

Peruvian domestic inflation response to changes in international commodity prices

Gerson Cornejo, David Florian y Alan Ledesma

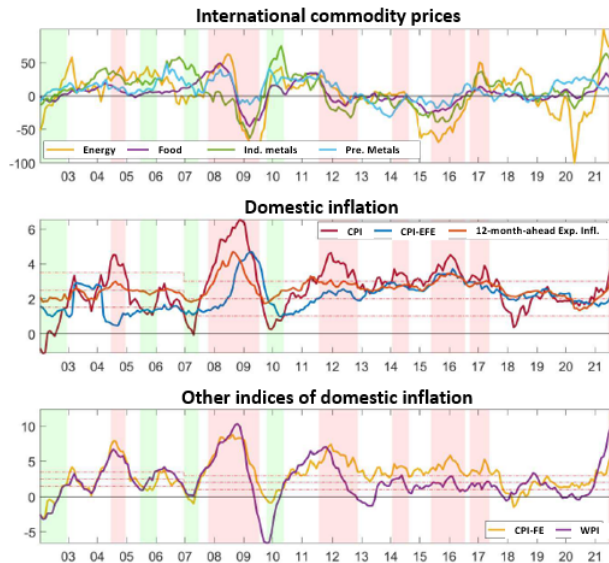
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Estructure

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Motivation

- Commodity prices seem to lead domestic inflation
- How relevant are these international prices for domestic inflation?
- How persistent are these effects?
- Is there any implication for monetary policy?



Background

- Recent empirical evidence identifies significant effects of variations in commodity prices on inflation
 - **Advanced economies:** Cecchetti y Moessner, 2008; Baek y Koo, 2010; Rigobon, 2010; Ferrucci et al, 2012; Davidson et al., 2016; García Germán et al., 2016; Sekeni y Tsuruga, 2018
 - **Emerging and developing economies:** Durevall et al., 2013; Lin y Xu, 2019; Chen et al., 2020
- WEO FMI, 2011 and Furcei et al., 2016 identify a greater effect in developing and emerging economies
 - higher share of commodities in the consumption bundle
 - higher dependency on energy commodities; and,
 - less anchored inflation expectations

Since the main objective of the Central Bank is price stability, identifying this relationship is crucial for the appropriate design of monetary policy

Data

- **Two** blocks of variables

- (i) **Exogenous block** (international variables): international price indices for energy (C^E), industrial metals (C^{IM}), precious metals (C^{PM}) and agriculture (C^A)
 - (ii) **Endogenous block** (domestic variables): consumer price index for food and energy (P^{FE}), consumer price index excluding food and energy (P^{EFE}), wholesale prices (P^W), exchange rate (S) and twelve-month-ahead inflation expectations ($\Delta_{12}P^{exp}$)
- All variables, but expectations, are taken in seasonal log differences: $y_t = \log(x_t/x_{t-12})100$

Methodology

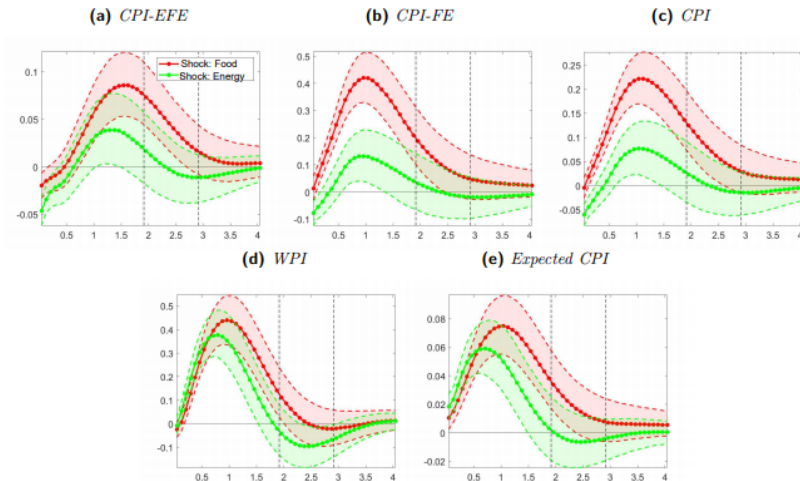
- **Bayesian VAR** with an **Independent Normal-Wishart** prior
 - Gains: **flexibility** — an additional hyperparameter can be specified to calibrate the impact of the domestic economy on the world market
 - Cost: higher demand of **computational resources** and **unstable Data Marginal Likelihood** (DML)
- The prior is specified following simultaneously the Minnesota structure ([Litterman, 1986](#)), sum of coefficients ([Doan et al., 1984](#)) and initial dummy observation ([Sims, 1993](#))
- Hyperparameters search: Max. DML (in a versión with the **Jeffrey's** diffuse *prior*)
- We used the BEAR toolbox ([Dieppe et al., 2018](#))

Identification

- Recursive structure to identify exogenous block
- Signs and zeros to identify domestic block
- All restrictions are contemporaneous

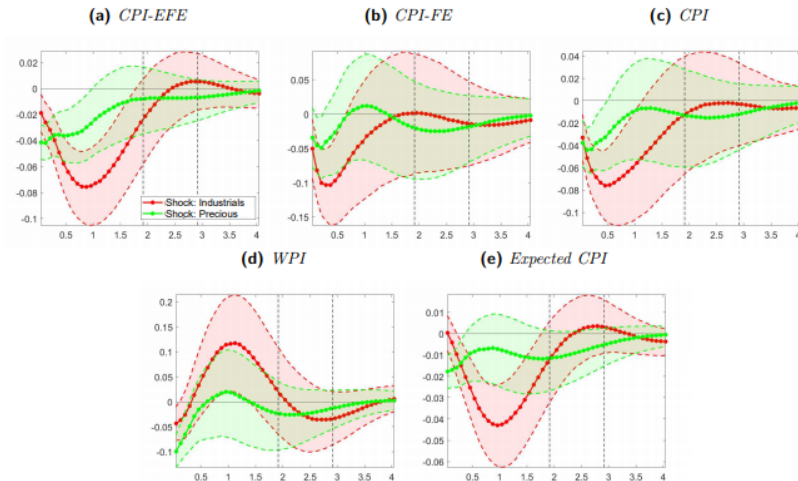
	Shock on...					C^F	C^{PM}	C^{IM}	C^E
	p^{EFE}	p^W	S	$\Delta_{12}P^{exp}$	p^{FE}				
Response from...	p^{EFE}	+	+	+					
	p^W	+	+	+					
	S								
	$\Delta_{12}P^{exp}$	+	+	+					
	p^{FE}		+						
C^F	0	0	0	0	0				
C^{PM}	0	0	0	0	0	0			
C^{IM}	0	0	0	0	0	0	0		
C^E	0	0	0	0	0	0	0	0	

Responses to a 1 S.D. shock to international prices of agriculture (red) and energy (green)



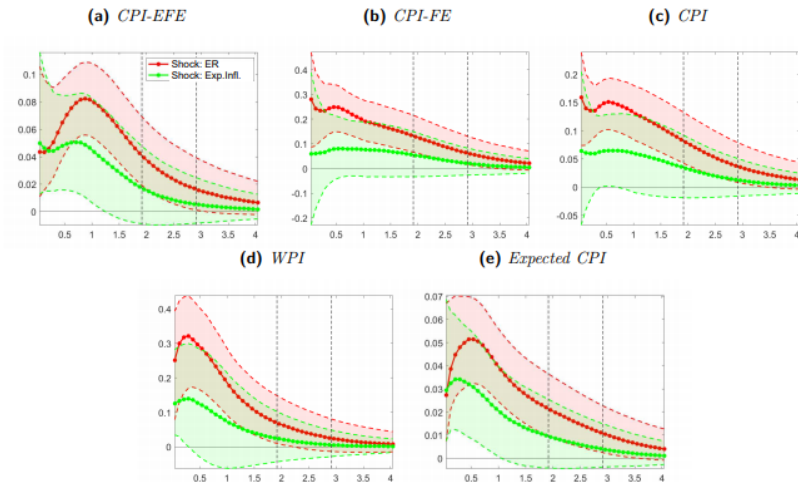
Note. IRFs are calculated for one-standard deviation shocks on food (red) and energy (green) prices. The areas correspond to a credible interval of 68%.

