Cross-Country Inflation Expectations: Evidence of Heterogeneous & Synchronized 'Mistakes'

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Presentation Outline

- Introduction
- Review of the Literature
- Data
- Heterogeneous ‘Mistakes’
- Synchronized ‘Mistakes’
- Conclusion

Full Information Rational Expectations (FIRE)

The Assumption

- Agents understand the true model that governs the economy
  - They are able to incorporate all new information instantaneously
  - They aim to minimize the mean squared error of their forecasts

The Implications

- Agents' expectations are statistically optimized forecasts
- Forecast errors are unpredictable from all publicly available information at the time the forecast is made

Deviations from FIRE - What we already know

- Fact 1:Widespread violations of FIRE across variables, demographics, and surveys[1]
- Fact 2:Consensus forecasts display under-reaction to new information, whereas individual level forecasts display over-reaction[2]
- Fact 3:Agents' degree of (in)attention to inflation varies with macroeconomic conditions[3]
  - The strength of the deviation of expectations from FIRE also communicates the degree of inattention to inflationary conditions

[1] See Mankiw et *al.* (2003), Souleles (2004), Bordalo et *al.* (2020)

[2] See Coibion and Gorodnichenko (2015); Bordalo et *al.* (2020)

[3] See Weber et *al.* (2025), Bracha and Tang (2024), Korenok et *al.* (2023), and Pfäuti (2024)

This Paper - An Overview

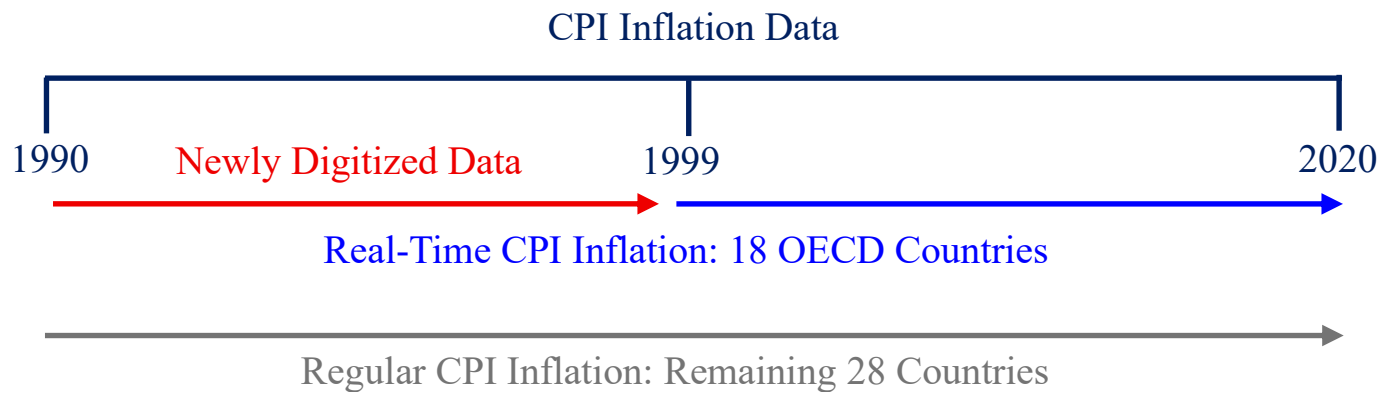
- Analyzes the **consensus** inflation predictions of professional forecasters across 46 countries from 1990 to 2020[4]
  - G7 and Western Europe
  - Asia Pacific
  - Latin America
- Examines the heterogeneity in deviations from FIRE across countries using two well-known tests of rational expectations
- Augments the availability of real-time data by introducing a novel historical dataset
- Explores the common components in cross-country inflation expectations using a Bayesian Dynamic Factor Model

[4] Data sourced from Consensus Economics

This Paper - Key findings

1. Tests of rational expectations reveal that FIRE is rejected across countries
2. Evidence points to the coexistence of over- and under-reaction in forecasts
3. Forecasters in historically low-inflation economies appear to update their forecasts less frequently than those in high-inflation economies
4. Evidence points to the existence of a cross-country dynamic latent factor reflecting synchronization in forecast errors

1. Monthly consensus predictions of inflation made by professional forecasters for the current calendar year and one-year-ahead
   - Forty-six countries ▸ Country List
   - Forecasting the Central Bank's preferred inflation measure ▸ E.g. UK
2. CPI inflation from the World Bank
3. Real-Time CPI Inflation - 18 OECD Countries



Extract from OECD's Main Economic Indicators (MEI) Publication February 1991

CANADA

1990												12-month rate of change / Variation sur 12 mois	
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
													PRIX *1985 = 100*
													Prix à la production (ind. manufacturières)
109.6	110.4	110.2	110.0	110.5	110.3	110.0	110.1	111.1	111.5	111.6	111.4	1.8	Total
114.8	115.1	115.2	115.8	116.6	116.8	116.6	116.4	116.4	116.5	116.3	116.1	1.6	Produits alimentaires et boissons
127.6	129.9	128.1	126.9	127.5	127.8	126.5	125.5	126.4	125.0	124.8	124.1	-2.6	Papier et industries connexes
113.6	114.1	113.9	114.0	114.2	114.4	114.1	114.2	115.5	118.1	119.9	120.0	6.0	Produits chimiques
111.9	111.5	113.5	113.7	115.2	113.9	114.7	117.8	119.8	117.2	114.4	111.3	-3.4	Métaux de base
114.6	114.9	114.7	114.4	114.4	114.3	114.2	114.5	114.6	114.7	114.7	114.7	0.5	Ouvrages en métaux
112.5	112.5	111.7	111.8	112.4	111.9	111.2	111.4	112.4	111.7	111.4	111.4	-1.0	Machines électriques
77.4	78.0	77.7	77.0	76.5	76.4	75.5	76.9	81.0	87.1	90.8	92.1	23.3	Produits du pétrole et du charbon
													Prix à la consommation
121.8	122.6	123.0	123.0	123.6	124.1	124.7	124.9	125.2	126.2	126.9	126.8	5.0	Total

