



Universitat  
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# Inflation and pandemic in Spain

Bank of Albania

18<sup>th</sup> South-Eastern European Economic Research Workshop (SEE-ERW)

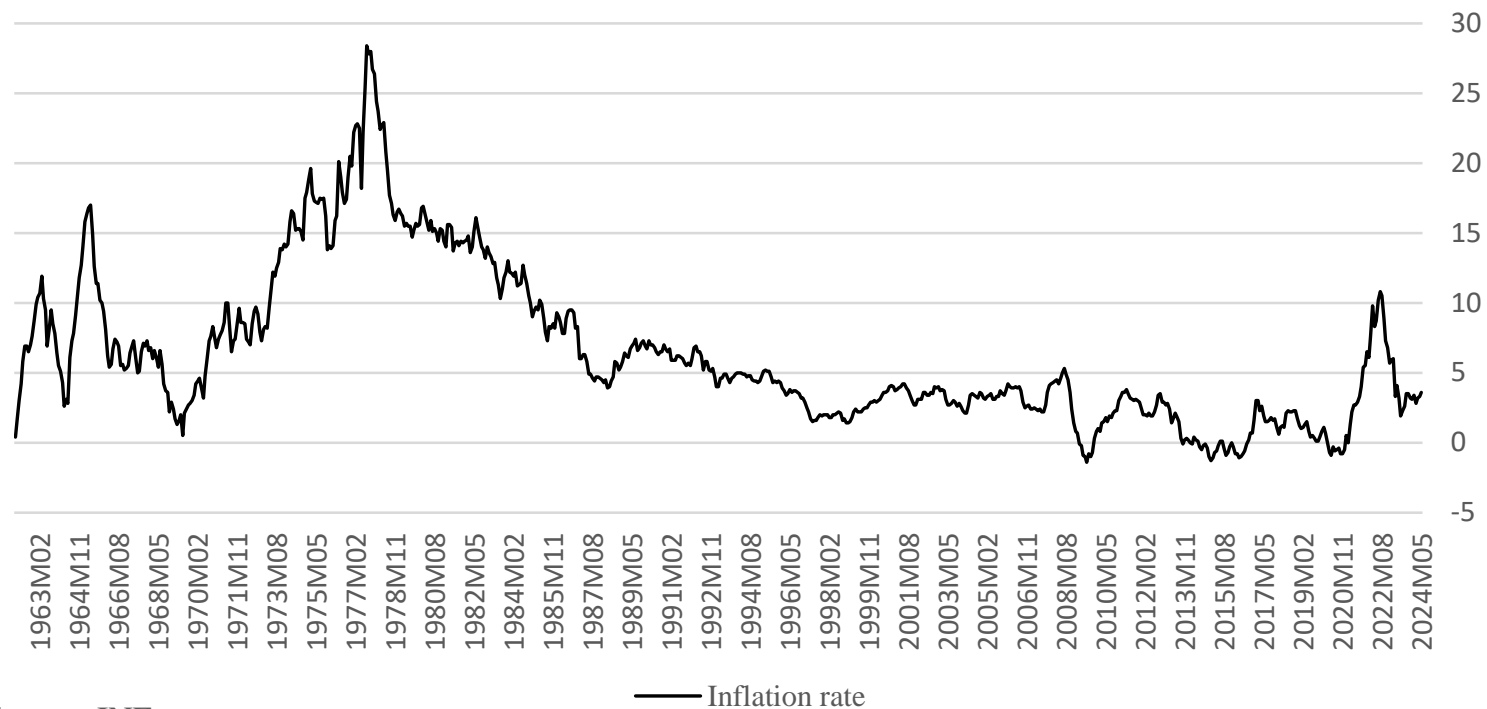
Tirana, November 19 - 20, 2024.

Prof. Dr. Leonardo Tariffi

November - 2024

What are the main inflation  
macroeconomics drivers in Spain?

