

# Time series application to inflation in Argentina (2017-2023)

Student: Ian Bounos

Instructor: Dr. Natália de Paula Moreira

Teaching Fellow: Luiz Cantarelli



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# Esquema de presentación

- 1 Conceptual framework
- 2 ARIMA Inflation
- 3 Model with explanatory variables
- 4 Conclusions

1 Conceptual framework

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# Conceptual framework

The high inflation in Argentina is a serious problem that has been ongoing for over ten years. This has sparked public debates about its causes.

- On the one hand, there is a classic **monetarist** approach that argues that the main cause of inflation is the increase in the amount of money in circulation or the decrease in the demand for money. There are more sophisticated versions that also incorporate rational expectations <sup>1</sup>, implying certain consequences in understanding the causes of inflation and its connection to public spending.
- On the other hand, we have alternative theories that seek causality in other variables such as external constraints (foreign exchange scarcity), distributive conflicts, or price rigidities.<sup>2</sup>

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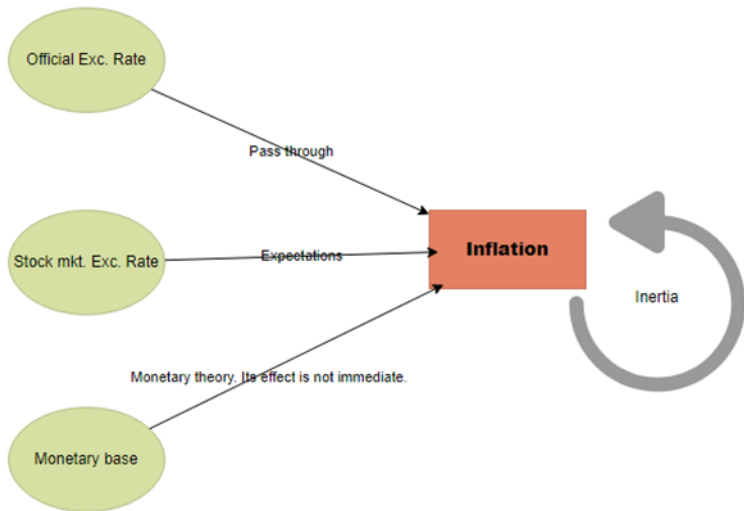
<sup>1</sup>Thomas J. Sargent, 1982. "The Ends of Four Big Inflations"

<sup>2</sup>Heynmann and Leijonhufvud, 1995. "High Inflation: The Arne Ryde Memorial"

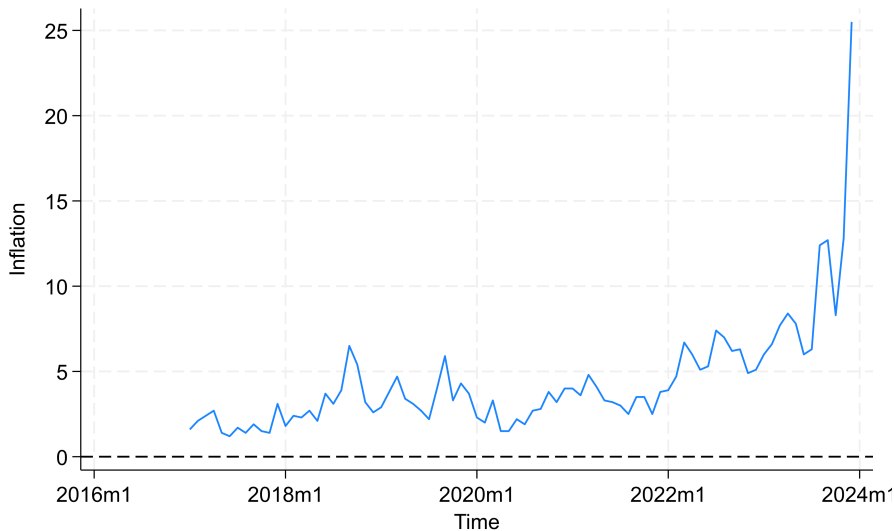
We will use an oversimplified model to put into practice the concepts of the course and, at the same time, represent current discussions about the causes of inflation in Argentina.