Digitized Data

Publication Reporting Period		Measure: CPI- All Items Canada (Indexation: 1985 = 100) Publication Month/Vintage (Columns)													
		Mar-90	Apr-90	May-90	Jun-90	Jul-90	Aug-90	Sep-90	Oct-90	Nov-90	Dec-90	Jan-91	Feb-91	Mar-91	Apr-91
January	1990	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8	121.8
February	1990		122.5	122.5	122.5	122.5	122.6	122.6	122.6	122.6	122.6	122.6	122.6	122.6	122.6
March	1990			122.9	122.9	122.9	123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0
April	1990				123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0	123.0
May	1990					123.6	123.6	123.6	123.6	123.6	123.6	123.6	123.6	123.6	123.6
June	1990						124.1	124.1	124.1	124.1	124.1	124.1	124.1	124.1	124.1
July	1990							124.7	124.7	124.7	124.7	124.7	124.7	124.7	124.7
August	1990								124.7	124.9	124.9	124.9	124.9	124.9	124.9
September	1990									125.2	125.2	125.2	125.2	125.2	125.2
October	1990										126.2	126.2	126.2	126.2	126.2
November	1990											126.9	126.9	126.9	126.9
December	1990												126.8	126.8	126.8
January	1991													130.2	130.2
February	1991														130.2

Data Revision

Methodology | USA | Japan | Germany | France | Italy | Canada | UK | Belgium | Greece | Austria | Denmark | Finland | Ireland | Netl ...

Note: These data are sourced from the OECD's Main Economic Indicators publications (collected from various public sources) and are organized by publication month/vintage.

1 Mincer-Zarnowitz (MZ) Regression

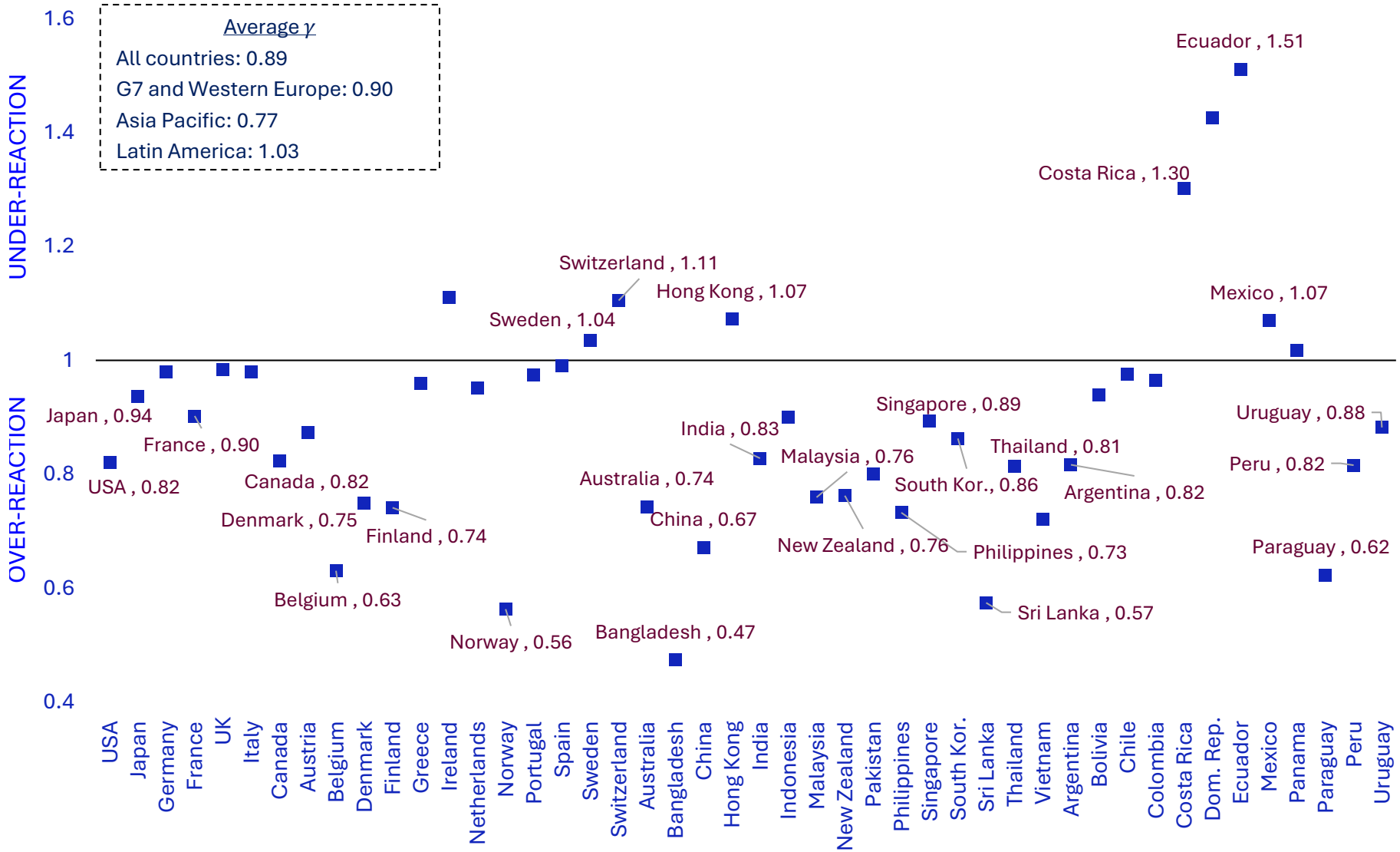
$$\pi^i_{t+h} = \alpha^i + \gamma^i F_t \pi^i_{t+h} + u^i_{t+h}, \tag{1}$$