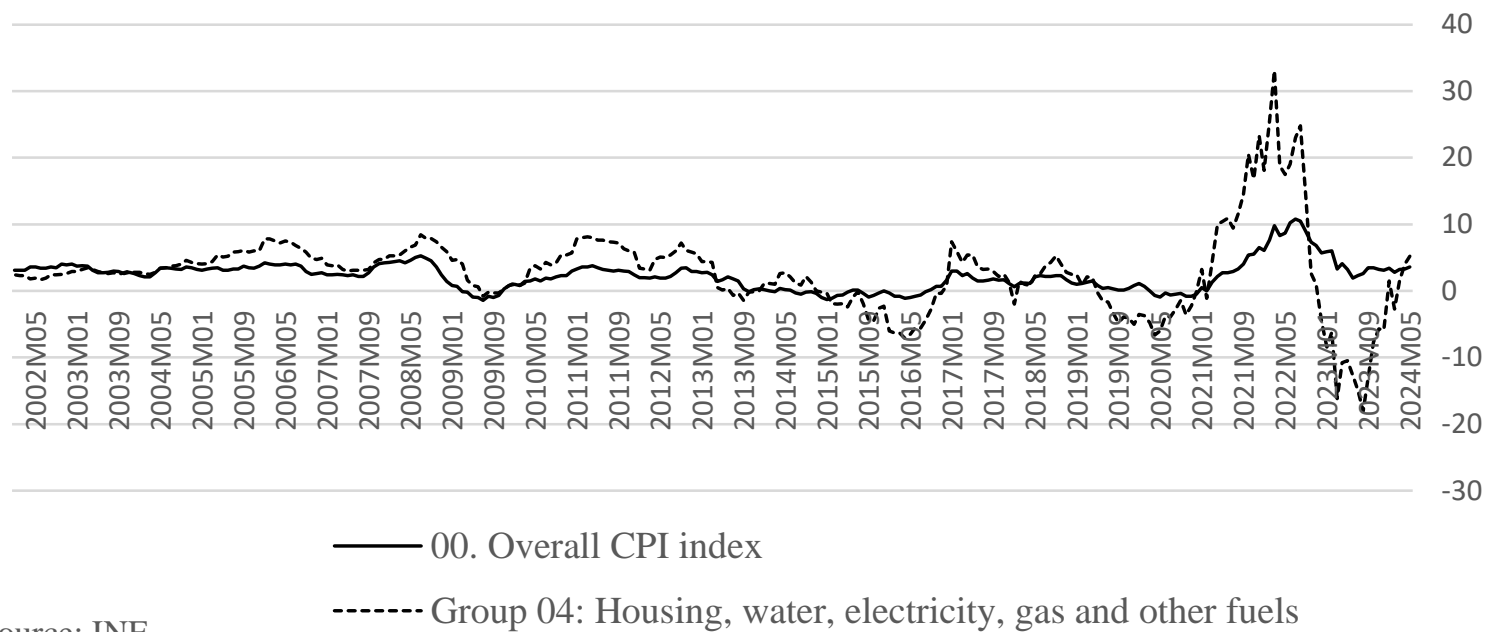
Figure 1: Consumer Price Index  
(Annual change in percentages - Base year 2021)



Source: INE

In Spain, the annual variation in percentages of the CPI can be observed in figure 1. Annual inflation has been lower than the two digits since May 1985. In June 2022, the inflation rate reached the 10% annual change once again and exceeded it for a short period of time. The CPI percentage change reached below zero levels in 2009, from 2014 to 2016, and especially during the Covid pandemic in 2020.