- **Inflation:** Inflation can “cause itself” over time. This phenomenon is usually referred to as inflationary inertia. The existence of this phenomenon has been debated.
- **Official Exchange Rate:** a depreciation of the currency typically implies an increase in prices, usually through the rise in tradable goods and its impact on costs. This phenomenon is usually referred to as pass-through.

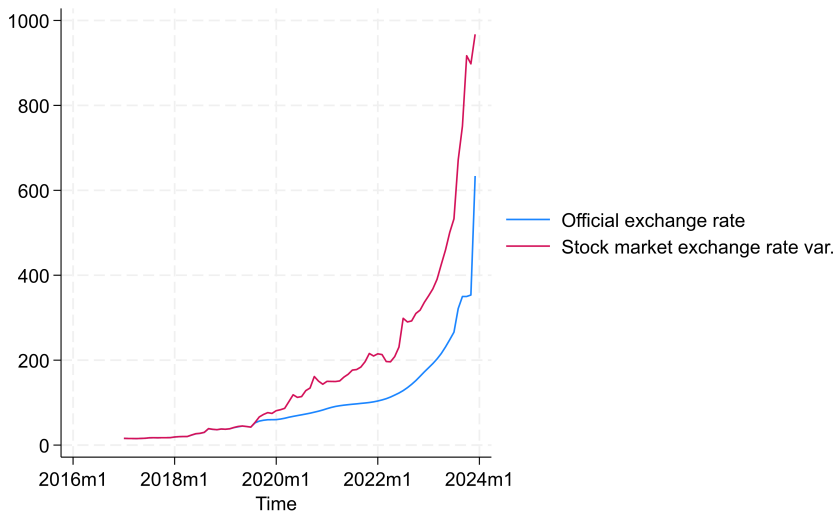
- **Stock market Exchange Rate:** when currency restrictions are in place, the official exchange rate begins to diverge from other parallel markets. The effect of this on prices is usually through its influence on expectations and is context dependent.
- **Monetary Base:** Monetary theory affirms that an increase in the monetary base (simply and informally put , money printing) implies an increase in prices, provided that the demand for money is fixed. This variable has certain limitations. For example, it does not include interest-bearing liabilities of the central bank.

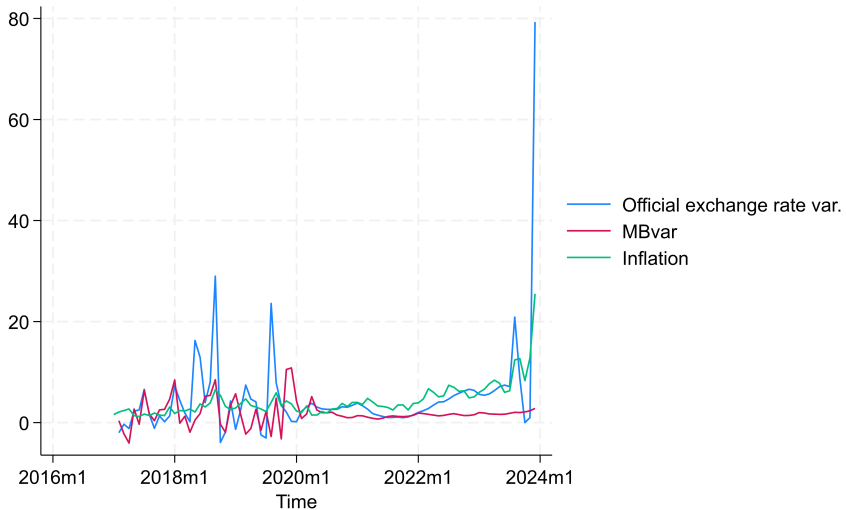


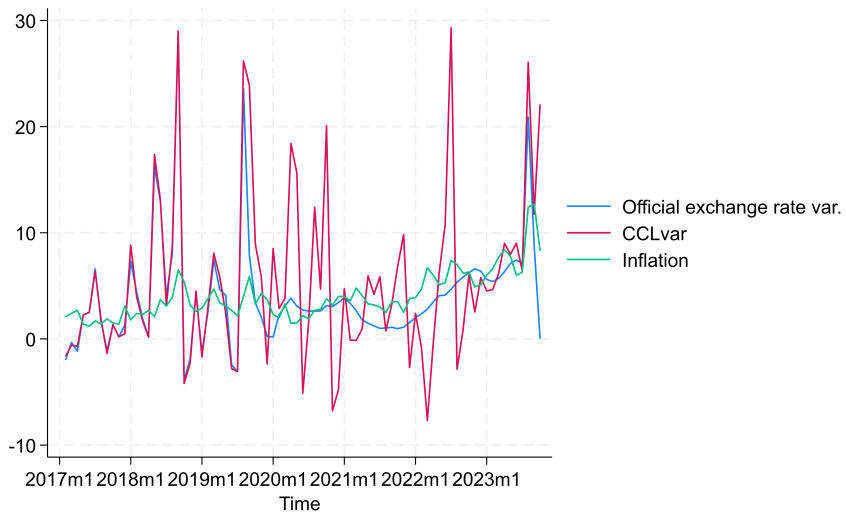
# Inflation











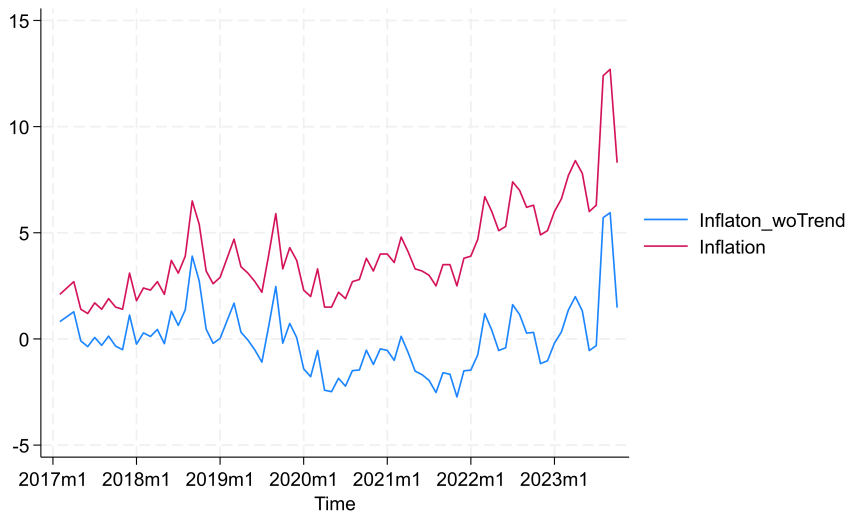
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First, we conduct a univariate ARIMA analysis for inflation to understand its structure without taking into account the influence of other variables. First, we implement DF.

Test	p value
DF standard	0.137
DF trend	0.009

Cuadro: Results

**Conclusion:** if we remove the trend from the variable, it is  $I(0)$ . To be sure, we conduct a DF test for the detrended variable and it gives us a p-value of 0.001.



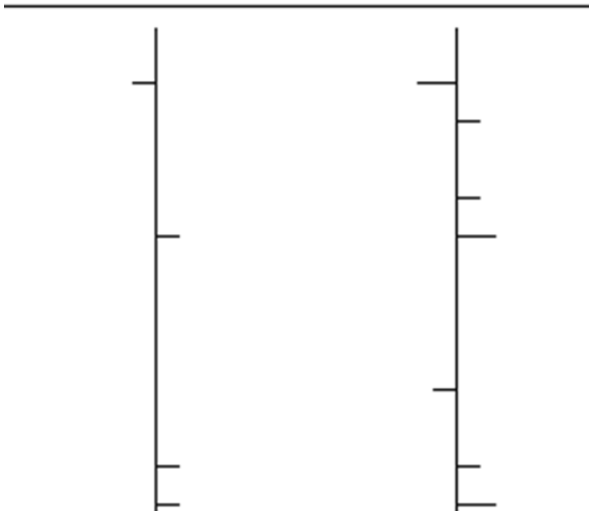
LAG	AC	PAC	Q	Prob>Q	-1      0      1 [Autocorrelation]	-1      0      1 [Partial autocor]
1	0.6489	0.6561	35.382	0.0000		
2	0.3129	-0.1889	43.713	0.0000		
3	0.2668	0.3472	49.849	0.0000		
4	0.2669	0.0230	56.068	0.0000		
5	0.2822	0.2172	63.113	0.0000		
6	0.2858	0.0686	70.433	0.0000		
7	0.1554	-0.2667	72.626	0.0000		
8	0.0250	-0.1280	72.684	0.0000		
9	0.0142	0.0236	72.703	0.0000		
10	0.0233	0.0080	72.754	0.0000		
11	0.0065	0.2780	73.610	0.0000		

We choose a model **ARIMA(1,0,0)** for the detrended Inflation.

# Residuals AC and PAC

-1      0      1 -1      0      1  
[Autocorrelation]   [Partial autocor]

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# Model: stationarity of explanatory variables

We check that the explanatory variables are stationary with a DF Test.

Variable	DF p value
Var. OER	0.000
Var. SMER	0.000
Var. MB	0.000

Cuadro: Results

So we conclude that we can include them easily.

# Model definition

We start with a model that includes every variable and then start pruning the non significant variables.

$$Inf_t = \beta_0 + \beta_1 vOER_t + \beta_2 vSMER_t + \beta_3 vMB_t + \beta_4 Rest_t + \delta t + \phi Inf_{t-1} + \epsilon_t$$

where:

- $Inf_t$  is monthly inflation. The decision of including the lag is based on the results of the previous section.
- $vOER_t$  and  $vSER_t$  are the percentage monthly variation of Official and Stock Market Exc. rate, respectively.
- $vMB_t$  is the monthly variation of monetary base.
- $Rest_t$  is a *dummy* variable that indicates whether there are currency restrictions running.

# Model final version

For pruning, we systematically remove one variable at a time, starting with the one with the highest p-value, until all remaining variables are statistically significant. The final model is as follows:

$$Inf_t = \beta_0 + \beta_1 vOER_t + \beta_2 Rest_t + \delta t + \phi Inf_{t-1} + \epsilon_t$$

Inflation	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
TCOvar	.115147	.0224567	5.13	0.000	.070411	.1598831
Inflation L1.	.5199208	.0859065	6.05	0.000	.3487862	.6910554
ExcRestrictions	-1.15008	.5449851	-2.11	0.038	-2.235746	-.0644142
Time	.0525339	.0150459	3.49	0.001	.0225609	.0825068
_cons	-35.9249	10.35483	-3.47	0.001	-56.55278	-15.29703

residuals DW test: 2.01

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# Conclusions

- The results show a positive relationship between the official exchange rate and inflation, at least in the short term. This would be consistent with the recurring decision of governments to impose restrictions on the exchange rate because the political cost of inflationary devaluation is immediate.
- Additionally, we observe a strong influence of the inflation from the previous month on the present inflation. This can be explained by various reasons, such as the existence of indexed contracts (which increase with inflation and can create a vicious circle).
- The stock market exchange rate and the monetary base appear to be non-significant. However, nothing is conclusive because there are several more complex issues not being taken into account. Moreover, the data is of monthly frequency, so the conclusions seem to be short-term. Perhaps modifications to the model could be considered.

# Obrigado!