- where
  - π^i_{t+h} : realized inflation of country i at time $t+h$
  - $F_t\pi^i_{t+h}$: the h-period-ahead inflation forecast made at time t
  - u^i_{t+h} : the rational expectations error term
- FIRE implies the joint null hypothesis of $(\alpha, \gamma) = (0,1)$
  - $\gamma > 1 \implies$ under-reaction
  - $\gamma < 1 \implies$ over-reaction

Mincer-Zarnowitz Regression - Estimated p-values

G7 and Western Europe $(\alpha, \gamma) = (0, 1)$		Asia Pacific $(\alpha, \gamma) = (0, 1)$		Latin America $(\alpha, \gamma) = (0, 1)$	
USA	0.04	Australia	0.00	Argentina	0.03
Japan	0.08	Bangladesh	0.01	Bolivia	0.11
Germany	0.45	China	0.00	Chile	0.93
France	0.05	Hong Kong	0.00	Colombia	0.55
UK	0.94	India	0.06	Costa Rica	0.00
Italy	0.88	Indonesia	0.12	Dom. Rep.	0.26
Canada	0.01	Malaysia	0.00	Ecuador	0.00
Austria	0.32	New Zealand	0.05	Mexico	0.01
Belgium	0.00	Pakistan	0.21	Panama	0.11
Denmark	0.00	Philippines	0.00	Paraguay	0.00
Finland	0.00	Singapore	0.03	Peru	0.00
Greece	0.16	South Korea	0.02	Uruguay	0.00
Ireland	0.20	Sri Lanka	0.04		
Netherlands	0.64	Thailand	0.00		
Norway	0.00	Vietnam	0.14		
Portugal	0.79				
Spain	0.98				
Sweden	0.00				

Mincer-Zarnowitz Regression - Estimated γ Coefficients



Notes: The figure shows the γ coefficient from the Mincer-Zarnowitz specification in equation (1). The black line represents the evaluation line for $\alpha = 1$. Countries for which the test results are statistically significant are highlighted in red. Average number

The Mincer-Zarnowitz Regression: Summary observations

- Empirical evidence confirming that FIRE is violated across countries
- Over-reaction is the dominant bias across all countries
- Simultaneous over- and under-reaction across countries within all three regions.
  - On average, over-reaction is strongest within the Asia Pacific Region and weakest within the Latin American Region
  - Variability of the coefficients is small across G7 & Western Europe and Asia Pacific regions but larger across Latin American countries
  - For countries such as Costa Rica, Dominican Republic, Ecuador, Mexico, and Panama, under-reaction appears to be the dominant bias.[5]

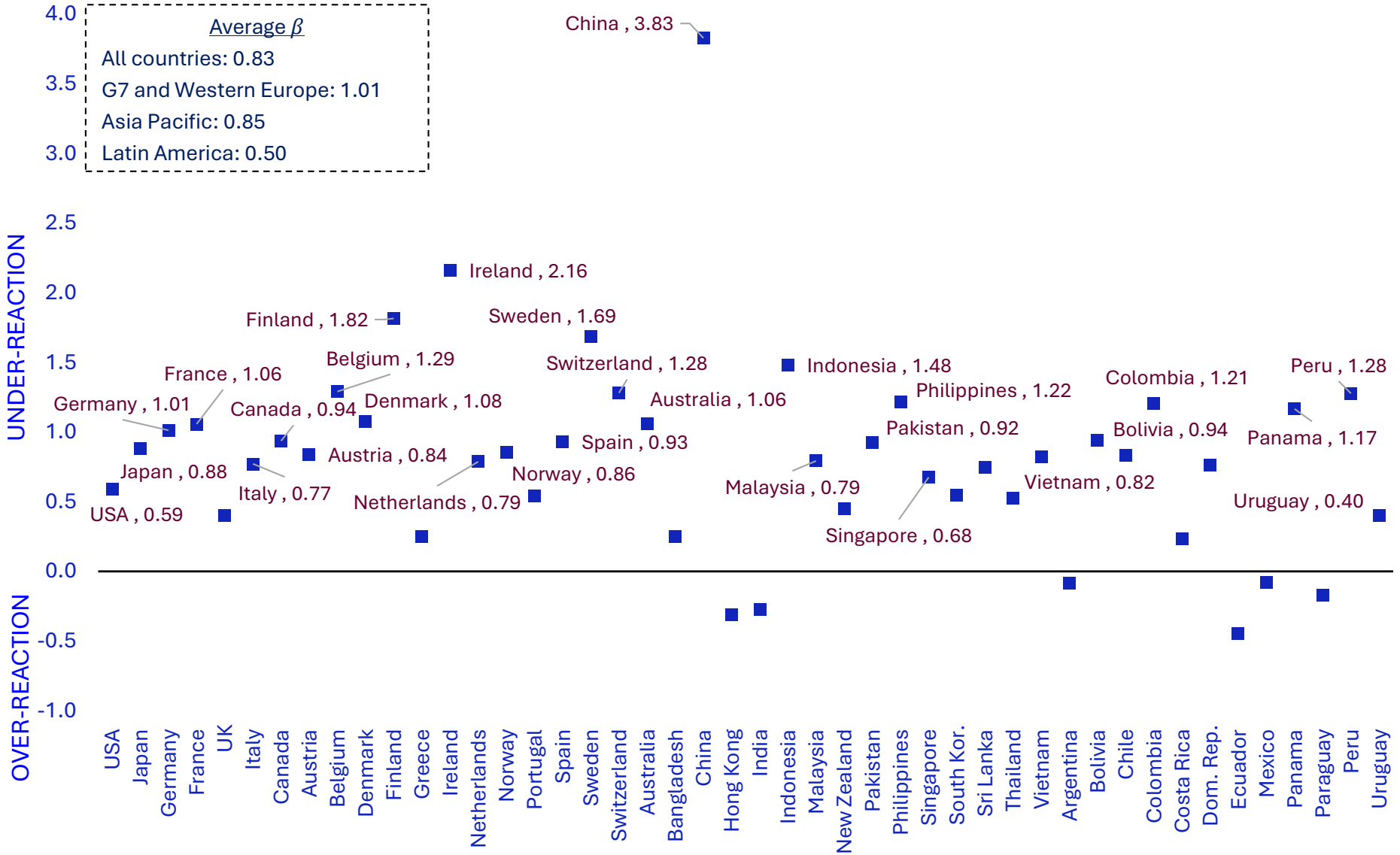
[5] The average gamma coefficient among these five countries is 1.27.