Responses to a 1 S.D. shock to international prices of industrial metals (red) and precious metals (green)



Note. IRFs are calculated for one-standard deviation shocks on industrial (red) and precious (green) metal prices. The areas correspond to a credible interval of 68%.

Responses to a 1 S.D. shock to the exchange rate (red) and expectations (green)



Note. IRFs are calculated for one-standard deviation shocks on the exchange rate (red) and inflation expectations (green). The areas correspond to a credible interval of 68%.

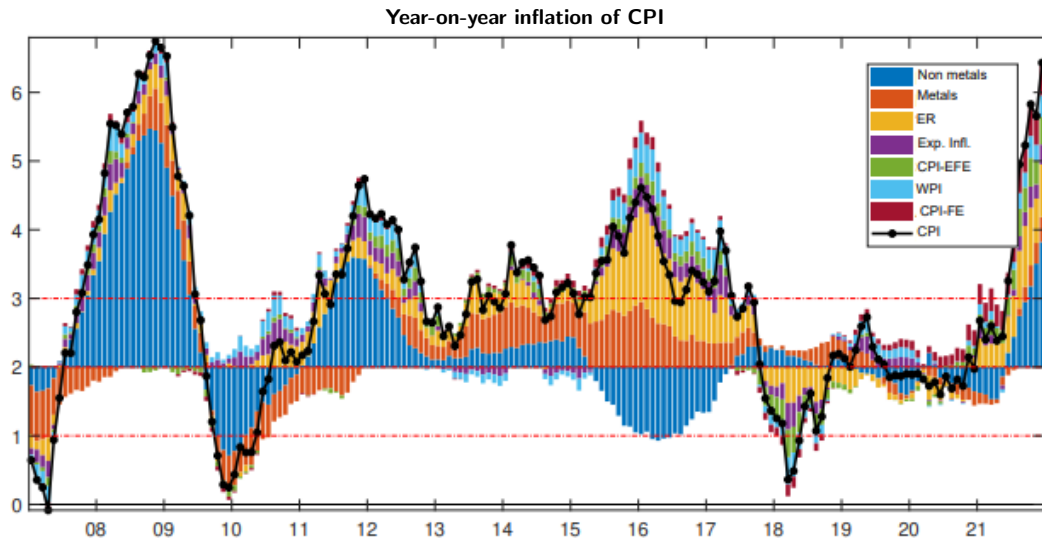
Time to maximum effect

- Highly persistent processes

		Response of ...				
		P^{exp}	P^W	P^{FE}	P^{EFE}	P
Shock to ...	C^E Max.	0.059	0.377	0.132	0.039	0.077
	Month	8	9	11	16	12
	C^F Max.	0.075	0.439	0.421	0.086	0.222
	Month	12	11	11	18	13
	C^{IM} Max.	-0.043	0.117	-0.103	-0.076	-0.076
	Month	11	13	3	10	5
	C^{PM} Max.	-0.018	-0.100	-0.049	-0.042	-0.044
	Month	0	0	2	1	1
	S Max.	0.051	0.321	0.281	0.082	0.159
	Month	6	3	0	10	0
	P^{exp} Max.	0.034	0.139	0.081	0.051	0.065
	Month	2	3	6	8	7

Note. P^e : Expected Prices; P^W : Wholesale Prices; P^{FE} : CPI Food & Energy; P^{EFE} : CPI Ex Food & Energy; P : CPI, S : Exchange Rate; C^E : Energy Prices; C^F : Food Prices; C^{IM} : Industrial Metal Prices; and C^{PM} : Precious Metal Prices. IRFs computed for one-standard deviation shocks.

Historical decomposition: CPI



Historical decomposition: CPI

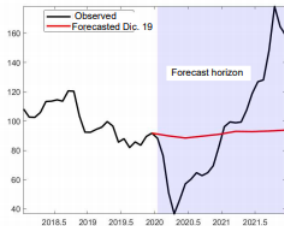
Episodes of CPI inflation rate above 3 % longer than six months

	Prices		Exp.	TC	EFE	FE	WPI	Deviation from target band
	Metal	Non-Metal						
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(A+B+C+D+E+F+G)
Oct.07 - Jun.09	0,20	2,26	0,19	0,24	0,03	0,06	0,18	3,17
Jul.11 - Oct.12	0,07	1,04	0,20	0,24	0,12	0,06	0,19	1,91
Jan.14 - Jul.14	0,54	0,31	0,03	0,31	0,13	0,10	0,02	1,44
May.15 - Jun.16	0,76	-0,79	0,32	1,01	0,17	0,14	0,32	1,92
Sep.16 - May.17	0,37	-0,49	0,28	0,69	0,16	0,04	0,29	1,35
Jun.21 - Dic.21	0,16	0,98	0,19	0,73	0,35	0,40	0,21	3,02
December 2021	0,36	1,82	0,29	0,76	0,40	0,48	0,31	4,43

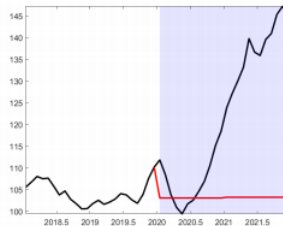
Note. The **deviation from the target band** is the average 12-month inflation in each period minus 2%. The left-hand panel shows the average contributions in each period.

Counterfactual: prepandemic expected commodity international prices

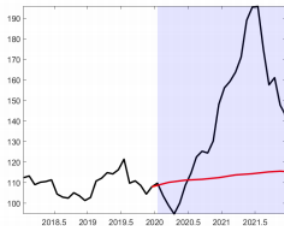
(a) *Energy*



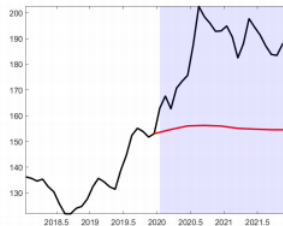
(b) *Food*



(c) *Industrial Metals*



(d) *Precious Metals*



Counterfactual: inflation forecast conditional to pre-pandemic expected commodity prices

(a) *CPI-EFE*



(b) *CPI-FE*



(c) *CPI*



(d) *WPI*



(e) *Expected CPI*



Limitations and pending agenda

- Measures of economic activity (domestic or external) are not part of the system, ...
- ... including them would facilitate the identification of domestic shocks (supply-demand).
- However, activity measures have shown an extraordinary sample variation since 2020.
- **Relevant nonlinearities** might not be sufficiently captured even within a TVP-BVAR
- Viable alternatives are being developed as in [Primiceri, 2020](#)

Conclusions

- Important contribution of international commodity prices in various measures of domestic inflation
- The effects are heterogeneous depending on the origin of the shock
 - Shocks in metal prices generate negative response - potentially linked to productivity on the supply side
 - Shocks in non-metal prices generate a positive response - affect the marginal costs of domestic production
- **Domestic shocks**
 - With an 'agnostic' identification of signs and zeros, some domestic shocks could be identified
 - TC shocks have a significant effect, although the implied pass-through is greater than the values reported in previous studies
 - There is no evidence of significant effects from shocks to expectations
- The exercise suggests that absent the recent spike in commodity prices, domestic inflation would have fallen within the inflation target range
- Responses to commodity shocks are remarkably persistent → *it should be considered in the design of monetary policy*