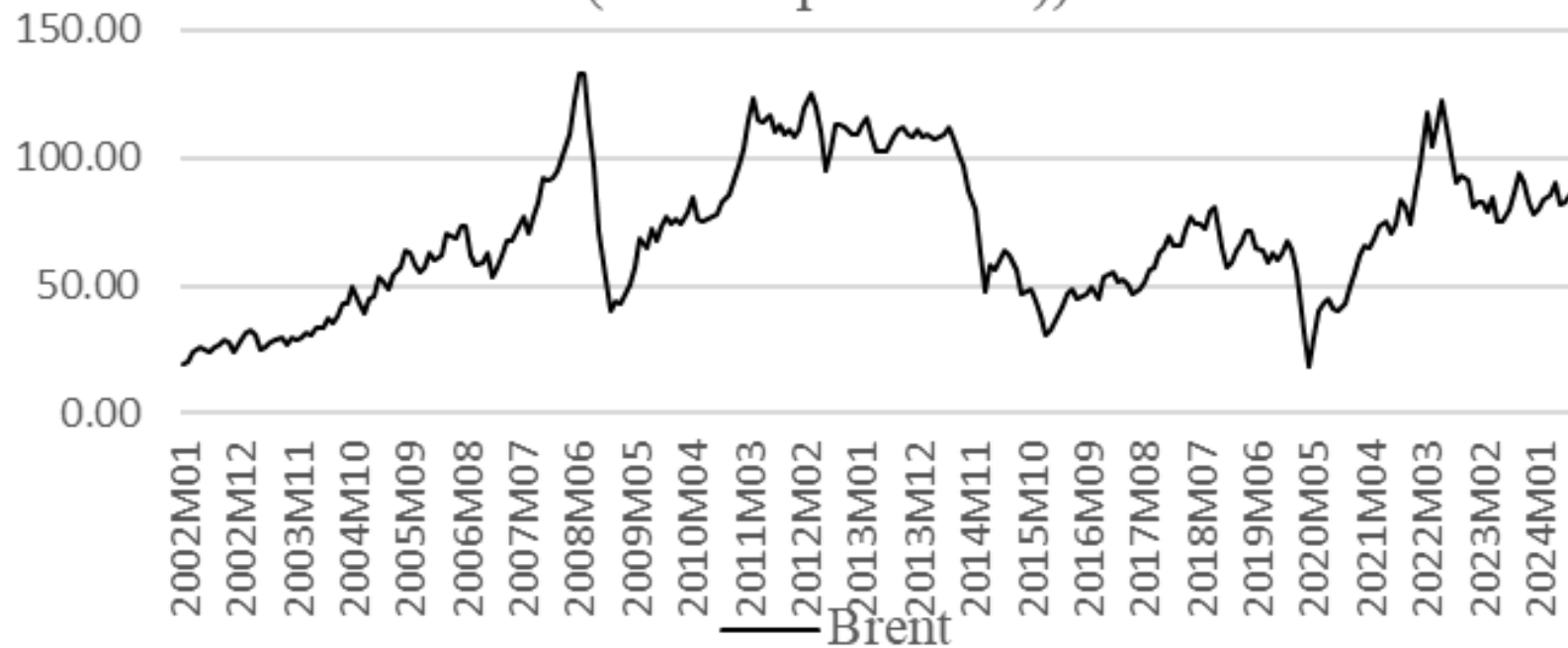
Figure 2: General CPI and CPI of housing, water, electricity,  
gas and other fuels  
(Annual change in percentages - Base year 2021)



Source: INE

In Figure 2, it can be observed the CPI in annual percentage changes for the group 04 on housing, water, electricity, gas and other fuels as well as the overall inflation rate over the last 20 years. Subgroup 04 picks the highest inflation rate in March 2022 when it reaches 33.1%. Notice that the data from group 04 shows not only higher variability than the general index but also a significant increase in prices during the pandemic. It could be seen as a leading indicator of the inflation rate in Spain during the observed period of time.

Figure 3: Europe Brent Spot Price FOB  
(Dollars per Barrel)