2 Coibion-Gorodnichenko (CG) Regression

$$\pi^i_{t+h} - F_t\pi^i_{t+h} = \alpha^i + \beta^i(F_t\pi^i_{t+h} - F_{t-1}\pi^i_{t+h}) + u^i_{t+h}, \qquad (2)$$

- where
  - $\pi^i_{t+h} - F_t\pi^i_{t+h}$: the one-period ahead forecast error
  - $F_t\pi^i_{t+h} - F_{t-1}\pi^i_{t+h}$: the time t forecast revision
  - u^i_{t+h} : the rational expectations error term
- FIRE implies $\alpha = 0$, $\beta = 0$
  - $\beta > 0 \implies$ under-reaction
  - $\beta < 0 \implies$ over-reaction

The CG Test - Estimated β Coefficients



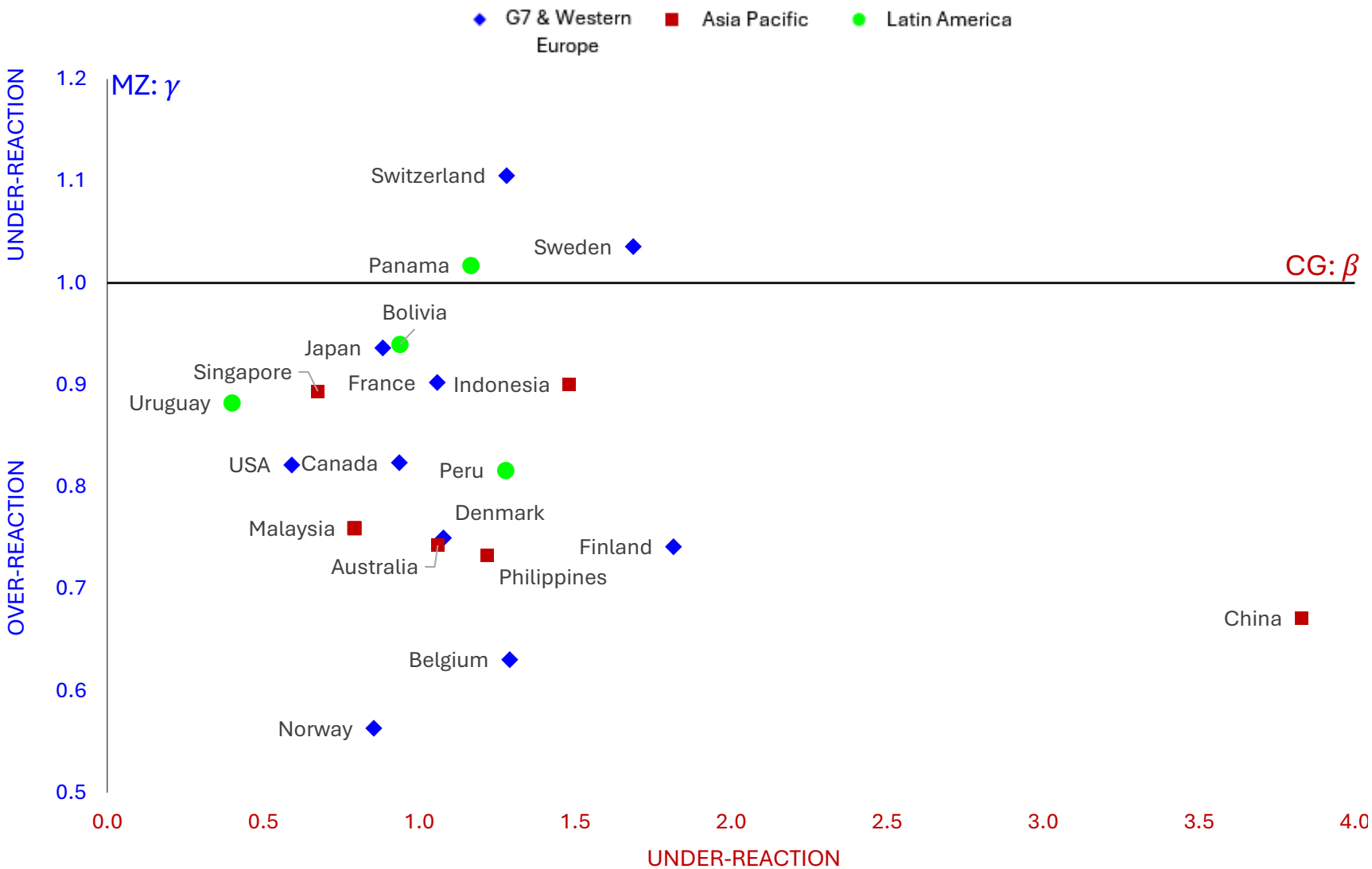
Notes: The figure shows the results of the Coibion-Gorodnichenko Test evaluating the null hypothesis, $\beta = 0$. Average number

The CG Test: Summary observations

- Empirical evidence confirming that FIRE is violated across countries, with under-reaction as the dominant bias
- On average, the magnitude of under-reaction observed varies substantially across regions and countries.
  - Standard deviation coefficients: G7 & WE: 0.47, Asia Pacific: 0.92, Latin America: 0.58
- Measures of information frictions point to varying levels of (in) attention across regions

Region	**CG Test Coeff.** $\hat{\beta}$	**Sticky-Information** $\hat{\lambda} = \hat{\beta}/(1+\hat{\beta})$
G7 & Western Europe	1.01	$0.50 \approx$ 6 mths.
Asia Pacific	0.85	$0.46 \approx$ 5.5 mths.
Latin America	0.50	$0.31 \approx$ 3.3 mths.

The Tests: Simultaneous Over- and Under-Reaction



Notes: The figure shows the statistically significant estimated γ and β coefficients from the MZ and CG tests, respectively, color-coded by region. Positive values on the x-axis represent under-reaction. On the y-axis, values greater than 1 represent

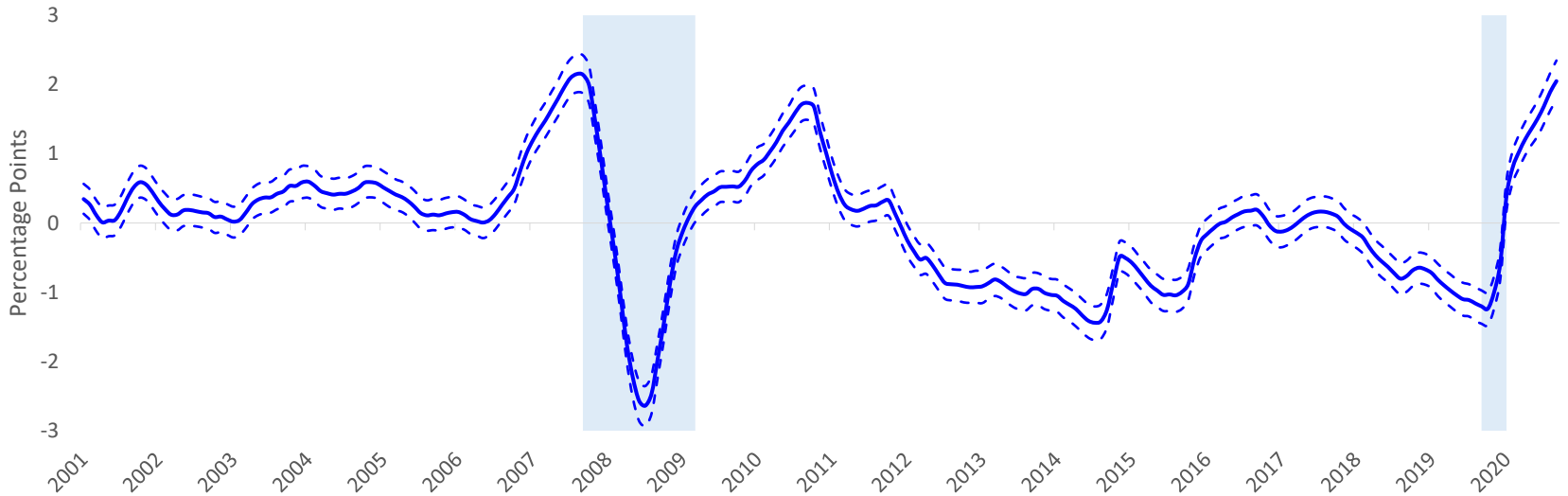
Summary Statements

- Generalizations about the nature of FIRE violations are not ubiquitous across countries
  - There is an argument for the role of regional or country-specific dynamics affecting the data-generating process of forecasters
  - Results likely point to the limitations of existing models of FIRE

Evidence of Synchronized 'Mistakes'

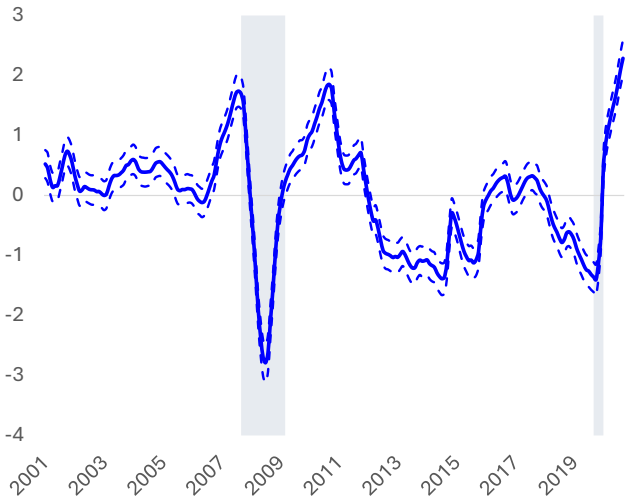
- To what extent do forecasters' 'mistakes' co-move across countries?
  - Is there a common factor driving cross-country departures from FIRE?
  - What percentage of the variability in domestic forecast errors is driven by this factor?

Cross-Country Dynamic Factor in Forecast Errors

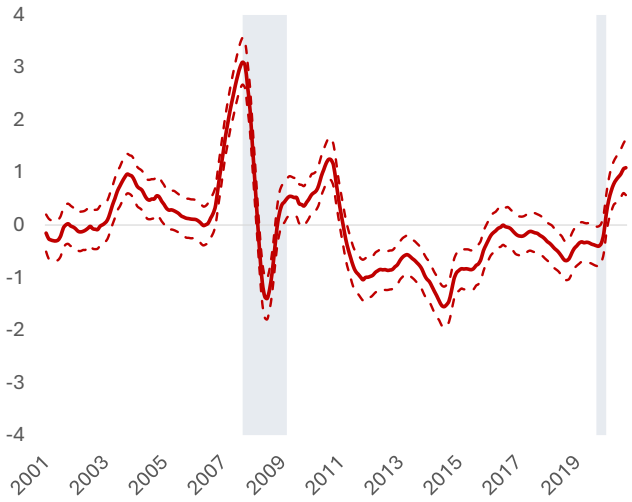


Notes: The figure shows the estimated dynamic latent factor in monthly forecast errors across 46 countries from Jan. 2001 - Dec. 2020. Forecast errors have been standardized to mean zero and unit variance. Shaded areas denote NBER recession dates. For all countries n = 247.

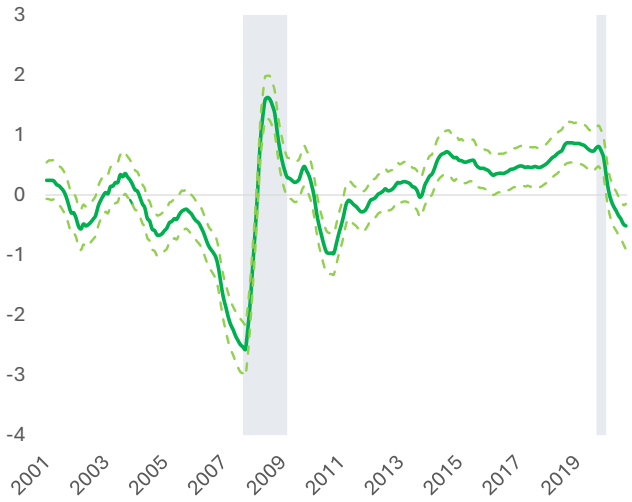
Cross-Country Dynamic Factor by Region



G7 & Western Europe



Asia Pacific



Latin America

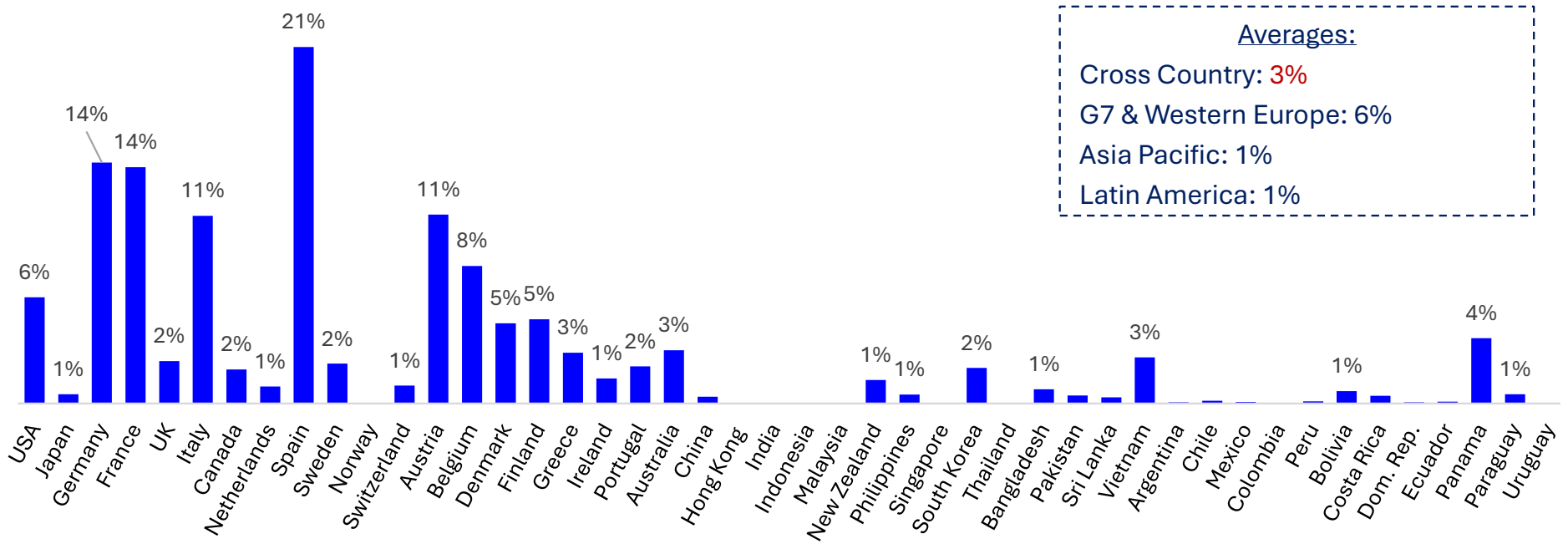
Notes: The figure shows the estimated dynamic latent factor in monthly forecast errors across 46 countries displayed by region from Jan. 2001 - Dec. 2020. The y-axis presents the data in percentage points. Forecast errors have been standardized to mean zero and unit variance. Shaded bars represent NBER recession dates. For the G7 and Western Europe Region n = 371, for Asia Pacific n = 312, and for Latin America n = 279.

Dynamic Factor Model: Summary Observations

- Fluctuations in the factor appear to reflect major global macro shocks[6]
- Forecast errors oscillate between under and over-prediction
  - Notable directional differences in the bias leading up to, during, and after the two crises
  - Differences are also noted across regions, particularly Latin America
- There appears to be a strong '*reversal*' in the bias after the respective crises
  - May reflect changing views on short-term inflation or long-term inflation expectations

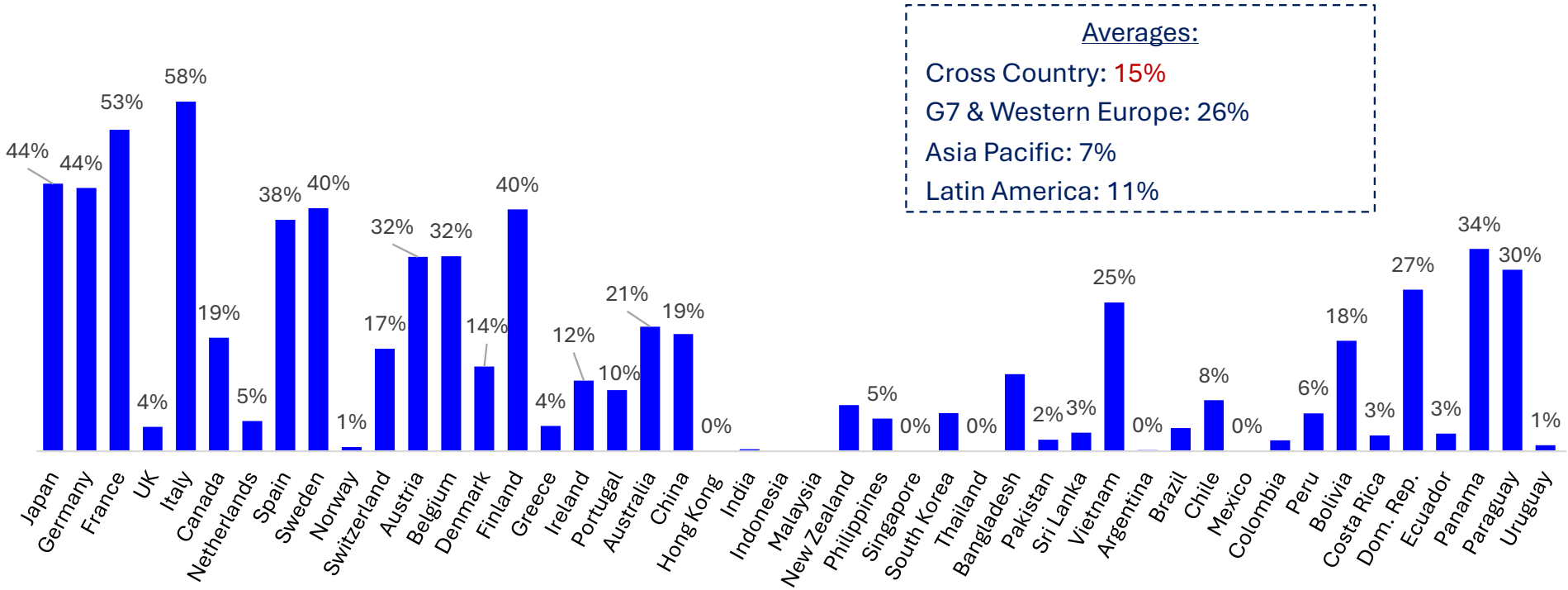
[6] Consistent with Borio and Filardo (2007)

Contribution of the Factor to country-specific forecast error volatility



Notes: The figure shows the contribution of the cross-country dynamic latent factor to each country's forecast errors over the period 2001 to 2020 in percentage points. Average contribution G7 & Western Europe: 6%; Average contribution Asia Pacific:1%; Average contribution Latin America: 1%

Contribution of the Factor to country-specific forecast error volatility: Global Financial Crisis



Notes: The figure shows the contribution of the cross-country dynamic latent factor to each country's forecast errors over the period 2006 to 2012 in percentage points.Average contribution G7 & Western Europe: 26%; Average contribution Asia Pacific:7%; Average contribution Latin America: 11%

Summary

- FIRE is rejected in the cross-country forecast errors of professional forecasters
- The observed heterogeneity in the magnitude and direction of violations of FIRE suggests a more prominent role for the inclusion of country-specific factors in modeling the Expectation Formation Process (EFP)
- Empirical evidence points to the existence of a global factor in cross-country forecast errors, which is more prominent during macroeconomic shocks
- There may be a need to take a more international approach to more comprehensively understand & model the EFP

Thank you.

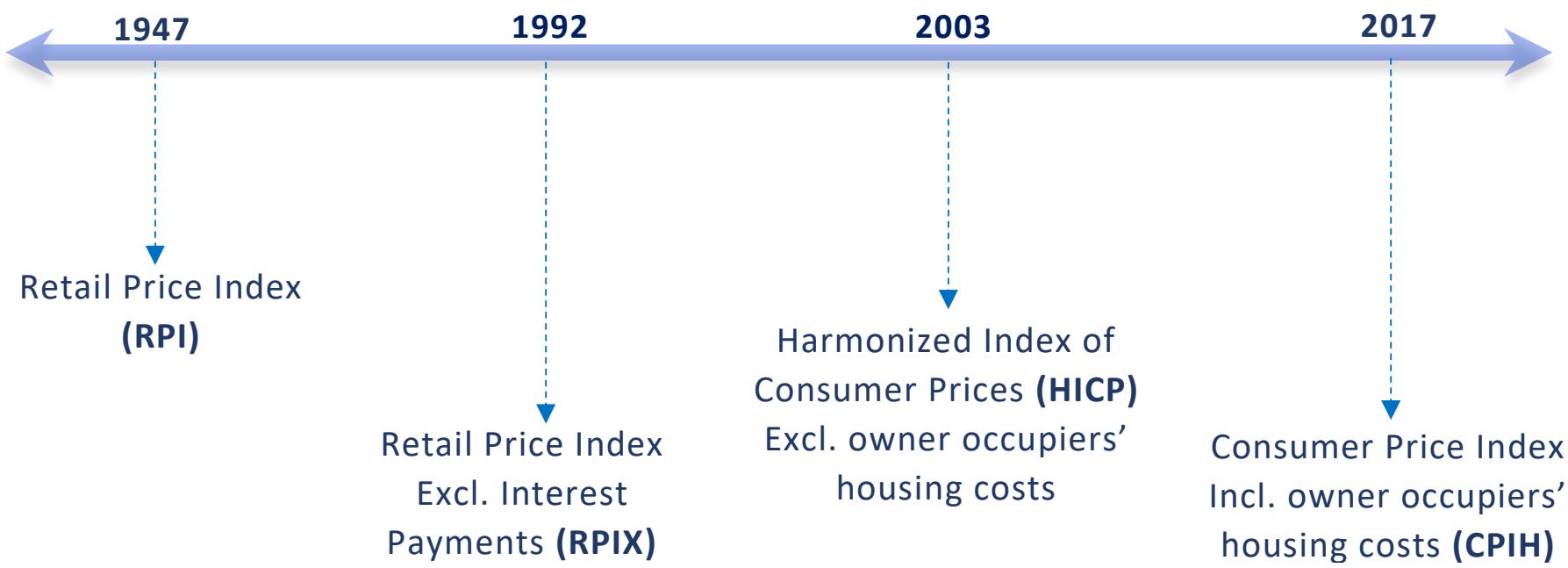
Appendix A: Country List

Data

G7 and Western Europe (1990 - 2020)	Asia Pacific (1994 - 2020)	Latin America (1995 - 2020)
USA	Australia	Argentina
Japan	Bangladesh	Bolivia
Germany	China	Chile
France	Hong Kong	Colombia
UK	India	Costa Rica
Italy	Indonesia	Dom. Rep.
Canada	Malaysia	Ecuador
Austria	New Zealand	Mexico
Belgium	Pakistan	Panama
Denmark	Philippines	Paraguay
Finland	Singapore	Peru
Greece	South Korea	Uruguay
Ireland	Sri Lanka	
Netherlands	Thailand	
Norway	Vietnam	
Portugal		
Spain		
Sweden		
Switzerland		

Appendix B: Evolution of the Bank of England's Inflation Targets

▸ Central Bank's Preferred CPI Measure



The Dynamic Factor Model

$$e_t = \lambda f_t + u_t, \tag{3}$$

where,

- $e_t = (e_{1t}, ..., e_{nt})'$, denotes a stationary n $\times$ 1 vector of standardized observable cross-country inflation forecast errors at time t
- f_t is an m $\times$ 1 vector of common (unobserved) trends
- λ is in an n $\times$ m matrix of (unknown) factor loadings
- $u_t = (u_{1t}, ..., u_{nt})'$, the idiosyncratic component, is $iid \sim N(0, \Sigma)$
- Note that Σ is set to be a diagonal matrix $\Rightarrow Eu_{it}u_{jt-s} = 0$ for $i \neq j$

▸ DFM Summary Equations

The Dynamic Factor Model

Making the model dynamic:

$$f_t = \Phi_1^f f_{t-1} + ... + \Phi_q^f f_{t-q} + \eta_t^f, \tag{4}$$

$$u_t = \Phi_1 u_{t-1} + ... + \Phi_p u_{t-p} + \eta_t, \tag{5}$$

where,

- Φ_i^f and Φ_i are autoregressive coefficient matricies
- Note: $E\eta_t^f \eta_{it-s} = 0 \; \forall \; i, s$

▸ DFM Summary Equations