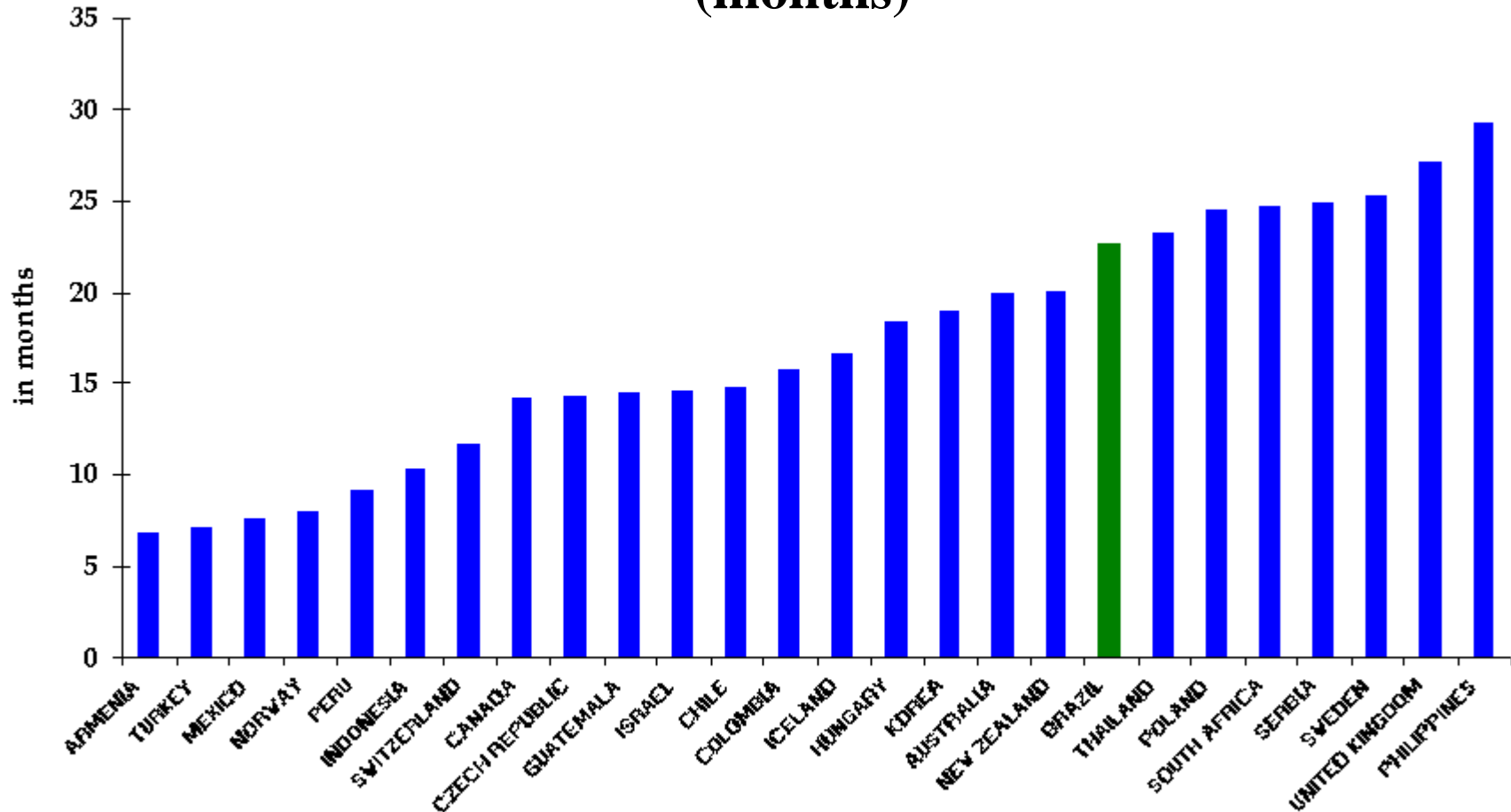
(percentage points)



Inflation Deviations from Targets

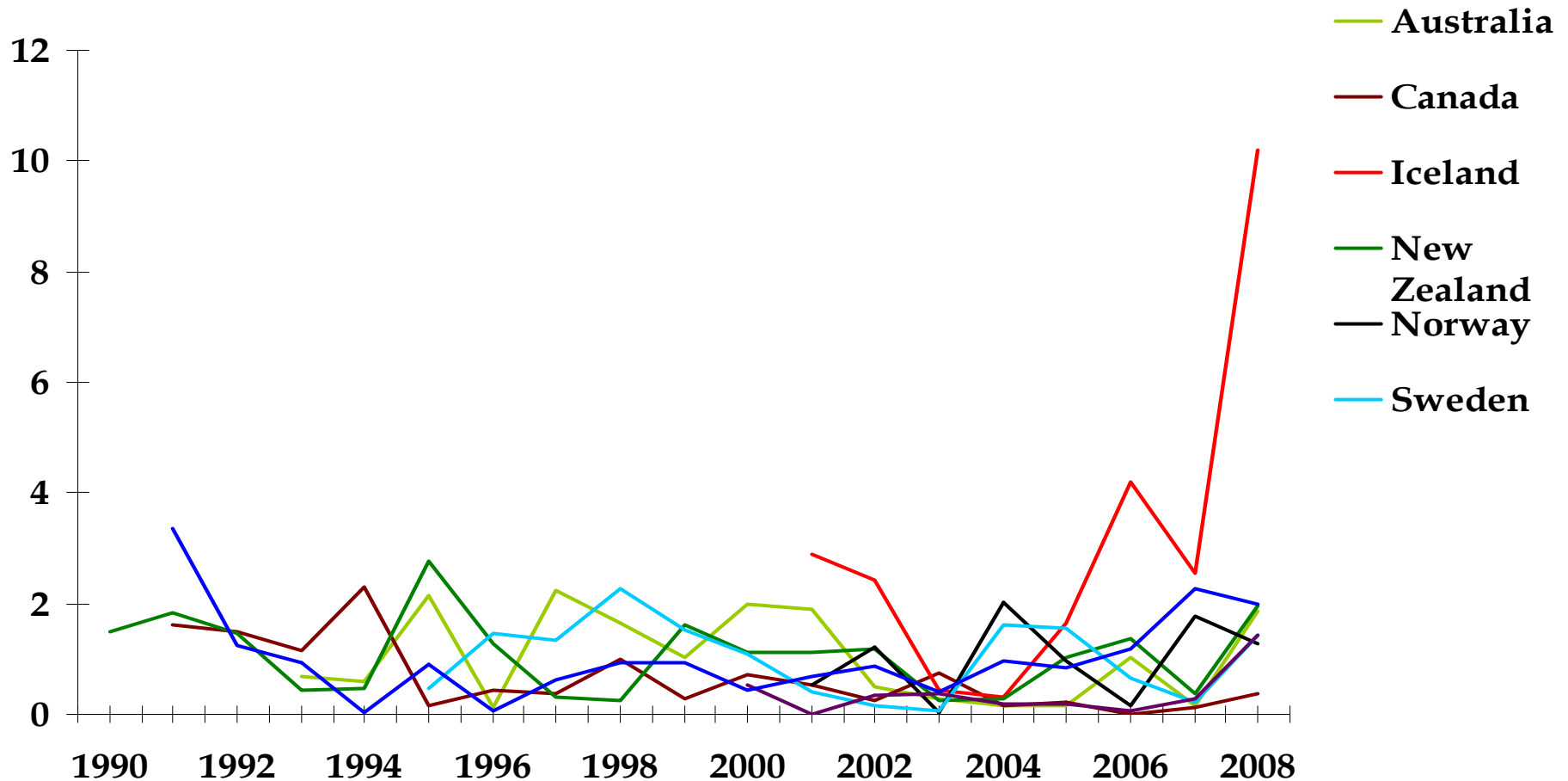
Half-lives of 1 p.p. Inflation Deviation Shocks

(months)



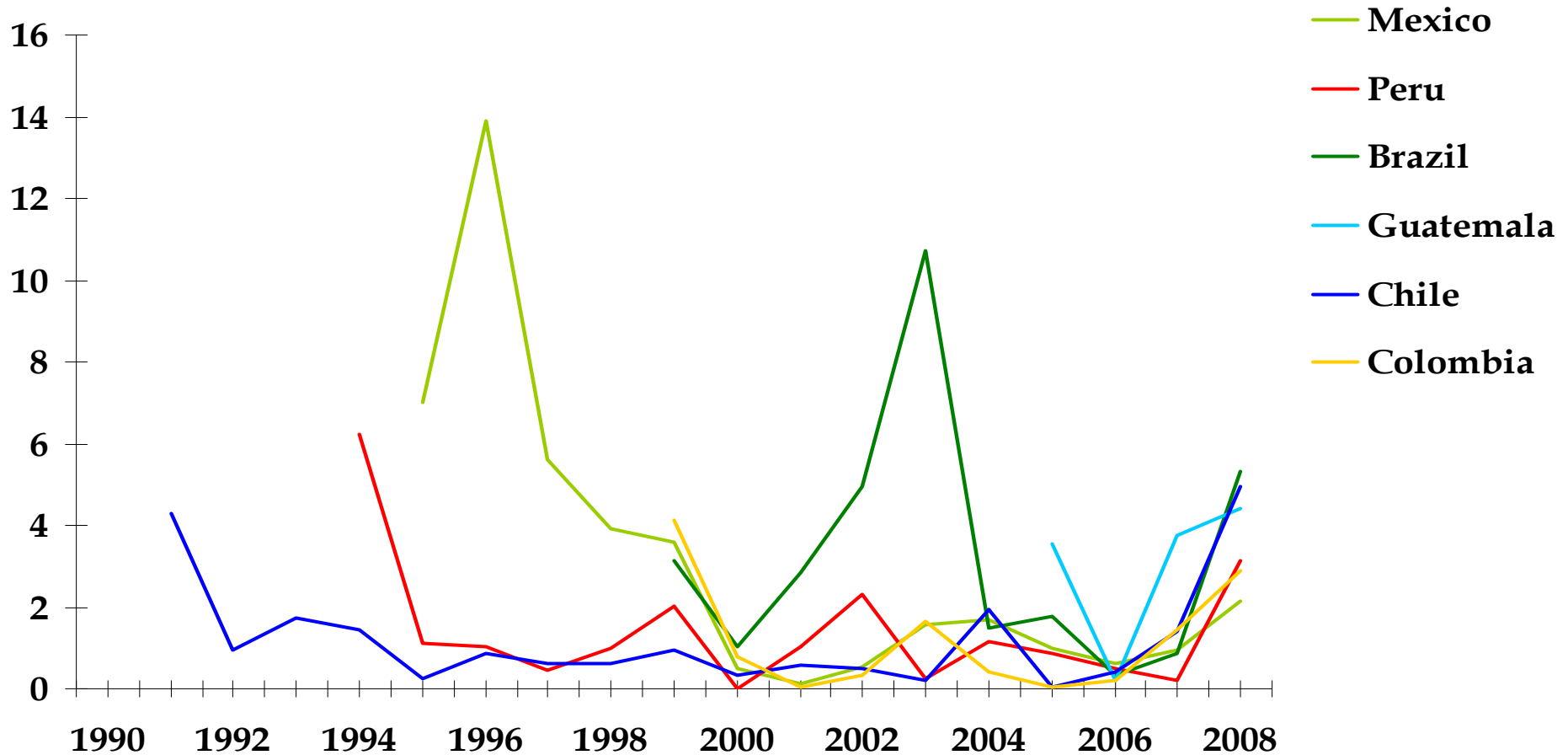
Inflation Deviations from Targets

Annual Absolute Inflation Deviations from Targets in Industrial Economies, 1990-2008



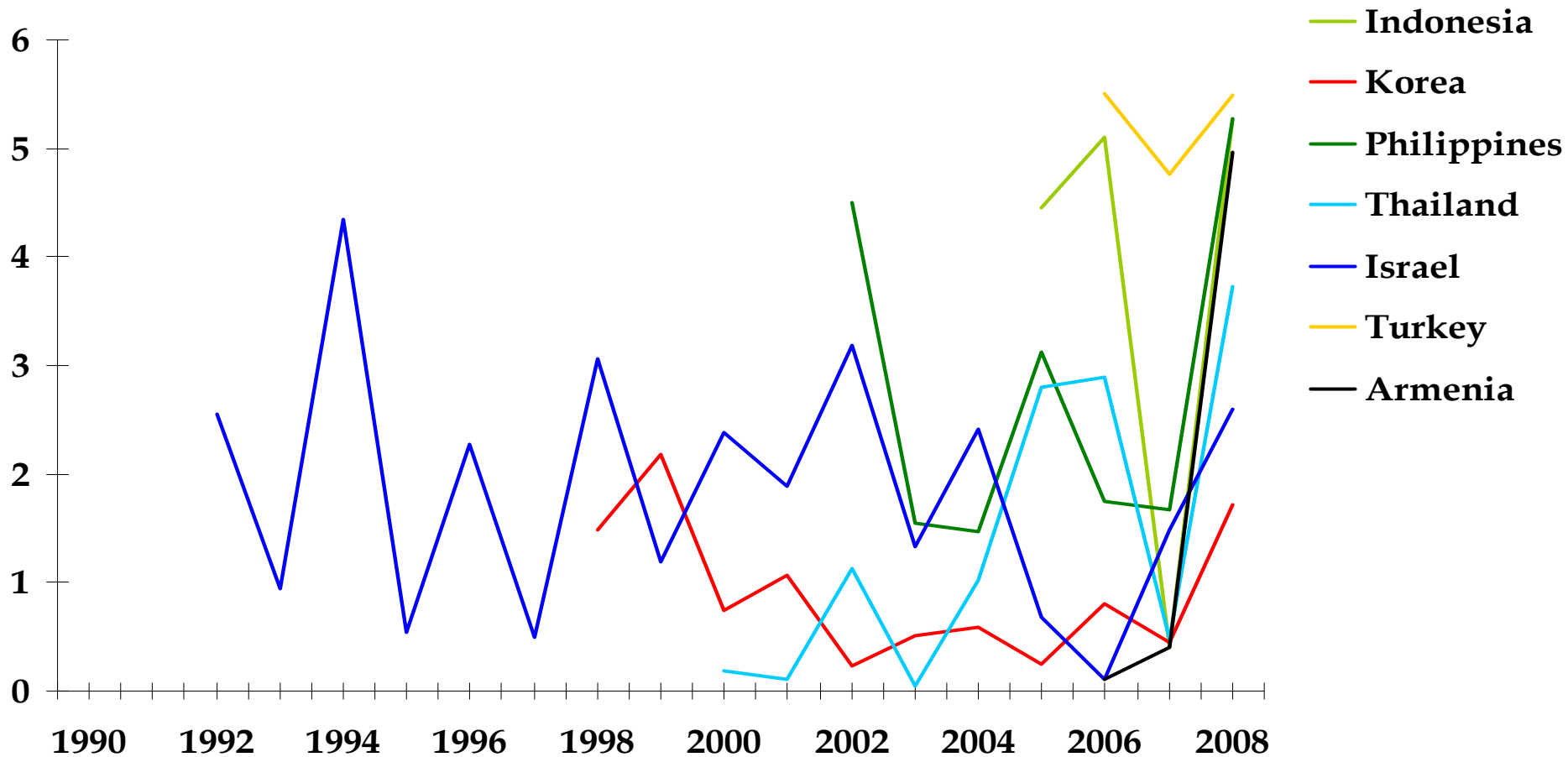
Inflation Deviations from Targets

Annual Absolute Inflation Deviations from Targets in Latin American Economies, 1991-2008



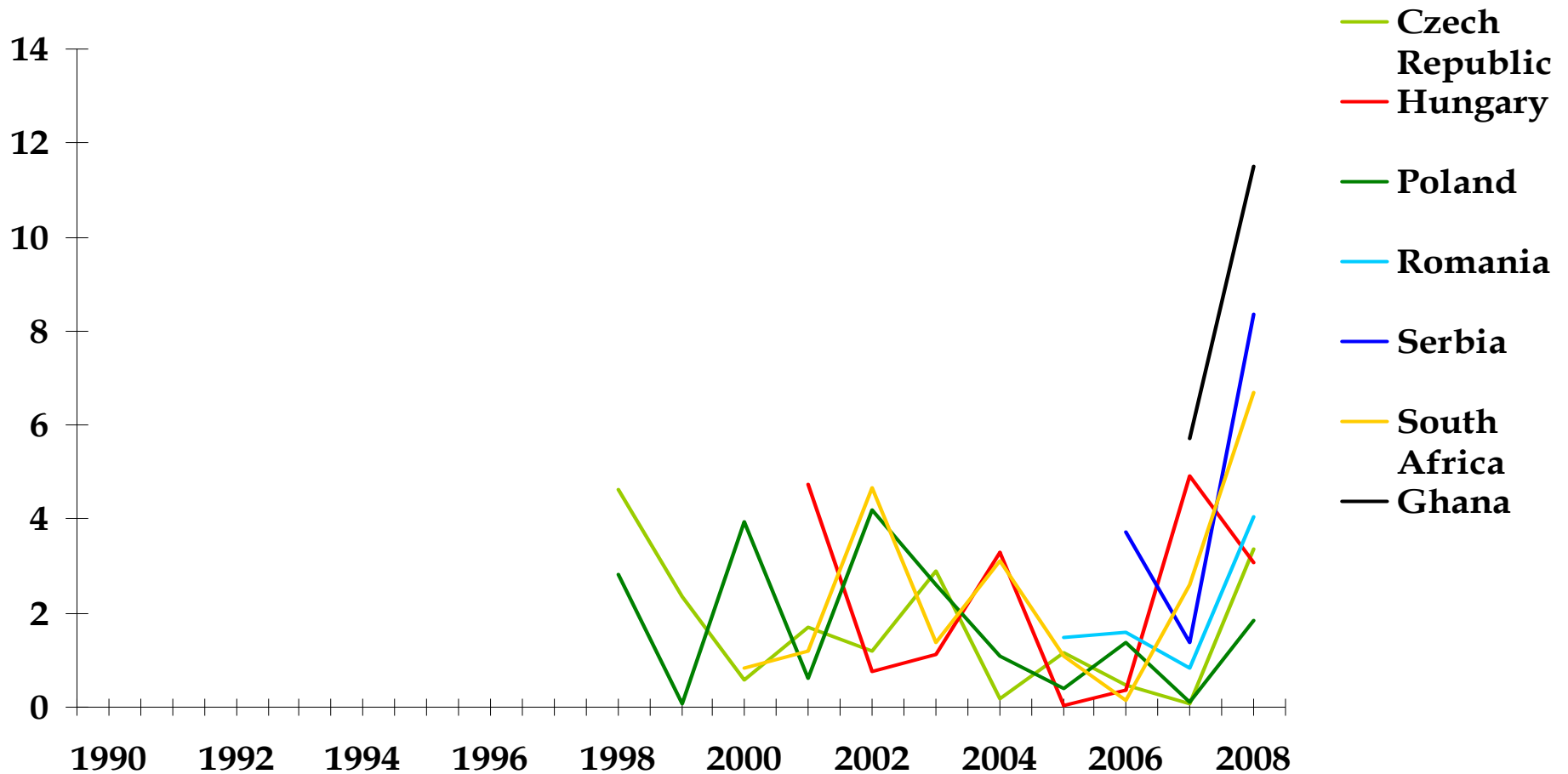
Inflation Deviations from Targets

Annual Absolute Inflation Deviations from Targets in Asian Economies, 1992-2008



Inflation Deviations from Targets

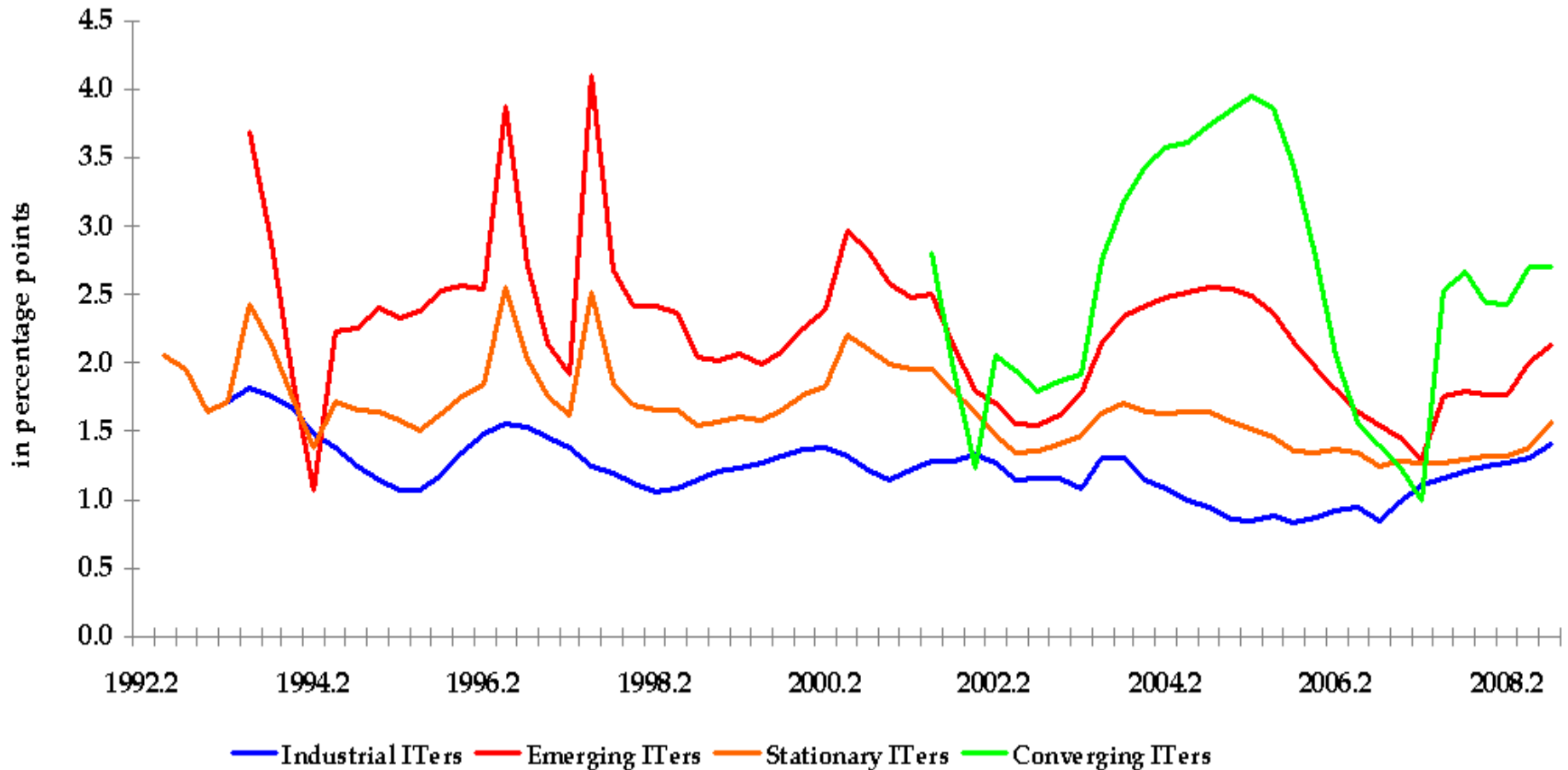
Annual Absolute Inflation Deviations from Targets in Central-Eastern and African Economies, 1998-2008



Inflation Deviations from Targets

Rolling estimation of RMSD (windows of 8 quarters)

(8-quarter windows, percentage points)



Inflation Deviations from Targets

Determinants of Inflation Deviations

(Albagli and Schmidt-Hebbel, 2008)

Main equation (panel data regression):

$$AD_{i,t} = \beta_1 \text{abs}(OIL_{i,t}) + \beta_2 \text{abs}(NER_{i,t}) + \beta_3 IICR_{i,t} + u_i + \varepsilon_{i,t}$$

$AD_{i,t}$ = absolute value of inflation deviation

$OIL_{i,t}$ = HP filtered oil price

$NER_{i,t}$ = nominal exchange rate depreciation

$IICR_{i,t}$ = institutional Investor's Credit Rating

u_i = country effect (country dummy)

$\varepsilon_{i,t}$ = error term

Inflation Deviations from Targets

	AD1	AD1	AD2	AD3	AD1	AD2	AD3
AD(-1)	0.794***	0.720***	0.843***	0.823***	0.720***	0.849***	0.823***
ABS(NER(-1))	0.009*	0.008*	0.008**	0.009**	0.009*	0.029***	0.008**
ABS(NER(-3))	0.008**	0.008*			0.008*		
ABS(OILG)			0.006**			0.009*	
ABS(OILG(-1))	-0.004*	-0.005*	-0.010***		-0.005*	-0.012***	
ABS(OILG(-2))	0.007**	0.006**	0.006**	0.003	0.006**	0.006**	0.003
CBI	-0.122**						
IICR	-0.009***	-0.019***	-0.012**	-0.018***	-0.019***	-0.009	-0.018***
R2	0.50	0.53	0.61	0.613	0.529	0.575	0.61
Durbin's H	0.48	-0.18	-0.61	-0.05	-0.18	-1.07	-0.05
Sample	90-03	90-03	90-03	90-03	90-03	90-03	90-03
Method	Pooled OLS	F-E OLS	F-E OLS	F-E OLS	F-E TSLS	F-E TSLS	F-E TSLS
N° obs.	517	517	536	517	517	517	517

4. Inflation Levels

Inflation Levels

(Mishkin and Schmidt-Hebbel, M&SH 2007)

Sample:

- Country sample: ITers up to 2004. Distinction between converging ITers (declining targets) and stationary ITers (constant targets)
- Time sample: quarterly data 1989-2004

Methodology:

- Cross-section regressions (OLS)
- Panel-data regressions (OLS, IV)

Inflation Levels

Authors	Sample	Method	LT Inflat. level diff.
Ball+Sheridan 2005	ICs: 7 IT, 13 IT	Cr-sec. OLS	Zero
Vega+Wink. 2005	World: 23 IT, 86 NIT	Prop. score	-(2.6 / 4.8)%
IMF (2005)	EMEs: 13 IT, 22 NIT	Cr-sec. OLS	-4.8%
M&SH (2007)	21 world IT, 13 ICs	Cr-sec. OLS	+1.2%

Main results for cross-section regressions:

- Unlike previous literature, M&SH do not find inflation-reduction gains associated to the adoption of IT

- Why? Possible reasons:

- The control group is too stringent (countries with exceptionally low inflation performance)

- Neglect of time dimension of data

Inflation Levels

M&SH's main results for panel-data regressions:

- Major inflation reduction gains when ITers are compared with their pre-IT period performance
- Major gains also observed when the treatment country group is composed by emerging and converging-target ITers

Inflation Levels

	Long-term Inflation-level Difference		
	<i>CG1 (NITers and pre-ITers)</i>	<i>CG2 (NITers)</i>	<i>CG3 (pre-ITers)</i>
All ITers (OLS)	-1.9%	zero	-5.0%
All ITers (IV)	-4.8%	zero	-5.0%
Industrial (IV)	zero	-1.1%	zero
Emerging (IV)	-7.5%	zero	-6.4%
Stationary (IV)	-2.1%	zero	zero
Converging (IV)	-8.0%	zero	-8.2%

Note: CG is country-control group; zero is statistically zero.

Inflation Levels

(Calderón and Schmidt-Hebbel, 2008)

Sample:

- Country sample: 97 countries (including, of course, ITers)
- Time sample: annual data for 1975-2005
- Comprehensive set of non-monetary inflation determinants in 5 groups: high inflation and persistence, monetary and exchange rate regimes, openness, structural variables and institutions, and business-cycle-related variables

Methodology:

- Estimations for inflation based on broad specification using different panel- data estimation techniques and frequencies of data (e.g., annual and 5-year-averages)
- Sensitivity tests for different specifications and country/time samples

Inflation Levels

Main results:

- IT helps in reducing inflation
- This result is robust to the use of different samples and inclusion of additional inflation determinants

Significant and robust determinants that reduce inflation in the world:

Inflation targeting regime (+)

Fixed exchange-rate regime (+)

Financial openness (+)

Fiscal balance (surplus) (+)

Income per capita (+)

Output gap (-)

5. Monetary Policy Efficiency

Monetary Policy Efficiency

(Mishkin and Schmidt-Hebbel, 2007)

Data Sample:

- Country sample: ITers, distinguishing between converging ITers (declining targets) and stationary ITers (constant targets). Control group: 13 industrial non-ITers (U.S., Japan, and 11 European countries)
- Time sample: quarterly data for 1989-2004

Methodology:

- Estimate aggregate demand and supply for country groups using quarterly data
- Solve optimal control problem of CB for optimal interest rate
- Compute inflation-output volatility efficiency frontier, varying CB inflation weight λ
- Decompose observed differences in macro performance (inflation and output volatility) into changes in supply shock variability (changes in efficiency frontier) and changes in MP efficiency (distance from efficiency frontier), assuming $\lambda=0.8$

Monetary Policy Efficiency

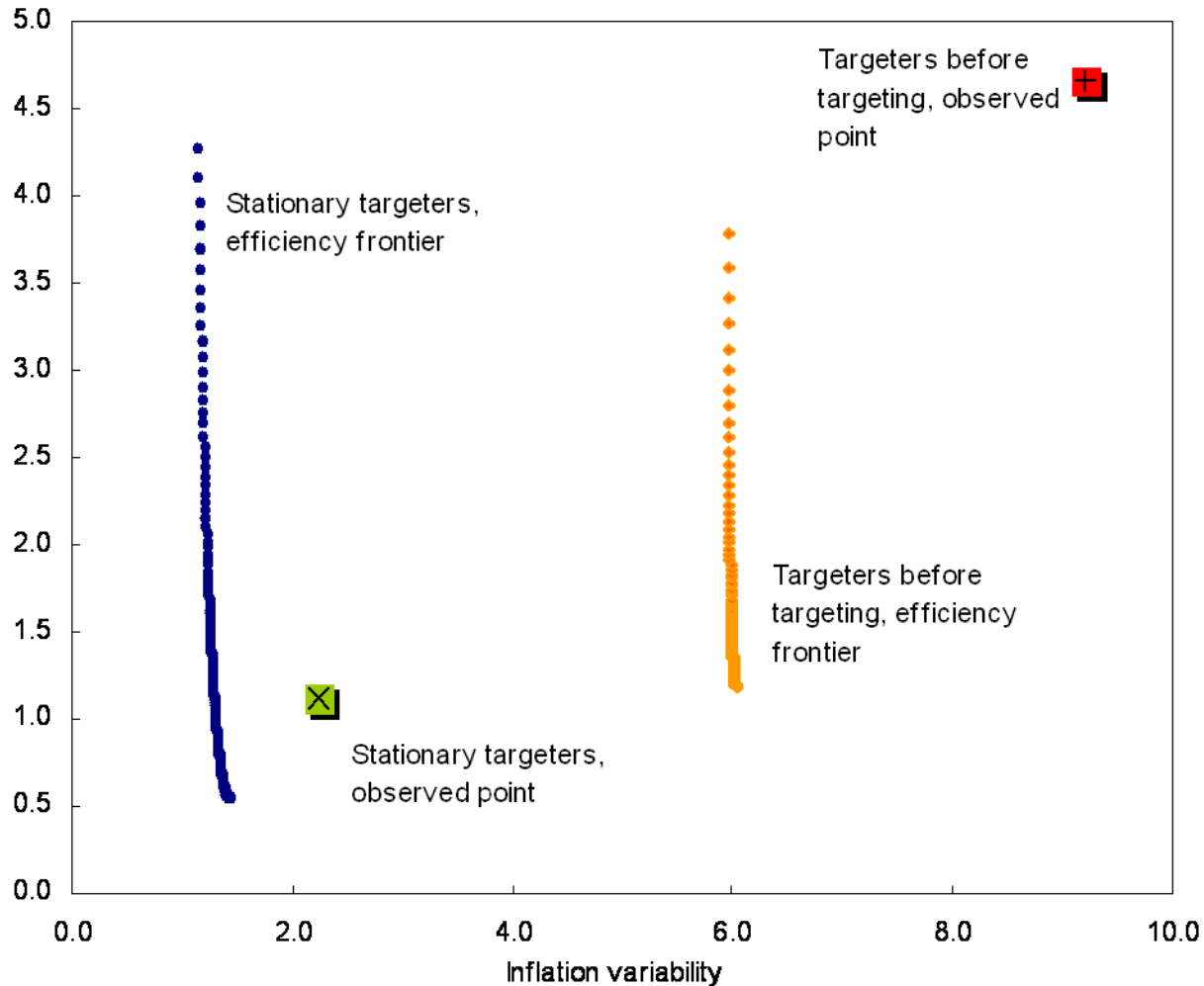
Main results:

- Macro performance and monetary policy (MP) efficiency have increased by large amounts after IT adoption, both in all ITers and in stationary ITers—but gains are larger under stationary IT
- But MP efficiency is still higher among in control group comprised by NITers than in IT countries

Monetary Policy Efficiency

Targeters before IT and Stationary Targeters

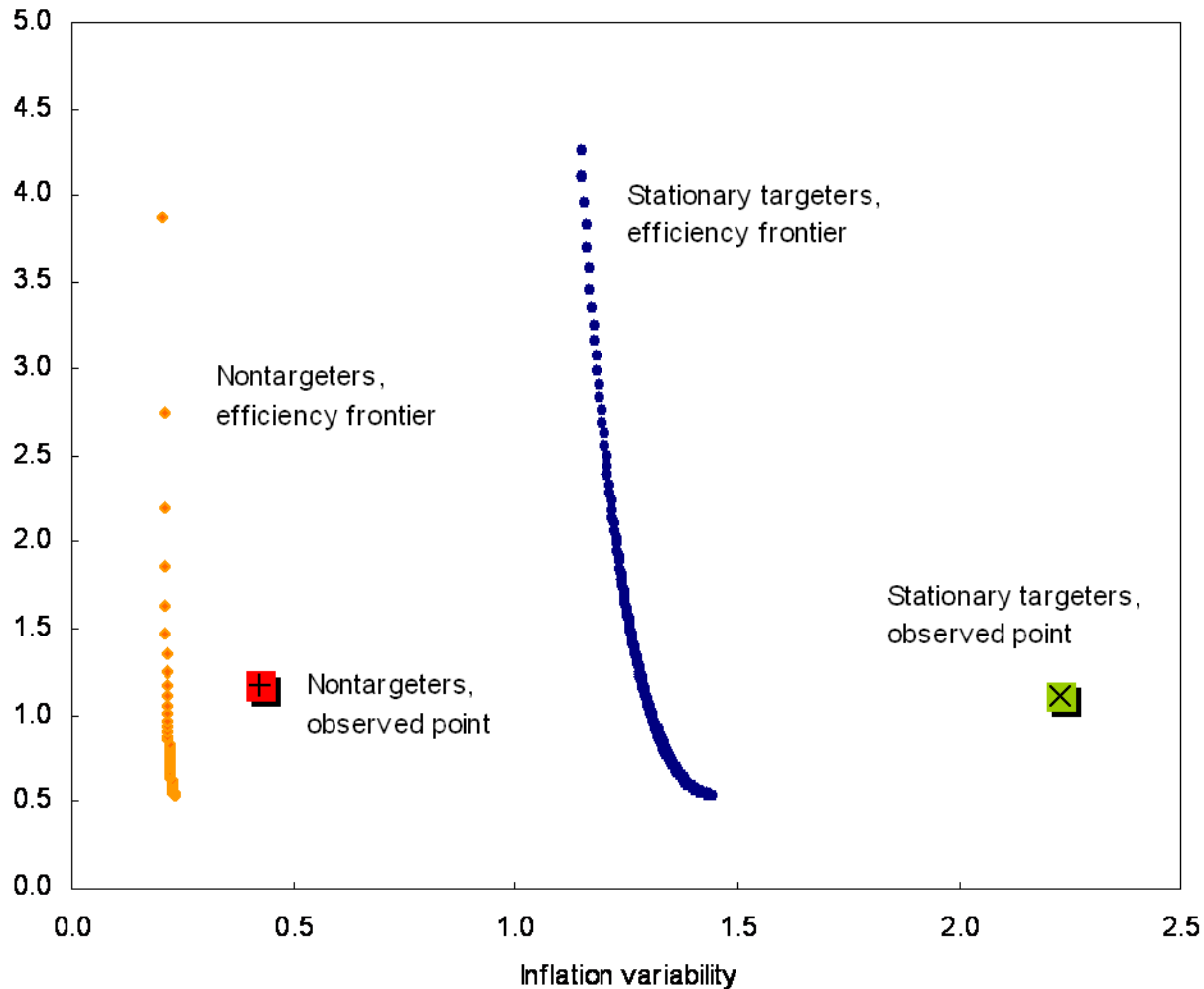
Output variability



Monetary Policy Efficiency

Stationary Targeters and Non-targeters

Output variability



6. Central Bank Transparency

Central Bank Transparency

Central Bank Transparency

Refers to the extent a central bank observes actual practices of information disclosure

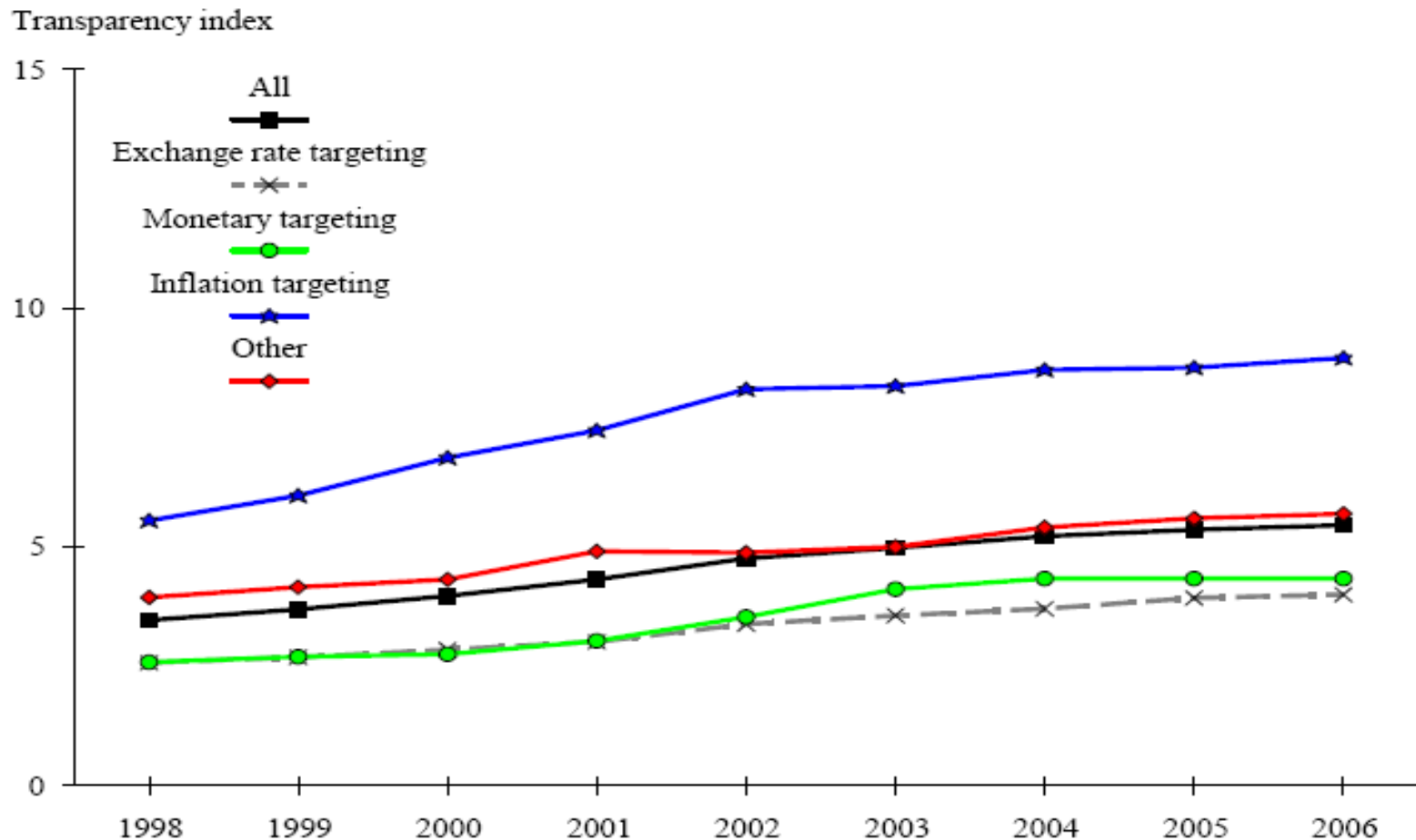
Measuring Central Bank Transparency

Eijffinger and Geraats (2005) propose a transparency index based on 5 criteria (the overall index runs from 0 to 15):

- Political transparency (policy objectives)
- Economic transparency (data, model and forecasts)
- Procedural transparency (release of minutes and votes)
- Policy transparency (announcement and explanation of decisions)
- Operational transparency (implementation of decisions)

Central Bank Transparency

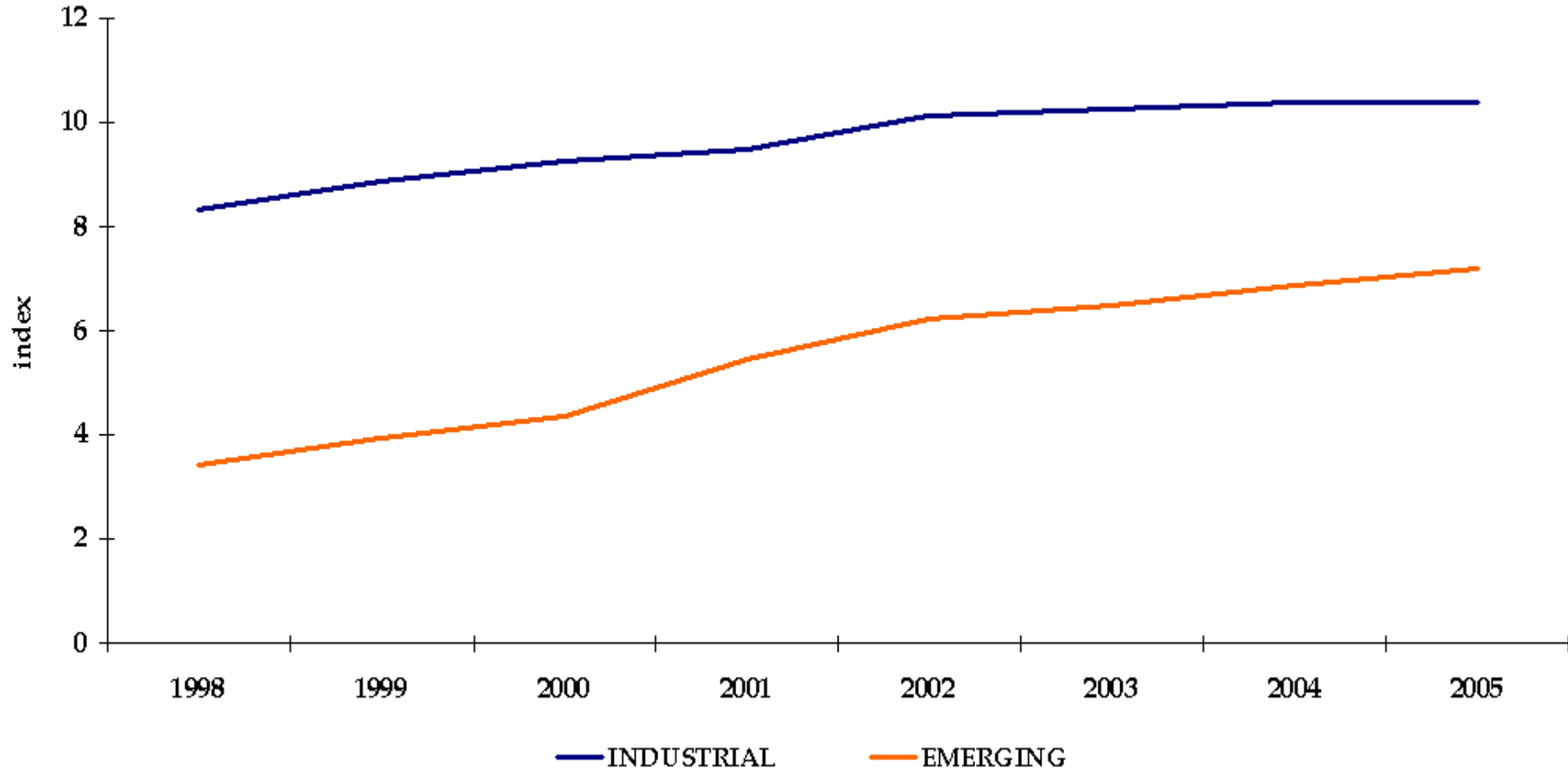
Transparency Index according to Monetary Policy Regimes



Source: Geraats, Petra (2008)

Central Bank Transparency

Transparency Index for Inflation Targeters



Source: Dincer and Eichengreen (2007)

7. Current Challenges to IT

Challenges to IT before the Crisis

There is some evidence that flexible but explicit IT dominates other successful monetary regimes in industrial countries (e.g., implicit IT a la ECB or Fed) because of:

- more transparency and accountability (Geraats and Eijffinger, Dincer and Eichengreen, Walsh)
- more predictability because of less discretion (Walsh)
- better anchoring of expectations (Gürkaynak et al. 2007 for 3 Western Hem. countries; De Carvalho and Minella 2009 for Brazil)

But inflation-targeting central banks face transparency and communication challenges:

- publish future interest-rate paths (Svensson, Walsh)
- publish paths of 4 key non-observables (output gap, NAIRU, neutral rate of interest, equilibrium exchange rate)
- publish full transcripts (minutes) of monetary policy meetings

Challenges to IT at a Time of Crisis

- Frontier monetary policy making – both explicit and implicit IT – is severely challenged by our current understanding of the crisis and the boom-and-bubble period that preceded it
- IT theorists and central bank practitioners should focus and decide on the following issues and proposals:
 - choice of alternative price-level target (Svensson)
 - higher inflation targets to minimize likelihood of hitting zero bound
 - extension of standard policy horizon to 5 years or more (Mishkin)
 - complementary use of conventional IR and unconventional MP instruments (quantitative and credit easing) when close to zero bound
 - inclusion of third argument(s) in MP objective and policy functions: credit growth and/or asset price gaps
 - larger weight on output gap in objective function

8. Conclusion

Conclusion

IT is not observationally equivalent to other monetary regimes used by frontier central banks (like implicit IT) or to best-practice monetary policy - neither in design nor in performance

.... yet the current crisis and the preceding boom-and-bubble period pose serious challenges to IT as we know it.

Many more emerging economies and some major industrial economies are likely to adopt a variant of IT in the future

.... but the specific form that frontier best-practice IT will take in the next (third) decade of its existence is far from clear now – the same way the current frontier IT regime was not anticipated at the birth of IT two decades ago.

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