Gains from Commitment: The Case for Pegging the Exchange Rate

Kai Arvai and Ricardo Duque Gabriel

Banque de France

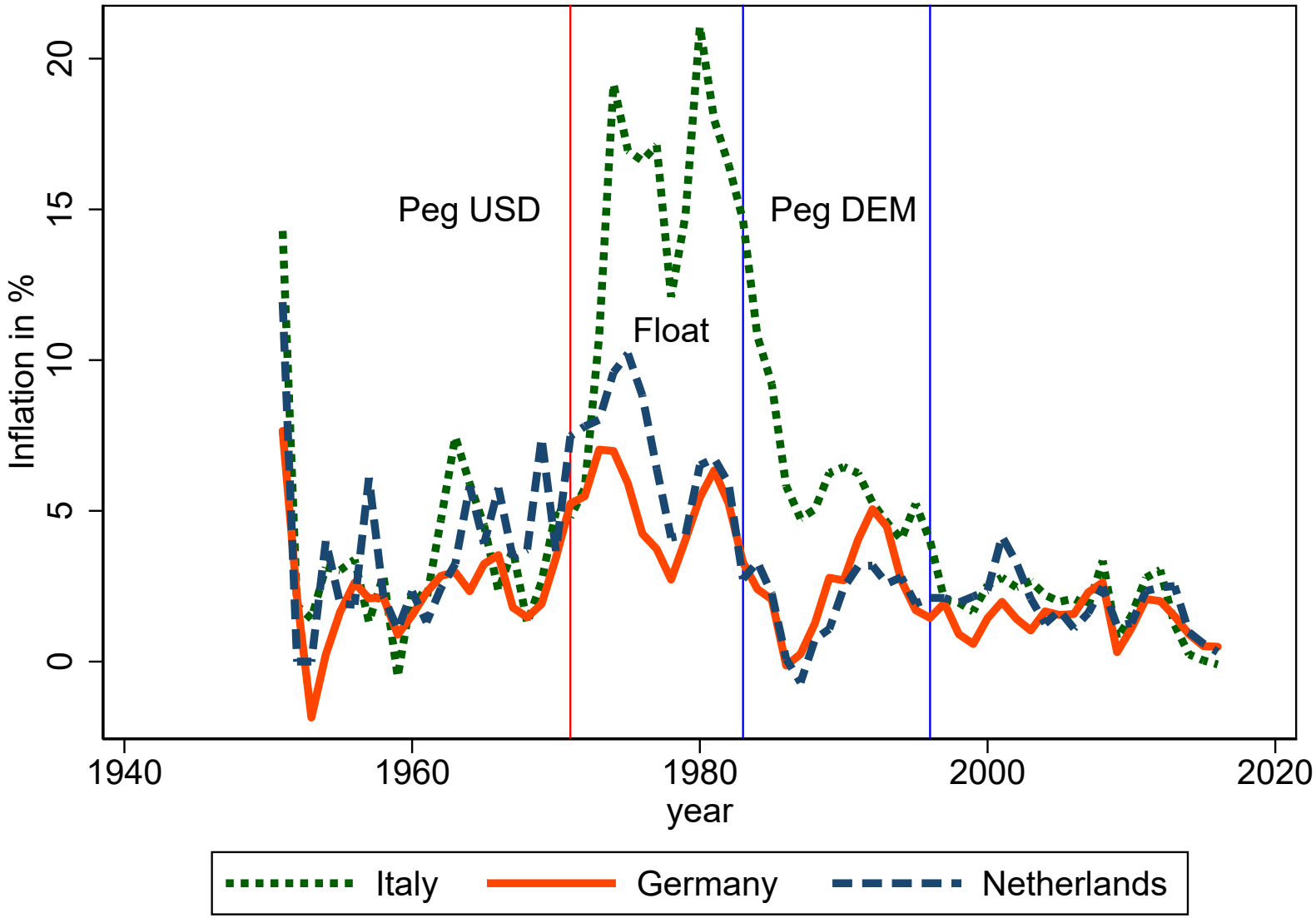
May 30, 2022

Introduction

- Should the exchange rate be fixed or flexible?
- Still an open debate in international economics
- Potential benefits of pegging: Lower and more stable inflation rates

This paper: Is this true? Quantify how much inflation lowers when pegging. Does the effect differ between countries? Why?

Motivation


Peg USD
Float
Peg DEM
Inflation in %
0
5
10
15
20
1940
1960
1980
2000
2020
year
Italy
Germany
Netherlands

Contribution Model

Model:

- Build a model with different monetary regimes (float, peg, union) where countries differ in their credibility.
- Low credibility means high likelihood of acting under discretion, implies high and volatile inflation

Contribution Model

Model:

- Build a model with different monetary regimes (float, peg, union) where countries differ in their credibility.
- Low credibility means high likelihood of acting under discretion, implies high and volatile inflation

We derive testable implications of the model:

1. Inflation $\downarrow$ *permanently* when pegging to a more credible country
2. Inflation volatility $\downarrow$ *permanently* when pegging
3. GDP growth $\uparrow$ *in the short run* when pegging
4. Effect depends on credibility

Contribution Empirics

Empirics:

- Provide an estimate of credibility for each country over time using the model
- Assemble a dataset of macro variables and 515 regime shifts for 169 countries between 1950 and 2015
- Inv. prob. weighted regression to get effect of exchange rate regime shift on inflation and economic activity
- Provide evidence for model implications:
  1. Inflation $\downarrow$ by 3.5% on average permanently
  2. Volatility $\downarrow$ by 1.2% on average permanently
  3. Cumulative GDP growth $\uparrow$ by 3% on average in first three years
  4. For each perc. point less credibility inflation reduction is 0.12% larger

Related Literature

- Model based on Chari et al. (2020), extend it by introducing time-varying credibility in spirit of Schaumburg and Tambalotti (2007)
- Empirical part uses exchange rate classification of Ilzetzki et al (2019)
- Itskhoki and Mukhin (2021): No change of properties in inflation after Bretton Woods for composite of large developed countries
- Older literature: Mussa (1986), Barro and Gordon (1983)

Model Structure

Follow Chari et al. (2020). Two country model version

Firms

- 2 goods, Traded (T) and Non-traded (N), imperfect substitutes
- Shocks to the N sector only
- Prices set one period in advance in the N sector, flex prices in T
- **Monopolistic markets** with time-varying markups

Model Structure

Follow Chari et al. (2020). Two country model version

Firms

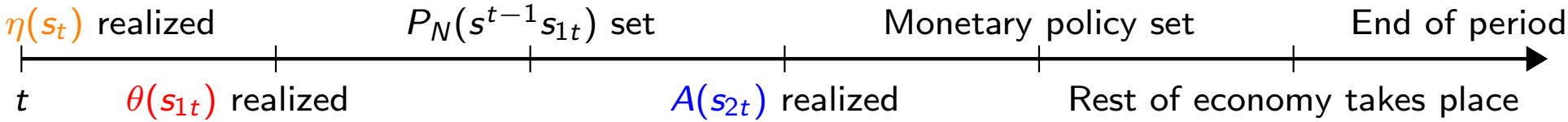
- 2 goods, Traded (T) and Non-traded (N), imperfect substitutes
- Shocks to the N sector only
- Prices set one period in advance in the N sector, flex prices in T
- **Monopolistic markets** with time-varying markups

Households

- Consume both types T and N
- Supply labor
- Cash in advance constraint implies costs of inflation

Main extension: **Time-varying credibility** for central bank

Set up and Timing



Shocks only to N-sector, country specific

- Monetary institution $\eta(s_t)$ determined. Commitment=0 with probability ξ_t, Discretion=1
- Markup shock $\theta(s_{1t})$
- Productivity shock $A(s_{2t})$

Monetary Policy: Intuition

Central banks maximizes utility of agents under commitment or discretion

under discretion:

- central bank takes prices as given (moves after firms set their prices) and tries to inflate away inefficient markups
- firms anticipate this move and increase prices in advance. in equilibrium higher inflation rate for the economy

Monetary Policy: Intuition

Central banks maximizes utility of agents under commitment or discretion

under discretion:

- central bank takes prices as given (moves after firms set their prices) and tries to inflate away inefficient markups
- firms anticipate this move and increase prices in advance. in equilibrium higher inflation rate for the economy

under commitment:

- central bank knows how firms would react, therefore commits not to react to markup shocks, but only productivity shocks
- this way the central bank eliminates distortions from rigid prices and ensures low inflation rates, follows Friedman rule

$\Rightarrow$ The less credible a central bank, the higher inflation on average.

Different monetary regimes

Flexible exchange rate

- Each country conducts monetary policy independently
- country-specific credibility ξ

Fixed exchange rate

- Client country fixes exchange rate to anchor, monetary policy as in anchor country
- Inherits anchor's credibility ξ^{Anch}

Currency Union

- Common central bank conducts monetary policy for the average of the union
- Inherits credibility of most credible country

Average inflation is a function of credibility (and markups, productivity, trade openness...). Lower credibility implies higher inflation.

Testable Implications

1. If a country pegs its currency to a more credible anchor country, its inflation and interest rates fall permanently

Testable Implications

1. If a country pegs its currency to a more credible anchor country, its inflation and interest rates fall permanently
2. If a country pegs its currency to a more credible country, output rises. [Reason: Cash in advance constraint implies costs for inflation. lower inflation enables more consumption, output $\uparrow$]

Testable Implications

1. If a country pegs its currency to a more credible anchor country, its inflation and interest rates fall permanently
2. If a country pegs its currency to a more credible country, output rises. [Reason: Cash in advance constraint implies costs for inflation. lower inflation enables more consumption, output $\uparrow$]
3. Inflation volatility under pure commitment is lower than under pure discretion. If a country pegs its currency to a more credible anchor country, the volatility of inflation goes down if the anchor country is sufficiently credible

Testable Implications

1. If a country pegs its currency to a more credible anchor country, its inflation and interest rates fall permanently
2. If a country pegs its currency to a more credible country, output rises. [Reason: Cash in advance constraint implies costs for inflation. lower inflation enables more consumption, output $\uparrow$]
3. Inflation volatility under pure commitment is lower than under pure discretion. If a country pegs its currency to a more credible anchor country, the volatility of inflation goes down if the anchor country is sufficiently credible
4. The less credible a client country is, the larger the reaction in inflation and output if it pegs to a credible anchor.

Calibration

Focus on Italy and Germany, calibrate trade openness real rates etc.

- Calibrate shock process (Credibility ξ_t and markup θ_t, iid) to match empirical moments
- method of simulated moments
- match Level of inflation over time for both countries
- match inflation volatility over time for both countries
- gives a time series for the probability of acting under commitment for each country (and a shock process for markups)

Calibration Results

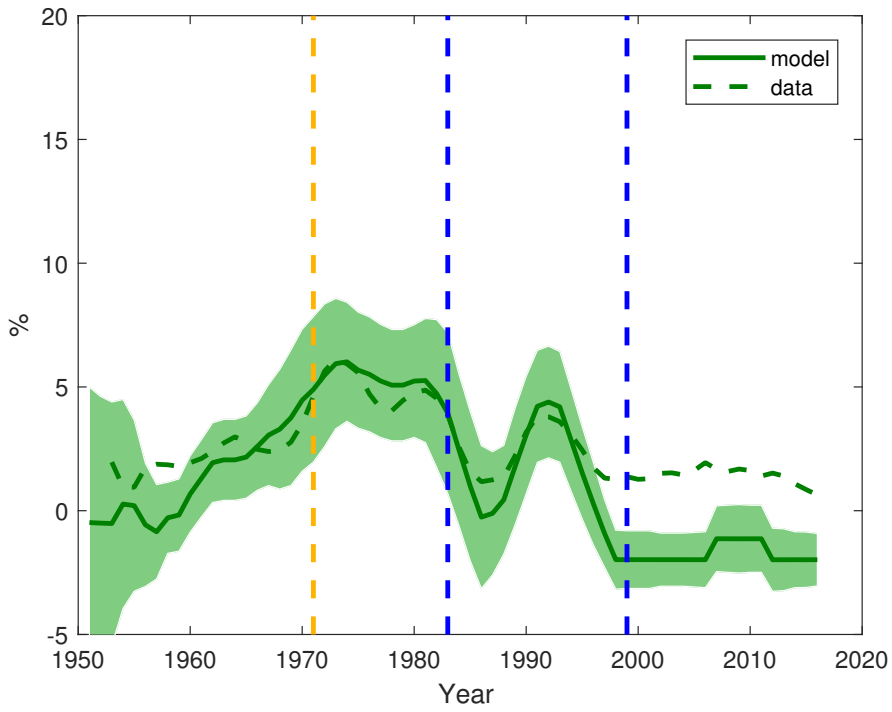
Table: Inflation under all regimes, model and data

		Float (1972-1985)		Peg (1986-1999)		Union (2000-end)	
		mean	std. dev.	mean	std. dev.	mean	std. dev.
ITA	π data	14.5%	0.04	4.5%	0.02	1.8%	0.01
	π model	13.8%	0.04	4.6%	0.02	0%	0.01
	ξ (SMM)	4.01%		9.19%		59.22%	
GER	π data	4.6%	0.02	2.1%	0.02	1.4%	0.01
	π model	4.9%	0.03	1.1%	0.02	-1.7%	0.01
	ξ (SMM)	8.12%		51.77%		94.05%	

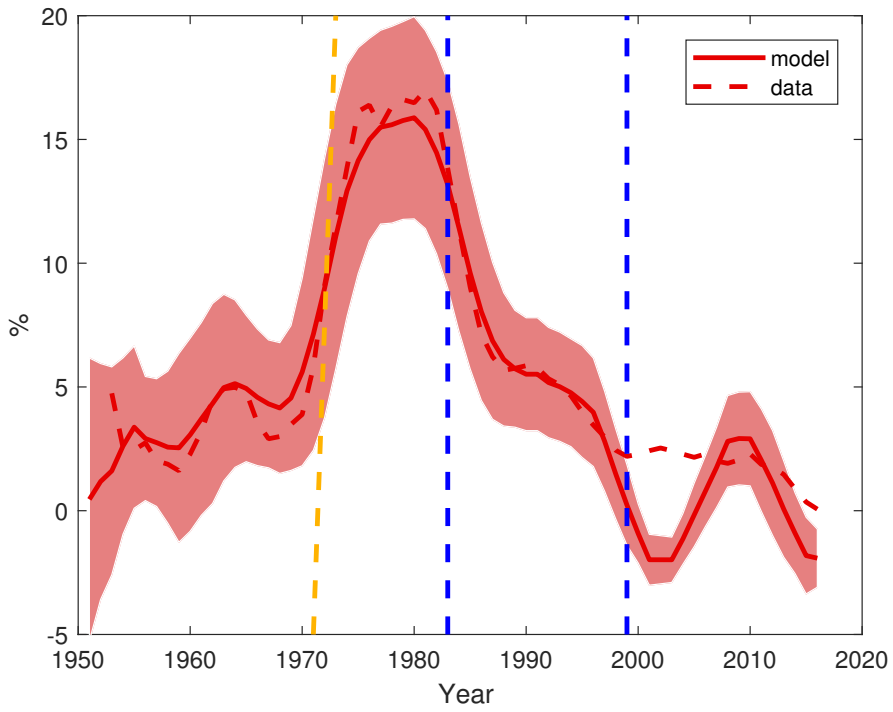
Results and Data Fit

Figure: π_N in the model

(a) π_N Germany



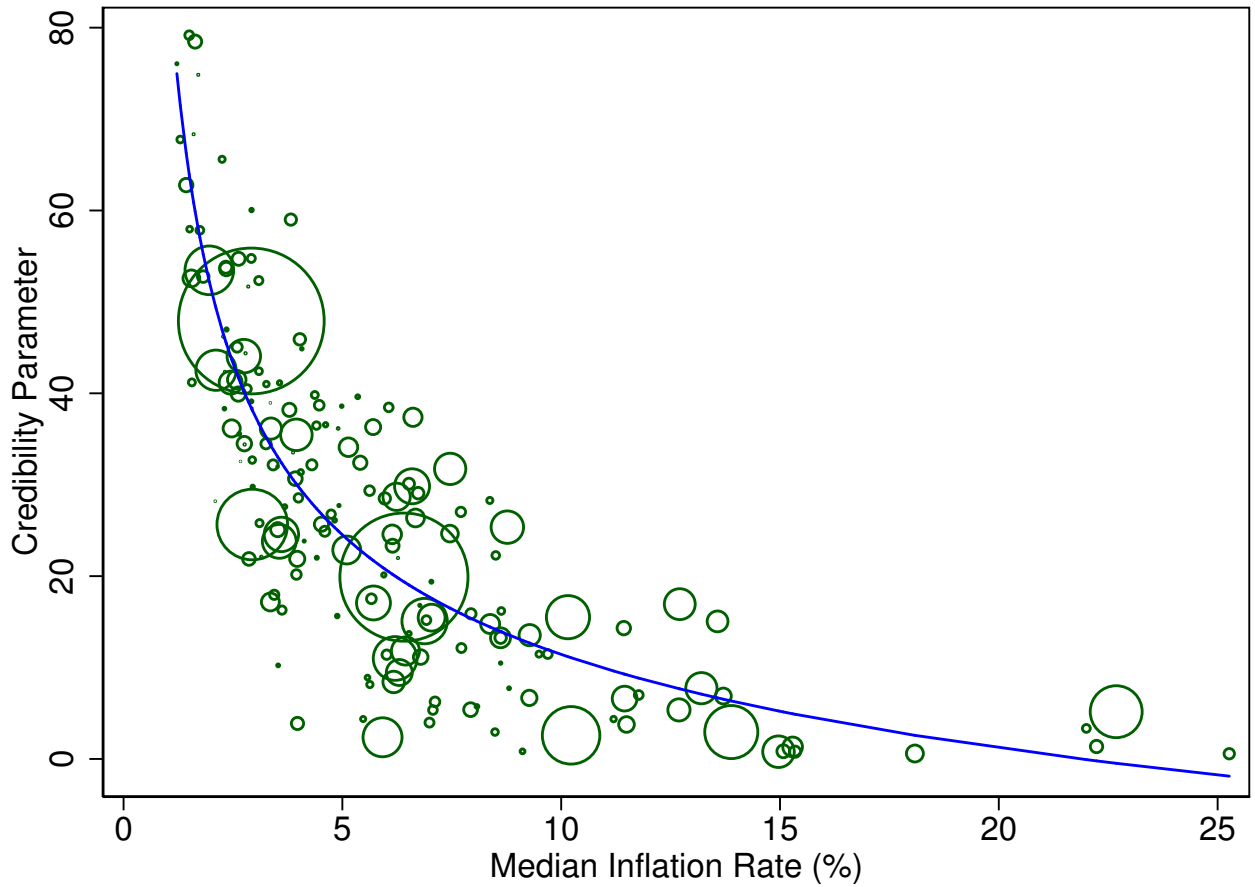
(b) π_N Italy



Shaded area indicates one standard deviation band of simulation

Credibility for all Countries

Figure: Relation between credibility measure and median inflation in our sample



Empirics: Overview

- Our dataset: Macro variables of 169 countries, 1950-2015, Source: IFS
- Combined with broad exchange rate regime classification of Ilzetzki et al (2019)
- Add our credibility measure

Empirics: Overview

- Our dataset: Macro variables of 169 countries, 1950-2015, Source: IFS
- Combined with broad exchange rate regime classification of Ilzetzki et al (2019)
- Add our credibility measure

- What happens to inflation and GDP if countries go to more fixed or flexible regime?
- Descriptive analysis (event studies)

Empirics: Overview

- Our dataset: Macro variables of 169 countries, 1950-2015, Source: IFS
- Combined with broad exchange rate regime classification of Ilzetzki et al (2019)
- Add our credibility measure

- What happens to inflation and GDP if countries go to more fixed or flexible regime?
- Descriptive analysis (event studies)

- Inverse probability weighted regression
- Idea: Predict exchange rate shifts (with credibility and other variables) and re-weight the regression

Summary Statistics

	Float		Peg		Union	
	mean	std. dev.	mean	std. dev.	mean	std. dev.
Inflation	11.78	12.31	5.59	6.02	4.19	6.62
Obs	3997		2258		1211	
GDP growth	4.18	4.78	4.57	4.81	3.74	6.09
Obs	3997		2258		1211	
Int. rate	9.97	7.53	5.40	2.78	3.88	1.29
Obs	1836		861		325	

Event Study

	Float				Peg			
	mean		std. dev.		mean		std. dev.	
	pre	post	pre	post	pre	post	pre	post
inflation	11.82	17.35	9.42	14.69	17.84	11.02	15.02	9.58
gdp	4.19	4.25	4.85	4.13	3.42	4.82	4.82	3.36
Bills	9.99	12.80	4.95	7.57	13.87	10.62	7.88	5.34

Inverse probability weighted regression

- Decisions to shift exchange rate regime are endogenous (identification problem)
- $\Rightarrow$ Predict these shifts by estimating the probability of a regime change. Then re-balance the sample and put greater emphasis on random regime changes.

1st stage is a logit model and estimates the probability:

$$log\left(\frac{P[d_{i,t}^{P,F,U}=1|Z_{i,t-1}]}{P[d_{i,t}^{P,F,U}=0|Z_{i,t-1}]}\right)=\xi_i+\beta Z_{i,t-1}+\varepsilon_{i,t} \quad (1)$$

First Stage Results

	Float	Peg	Union
credibility	-0.03***	-0.02***	0.00
	(0.01)	(0.01)	(0.01)
l1.CPI	1.18**	5.24***	7.61***
	(0.60)	(0.53)	(2.63)
l2.CPI	-1.21**	-5.18***	-5.67**
	(0.59)	(0.52)	(2.32)
l1.rGDP	-1.06	-3.15**	0.27
	(1.38)	(1.37)	(3.98)
l2.rGDP	-0.58	0.54	-3.95
	(1.27)	(1.32)	(3.70)
Pseudo R^2	0.04	0.08	0.10
AUC	0.67	0.71	0.80
	(0.02)	(0.02)	(0.02)
Observations	6018	6018	6018

weights to re-sample are $w_{i,t} = \frac{d_{i,t}}{p_{i,t}} + \frac{1 - d_{i,t}}{1 - p_{i,t}}$.

In general, this puts a stronger emphasis on low-inflation countries

Second Stage: Main Regression

- change is measured as its "**average treatment effect**"
- conditional local projection forecast

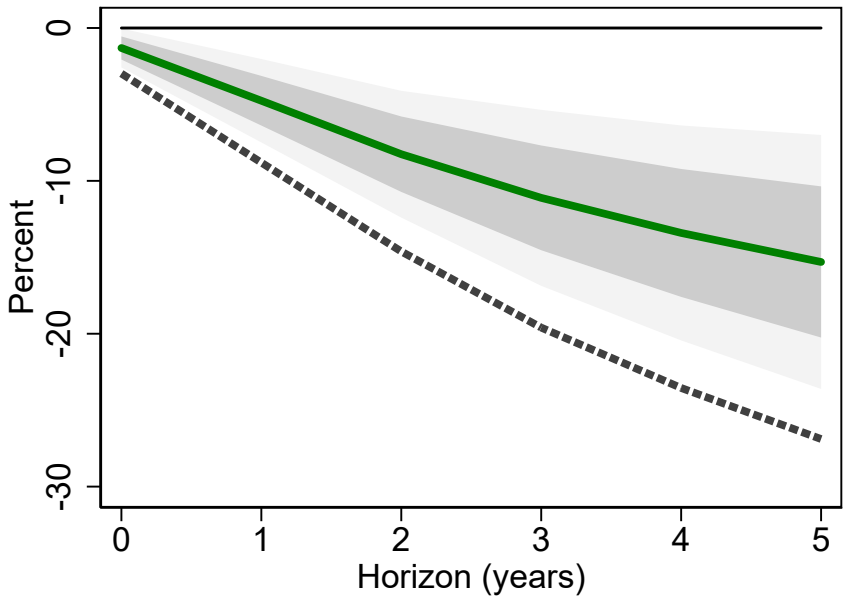
$$\Delta_h y_{i,t+h} = \xi_i^h + \gamma_t^h + \Gamma^h d_{i,t}^{P,F,U} + \phi_h Z_{i,t-k} + \epsilon_{i,t+h}, \quad \forall h \in \{0, ..., 5\} \quad (2)$$

$\Delta_h y_{i,t+h} = log(y_{i,t+h}) - log(y_{i,t-1})$ is the conditional forecast of the **cumulative growth in percent** in one of the outcome variables (real GDP or the price level)

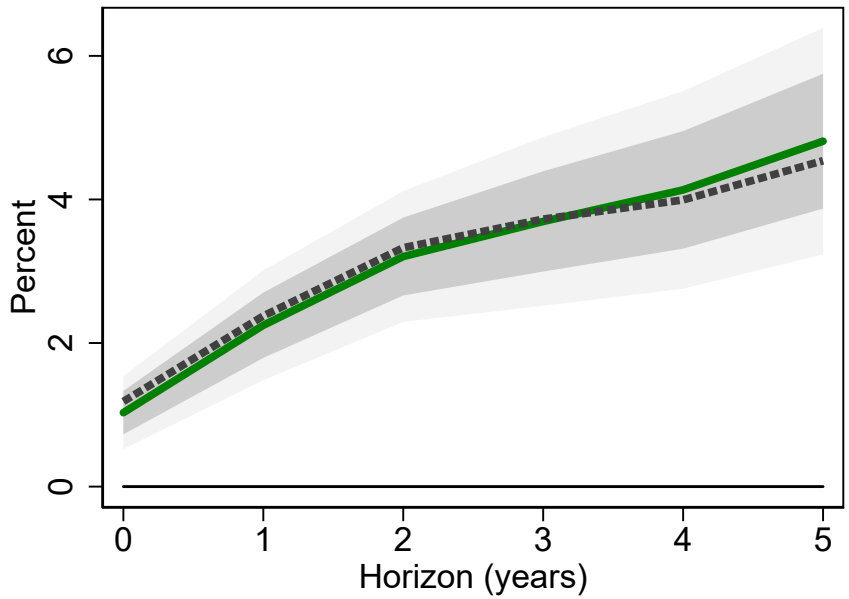
Regression Results Peg

Figure: IPWRA Results of a pegging event

(a) Cumulative price level change



(b) Cumulative real GDP change



Dotted line indicates OLS, solid line the reweighted sample. Shaded areas are 68% and 90% CI) Float

Inflation Volatility and Credibility

interaction term between the variable of interest and the credibility

$$\Delta y_{i,t+5} = \Gamma d_{i,t}^{P,F,U} + \Omega d_{i,t}^{P,F,U} \times \xi_i + \omega \xi_i + \phi Z_{i,t-k} + \gamma_t + \epsilon_{i,t} \quad (3)$$

$$\Delta y_{i,t+5} = \frac{std(\pi_{i,t+1:t+5}) - std(\pi_{i,t-4:t})}{std(\pi_{i,t-4:t})}$$

Table: The Credibility Channel Effects

	Real GDP		Price Level		Inflation Volatility	
Peg (Γ)	4.92^{***}	4.41^{**}	-17.13^{***}	-29.66^{***}	-1.12^{**}	-2.00^{**}
	(0.95)	(1.93)	(5.52)	(9.34)	(0.51)	(0.90)
Interaction (Ω)		0.02		0.59^{**}		0.04^{*}
		(0.08)		(0.24)		(0.02)
Observations	6018	6018	5973	5973	4592	4592

Conclusion

- A shift in the exchange rate regime has effects on the economy
- Especially countries with low credibility and high inflation rates can peg their currency to a stable anchor and reduce inflation
- We provide an estimate of the quantitative magnitude of these effects

Conclusion

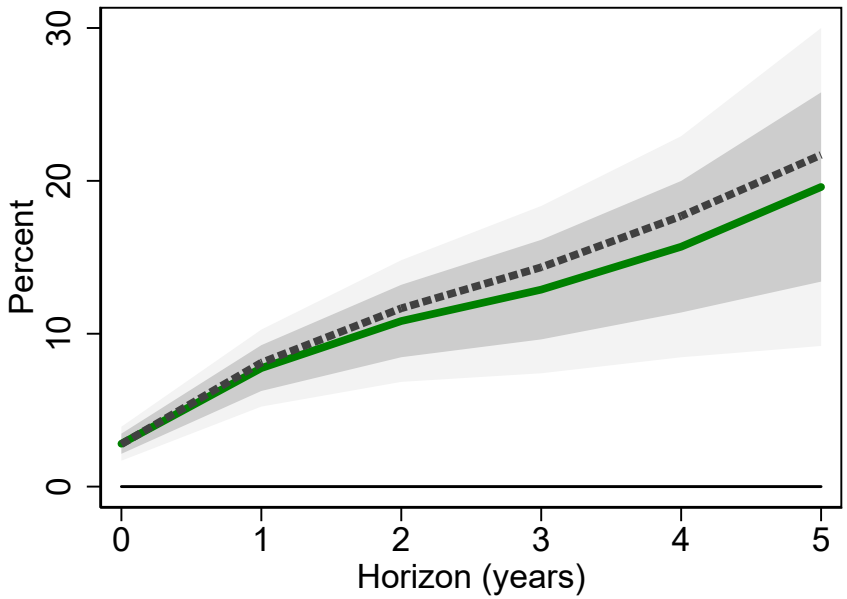
- A shift in the exchange rate regime has effects on the economy
- Especially countries with low credibility and high inflation rates can peg their currency to a stable anchor and reduce inflation
- We provide an estimate of the quantitative magnitude of these effects

1. Inflation $\downarrow$ by 3.5% on average permanently
2. Volatility $\downarrow$ by 1.2% on average permanently
3. Cumulative GDP growth $\uparrow$ by 3% on average in first three years
4. For each perc. point less credibility inflation reduction is 0.12% larger

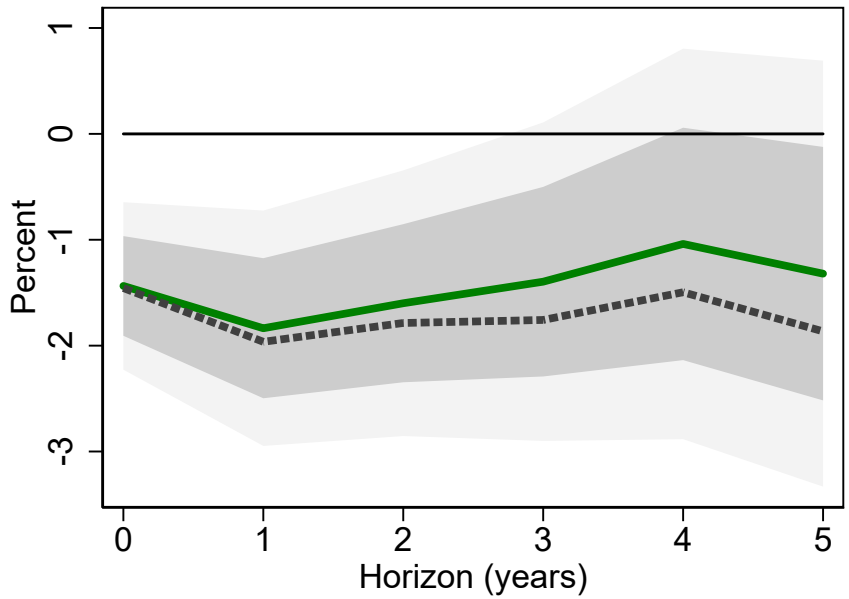
Regression results float

Figure: IPWRA Results of a floating event

(a) Cumulative price level change



(b) Cumulative real GDP change



Dotted line indicates OLS, solid line the reweighted sample. Shaded areas are 68% and 90% CI) Back