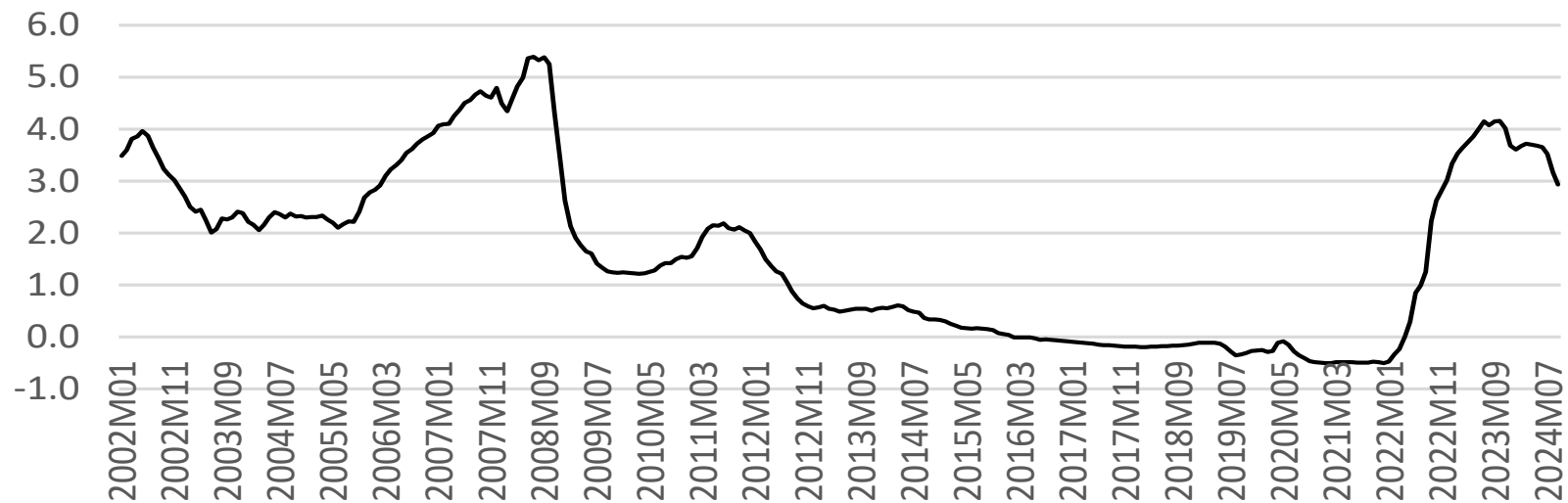
Source: EIA

Figure 3 shows oil prices free on board (FOB) in the Brent European market according to the U.S. Energy Information Administration (EIA).

There are three periods of time where the price was higher than 100 dollars per barrel in figure 3, the first one goes from March 2008 to August 2008, the second one is related to period that starts in February 2011 and ends in August 2014, and the last one starts in March 2022 until August 2022. Notice that Russia invaded Ukraine in February 2022.



Figure 4: Euríbor interest rate.  
EMU Money market. 12 months.  
(Percentage)

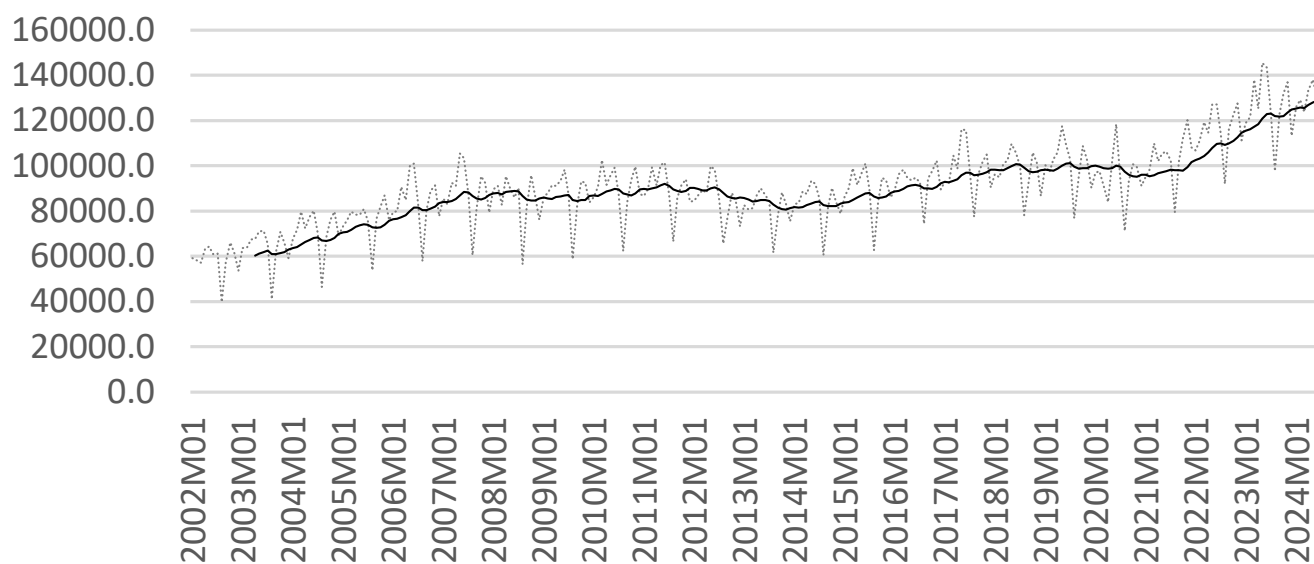


Source: BdE

— Euríbor interest rate

Based on data from the European Money Market Institute (EMMI), the Central Bank of Spain (BdE) publishes the Euribor in a monthly basis (the interest rate at which a selection of European banks lend one another). Figure 4 shows such an interest rate for 12 months related to the money market in the Economic and Monetary Union. There was a negative interest rate between February 2016 and March 2022. There are also three picks in the data corresponding to May 2002, July 2008, and October 2023.

Figure 5: Gross Domestic Product  
at current prices (Millions of Euros)



Source: Author's  
own calculations

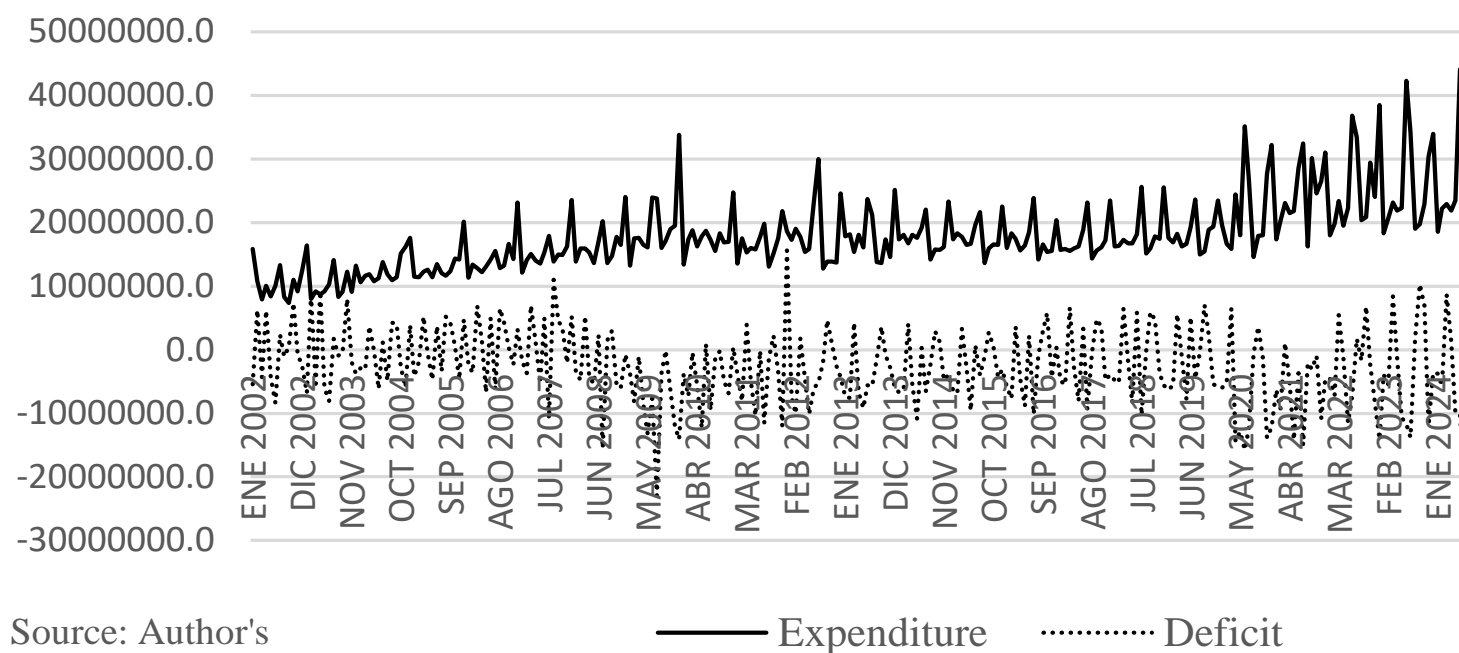
..... Monthly GDP

There were three phases during the Covid pandemic. The covid shock (both first and second quarters in 2020) as phase I, the reopening of the economy (from third quarter 2020 to third quarter 2021) as phase II, and the post reopening (from the fourth quarter 2021 onwards) as phase III.

The Gross Domestic Product (GDP) exhibited an unprecedented decline during the phase I in Spain. This reduction was equivalent to 22.8% from 326,698 millions of euros at current prices from the fourth quarter of 2019 to 252,148 millions of euros at current prices in the second quarter of 2020. The GDP's negative change during the phase I is different from the -0.34% CPI annual decrease in June 2020. There was not inflationary effects of a decreasing supply during this period of time.

The GDP grew at 8.21% y-to-y in the third quarter of 2021 when the CPI showed an annual change of 4.01% in September 2021. The economic activity has been growing in average 2.21% q-to-q since the beginning of phase III. The inflation rate reached a pick of 10.77% in July 2022 and decreased until it gets an average of around 3.2% during the first half of 2024. There was an increasing inflation during the reopening of the economy in phase II and a two-digit inflation in the post reopening of the economy in phase III.

Figure 6: Public expenditure and fiscal deficit  
(Thousands of Euros)



Source: Author's  
own calculations

Figure 6 shows the government expenditure (black line) as well as the fiscal deficit (segmented line). The level of government spending has been growing consecutively since the beginning of the selected period of time and its volatility is always higher, particularly after June 2020. Notice that the fiscal surplus reached its maximum level of 15,626,000 thousands euros in December 2011 and the highest fiscal deficit corresponds to July 2009 when it was equal to -23,013,000 thousands euros.



## Two approaches:

- The first approach applies a cointegration process (Johansen, 1988 and 1991) to find a long-term relationship between the macroeconomic variables (Engle and Granger, 1987) under the assumption of unrestricted intercept and restricted trend as in Pesaran, Shin and Smith (2000).
- The second approach uses the methodology of ordinary least squares (OLS) with error correction mechanism (ECM) to find the short-term relationship (Tariffi, 2024) employing a "from general to specific" procedure as specified by Campos et al. (2005) and Hendry (2024).

## The proxy variables:

- 1) CPI: The Consumer Price Index.
- 2) Brent: The Europe Brent Spot Price FOB (dollars per barrel).
- 3) Euribor: A 12 months Euro Interbank interest rate.
- 4) GDP: The gross domestic product (millions euros at current prices).
- 5) G: The government expenditure (thousands euros).
- 6) Deficit: The fiscal deficit.

It can be observed that all variables are integrated of order 1 ( $I(1)$ ) apart from the CPI. The CPI is integrated of order 2.

Table 1: Unit Root Test (Augmented Dickey-Fuller)	
Variable	Order of integration
CPI	$I(2)$
Brent	$I(1)$
Euribor	$I(1)$
GDP	$I(1)$
G	$I(1)$
Deficit	$I(1)$
Source: Author's own calculations	

Since at least 3 vectors shows  $r \leq 3$ , the null hypothesis of 3 cointegrated long run relationships are not rejected.

#### Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

\*\*\*\*\*

272 observations from 2002M2 to 2024M9. Order of VAR = 1.

List of variables included in the cointegrating vector:

CPI      BRENT      EURIBOR      GDP      G      DEFICIT      Trend

List of eigenvalues in descending order:

.65244   .57192   .53741   .40219   .059593   .0052092

\*\*\*\*\*

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
$r = 0$	$r = 1$	287.4344	43.6100	40.7600
$r \leq 1$	$r = 2$	230.7727	37.8600	35.0400
$r \leq 2$	$r = 3$	209.6870	31.7900	29.1300
$r \leq 3$	$r = 4$	139.9379	25.4200	23.1000
$r \leq 4$	$r = 5$	16.7122	19.2200	17.1800
$r \leq 5$	$r = 6$	1.4206	12.3900	10.5500

\*\*\*\*\*

Source: Author's own calculations.

# Cointegrating parameters values that have been found for the corresponding vectors.

Cointegration with unrestricted intercepts and restricted trends in the VAR

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272 observations from 2002M2 to 2024M9. Order of VAR = 1.

List of variables included in the cointegrating vector:

CPI      BRENT      EURIBOR      GDP      G      DEFICIT      Trend

\*\*\*\*\*

	Vector 1	Vector 2	Vector 3
CPI	-.0069817 ( -1.0000)	-.065875 ( -1.0000)	-.077337 ( -1.0000)
BRENT	.4254E-4 ( .0060929)	.3122E-3 ( .0047396)	-.7517E-4 ( -.9720E-3)
EURIBOR	.012361 ( 1.7705)	-.0029891 ( -.045406)	-.015159 ( -.19601)
GDP	-.1434E-7 ( -.2054E-5)	.1881E-5 ( .2856E-4)	.3572E-5 ( .4619E-4)
G	-.1118E-7 ( -.1601E-5)	-.7850E-8 ( -.1191E-6)	.5324E-8 ( .6885E-7)
DEFICIT	-.0087951 ( -1.2597)	.0058860 ( .089375)	.2027E-3 ( .0026210)
Trend	.5720E-3 ( .081923)	.1029E-3 ( .0015604)	-.0010607 ( -.013715)

## