

TIME FOR A NEW ASTROLABE?

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Prince Henry and a Portuguese Astrolabe

Prince Henry the Navigator on the Monument to the Discoveries, Lisbon



Mariner's Astrolabe, Portuguese, 1645, by Nicholao Ruffo, The Mariners' Museum, (2000.52.1)

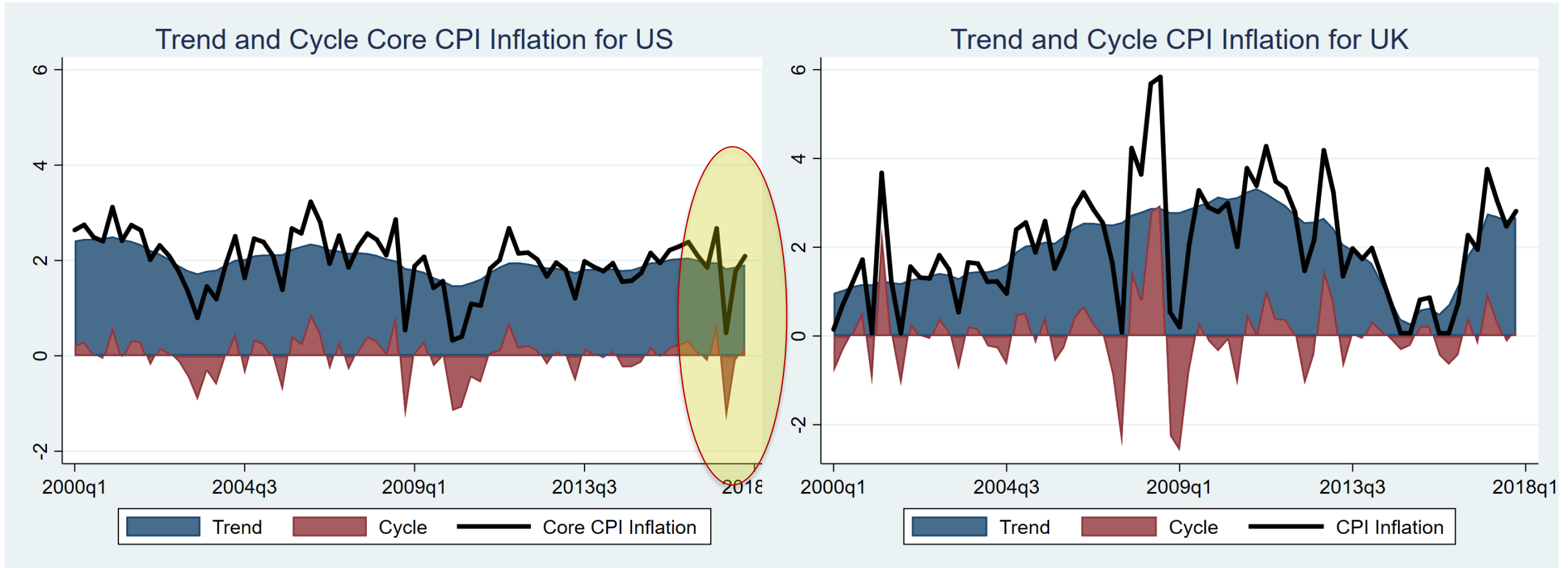


Trend-Cycle Analysis

- **Uses time-series to separate inflation into 2 components**
 1. slow-moving and persistent “trend”
 2. temporary, cyclical movements around the trend
- **Minimal assumptions & parameterization**
- **Flexibility over time**
- **The Model:**
 - “ARSV” model developed in Forbes *et al.* (2017)
 - Combination of UCSV model in Stock and Watson (2007) & auto-regressive (ARUC) model in Chan, Coop and Potter (2013) and Cecchetti *et al.* (2017)
 - Allows trend to follow unit root ($\tau_t = \tau_{t-1} + \varepsilon_t$) and captures the autoregressive process in deviations around trend as well as the stochastic volatility observed in the inflation data



Trend-Cycle Decomposition: US & UK

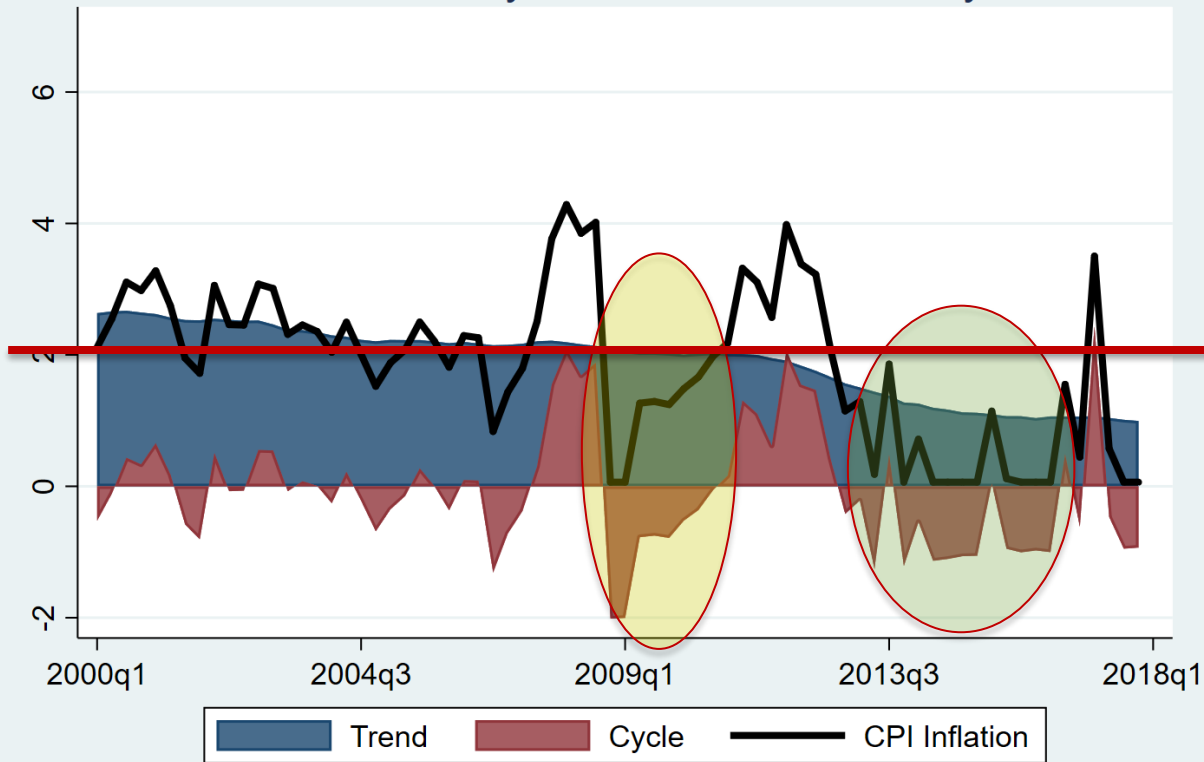


See Forbes, Kirkham and Theodoridis (2017) or Forbes (2018) for more details.

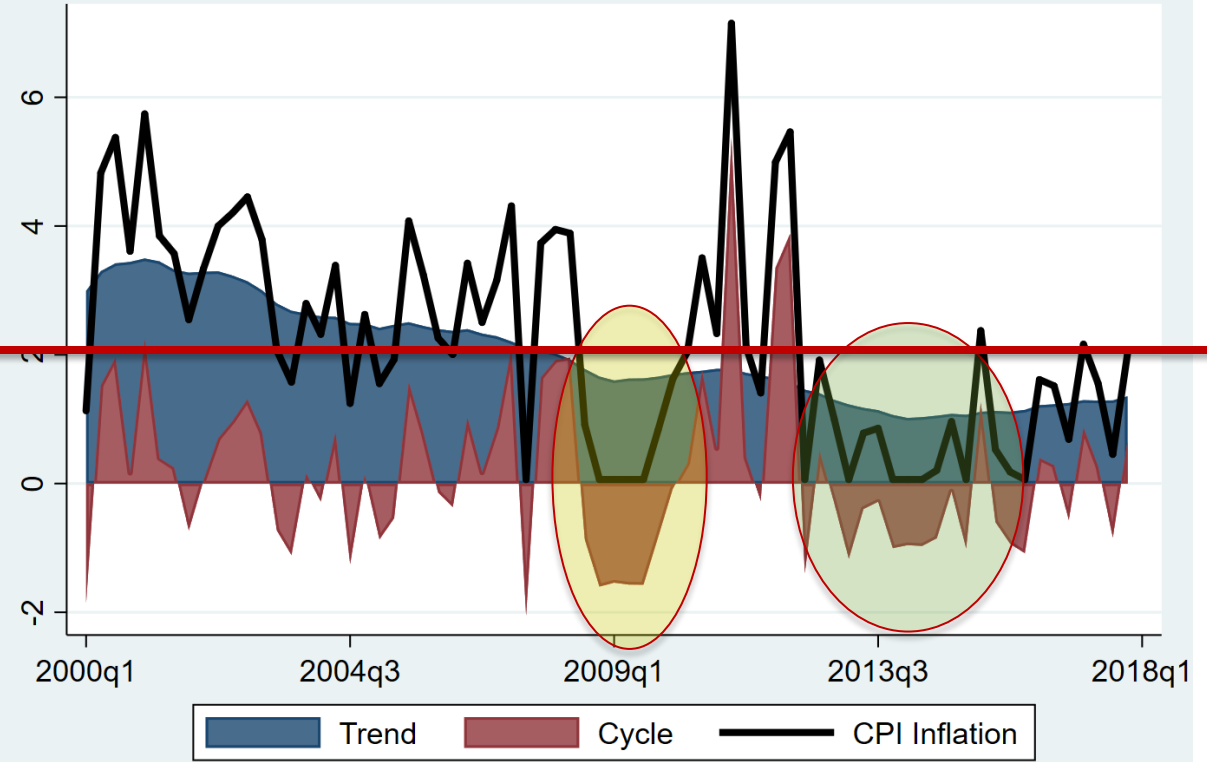


Trend-Cycle Decomposition: Italy & Portugal

Trend and Cycle CPI Inflation for Italy



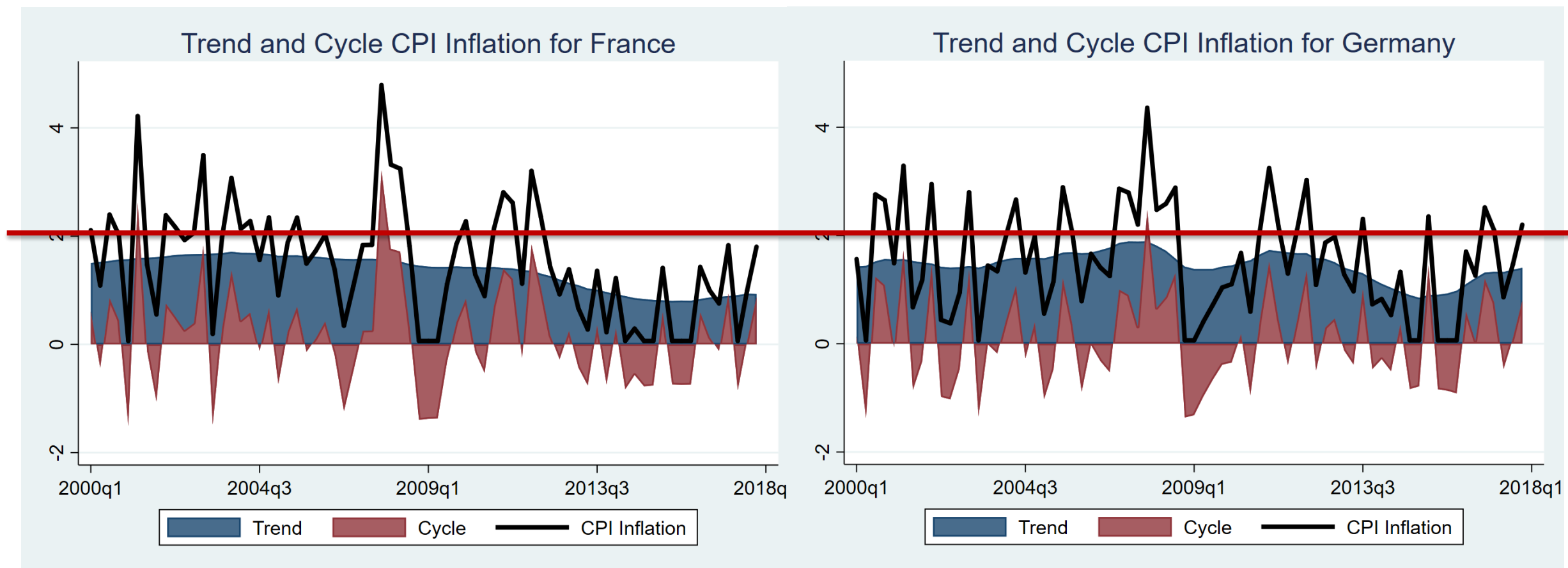
Trend and Cycle CPI Inflation for Portugal



See Forbes, Kirkham and Theodoridis (2017) or Forbes (2018) for more details.



Trend-Cycle Decomposition: France & Germany

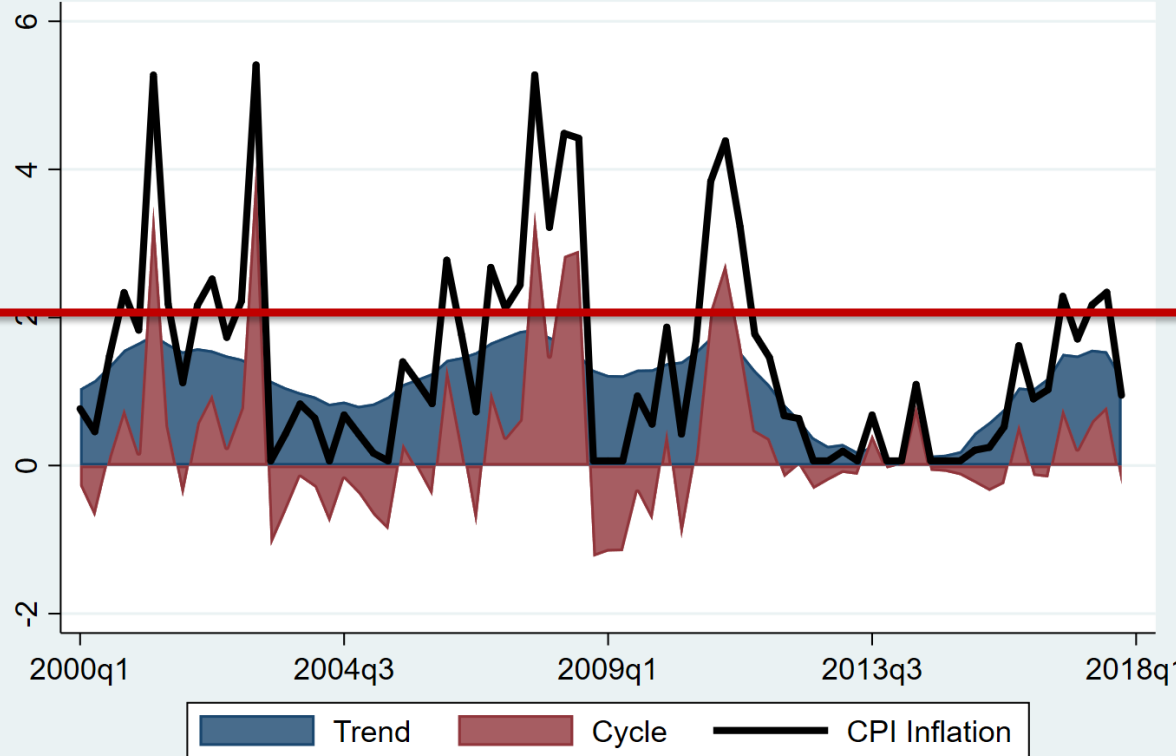


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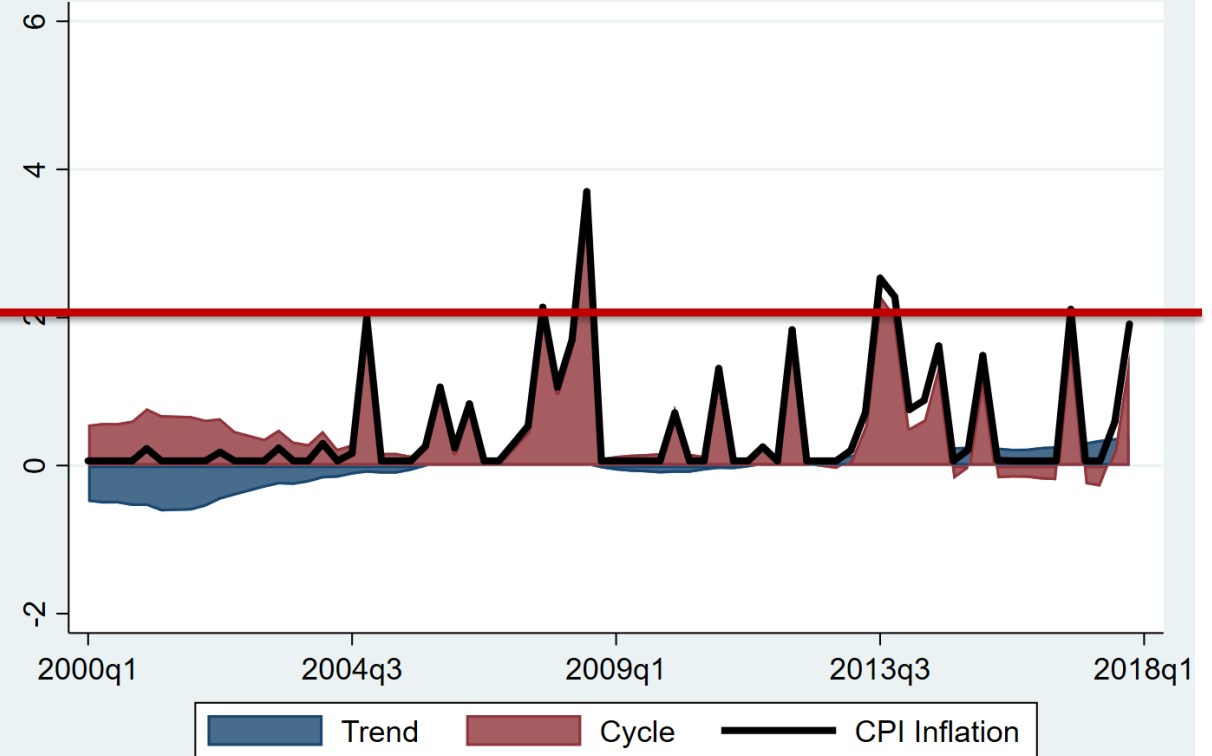


Trend-Cycle Decomposition: Sweden & Japan

Trend and Cycle CPI Inflation for Sweden



Trend and Cycle CPI Inflation for Japan



See Forbes, Kirkham and Theodoridis (2017) or Forbes (2018) for more details.



The Disconnect?

- **Several potential explanations:**
 - Measurement of inflation (Stock and Watson, 2018)
 - Measurement of slack (Albuquerque and Baumann, 2017, Hong *et al.*, 2018)
 - Inflation expectations (Coibion and Gorodnichenko, 2015)
 - Credibility of central banks (Miles *et al.*, 2017)
 - Global slack (Borio and Filardo, 2007)
- **Changes in global economy**
 - Increased trade flows
 - Greater role of emerging markets/impact on commodity prices
 - Greater use of supply chains (Auer, Levchenko and Sauré, 2016)



Regressions
of quarterly,
annualized
inflation from
1990-2017
for 43
countries.

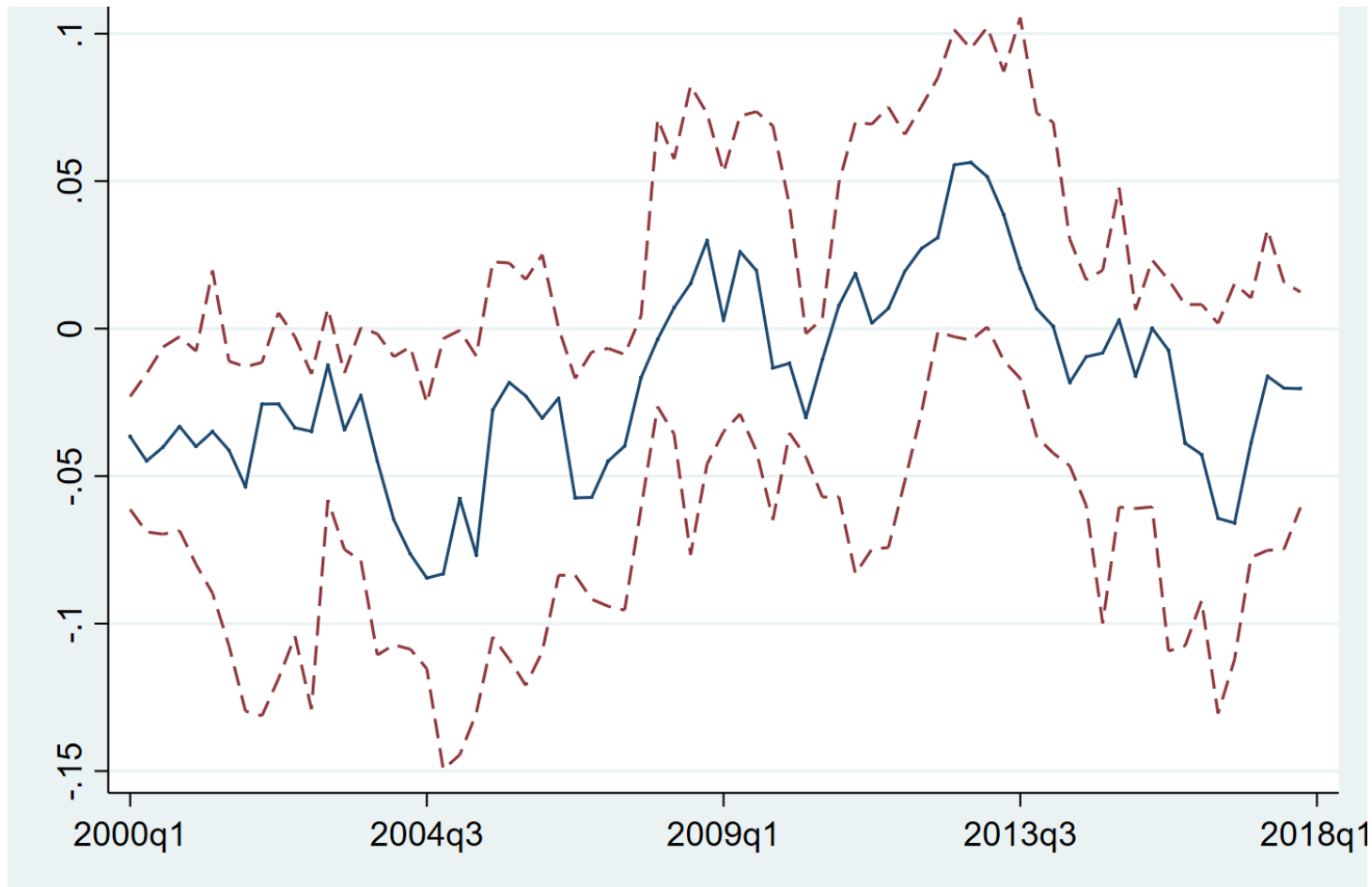
See Forbes (2018)
for details.

	CPI Inflation	Core Inflation
<i>Inflation</i>	0.670***	0.462***
<i>Expectations</i>	(0.073)	(0.052)
<i>Lagged</i>	0.646***	0.704***
<i>Inflation</i>	(0.034)	(0.024)
<i>Domestic</i>	0.094***	0.084***
<i>Output Gap</i>	(0.017)	(0.012)
<i>Real Exchange</i>	-0.020***	-0.013***
<i>Rate</i>	(0.006)	(0.004)
<i>World Output</i>	0.072***	0.043***
<i>Gap</i>	(0.023)	(0.012)
<i>World Oil</i>	0.002***	0.001**
<i>Prices</i>	(0.001)	(0.000)
<i>World Commodity</i>	0.010***	0.003**
<i>Prices</i>	(0.002)	(0.001)
<i>World PPI</i>	0.114***	0.019
<i>Dispersion</i>	(0.034)	(0.028)
<i>Adj. R2</i>	<i>0.55</i>	<i>0.63</i>
<i># observations</i>	<i>3002</i>	<i>3038</i>

**But
important
differences
across
individual
countries**



Changes across Time: Rolling Coefficient on Exchange Rate

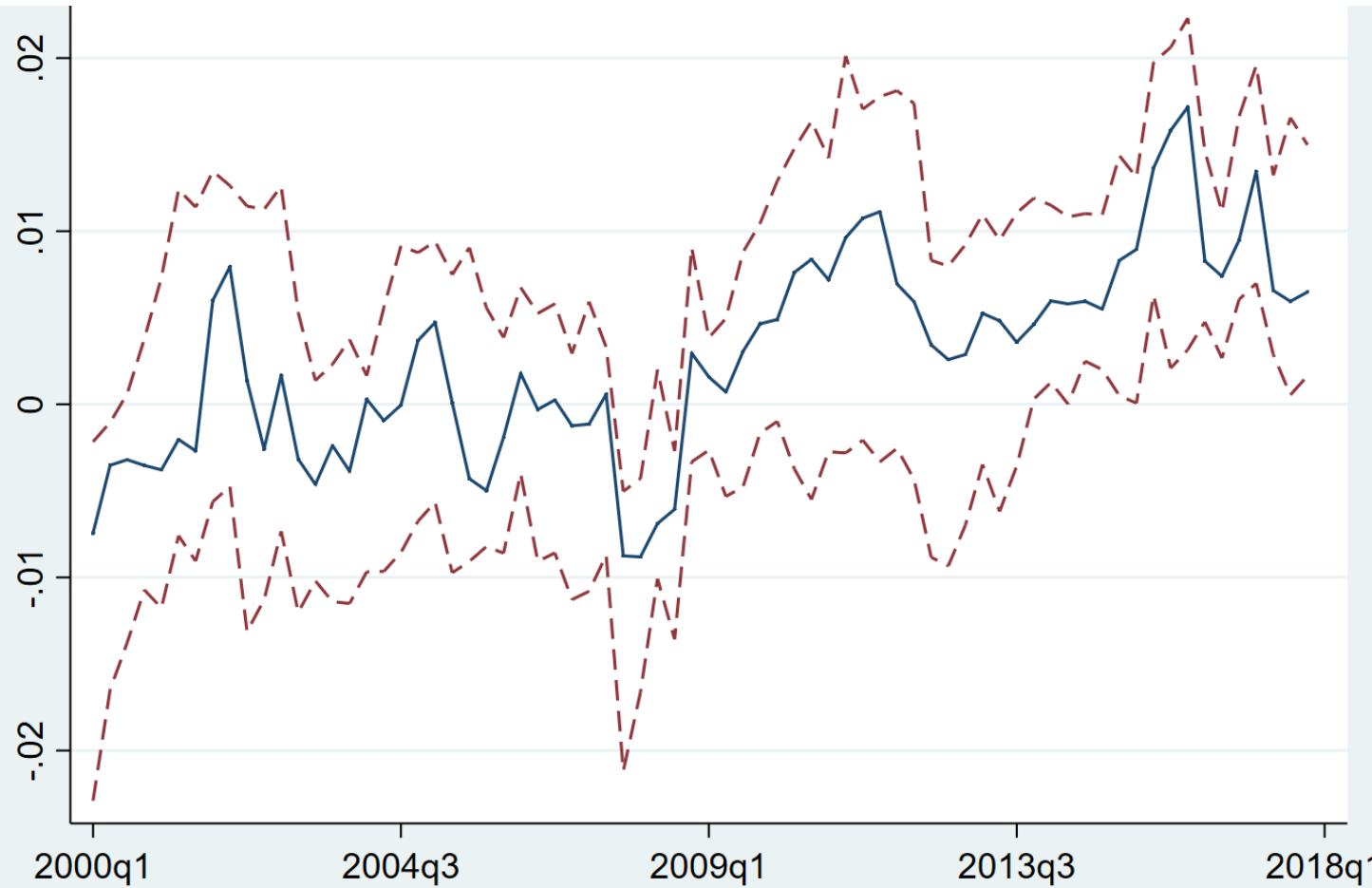


Median coefficient from rolling regressions using 8-year windows for quarterly, annualized CPI inflation from 1990-2017, estimated separately for each country. Dashed lines are the 33% and 66% of the distribution. See Forbes (2018) for more details.



Changes across Time: Rolling Coefficient on Commodity Prices

Commodity price inflation measured relative to CPI inflation

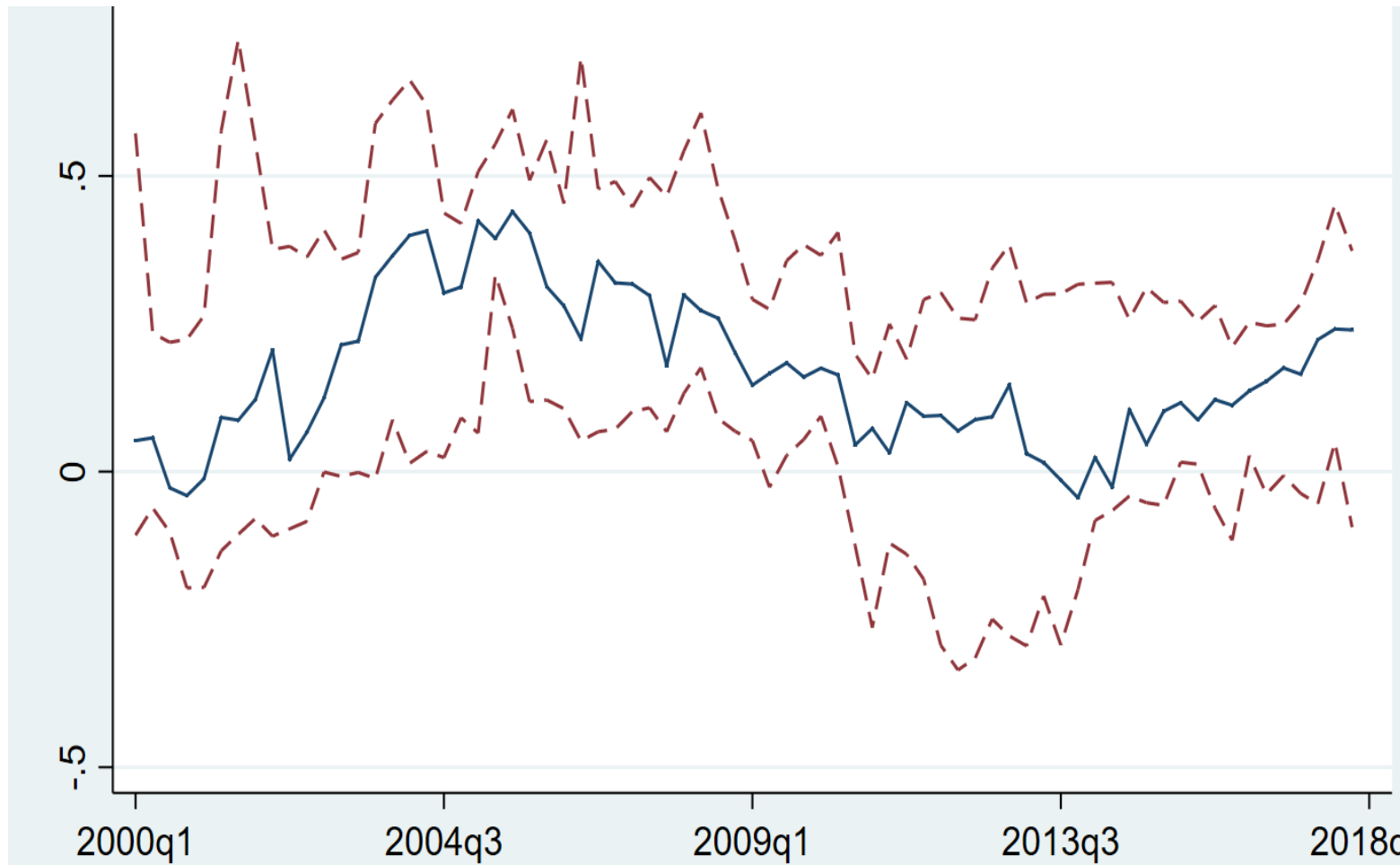


Median coefficient from rolling regressions using 8-year windows for quarterly, annualized CPI inflation from 1990-2017, estimated separately for each country. Dashed lines are the 33% and 66% of the distribution. See Forbes (2018) for more details.



Changes across Time: Core Inflation Rolling Coefficient on Domestic Output Gap

Domestic output gap measured by principal component of 7 measures of slack

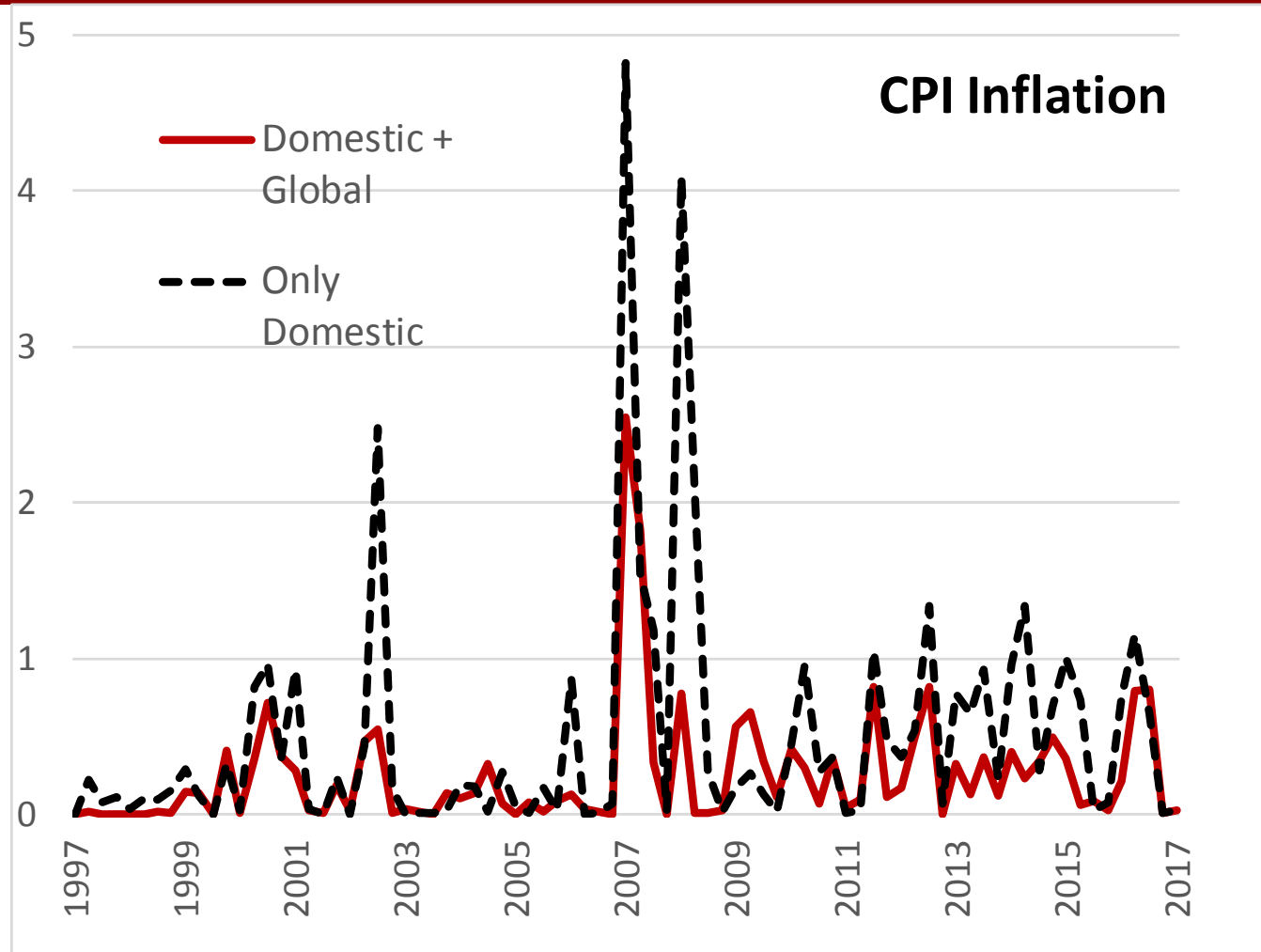


Median coefficient from rolling regressions using 8-year windows for quarterly, annualized CPI inflation from 1990-2017, estimated separately for each country. Dashed lines are the 33% and 66% of the distribution. See Forbes (2018) for more details.



Global Variables: Reduce Errors

Median of squared difference between actual and predicted inflation in model estimated for each country with and without global variables



Regressions of quarterly, annualized inflation from 1990-2017 for 43 countries. Post is period 2007-2017.

	CPI Inflation	Core Inflation
<i>Inflation Expectations</i>	0.592***	0.416***
<i>Lagged Inflation</i>	0.682***	0.750***
<i>Domestic Output Gap</i>	0.115***	0.116***
<i>Real Exchange Rate</i>	-0.025***	-0.018***
<i>World Output Gap</i>	0.027	0.037
<i>World Oil Prices</i>	0.002***	0.001**
<i>World Commodity Prices</i>	0.002	0.002
<i>World PPI Dispersion</i>	0.301***	0.012
<i>Post * Inflation Expectations</i>	0.188**	0.165***
<i>Post * Lagged Inflation</i>	-0.116	-0.154***
<i>Post * Domestic Output Gap</i>	-0.052	-0.078**
<i>Post * Real ER</i>	0.008	0.008
<i>Post * World Output Gap</i>	0.122**	0.044
<i>Post * World Oil</i>	0.000	0.000
<i>Post * World Commodities</i>	0.014***	0.001
<i>Post * World PPI Dispersion</i>	-0.322***	0.008
Adj. R2	0.56	0.63
# observations	3002	3038
Global variables jointly signif?	154.3***	40.0***

See Forbes (2018) for details.



Conclusions

- **Global factors should be included more comprehensively in inflation models**
 - Allow parameters to evolve over time
- **Which global factors are most important?**
 - Exchange rates important, but roles of different factors varies across countries and time
 - Over last decade increased role for: commodity prices, global slack
 - Especially for CPI inflation
 - In some countries: decreased role of domestic slack
 - Especially in advanced economies with own currencies
- **Don't throw out the astrolabe**
 - Key variables in inflation model still relevant

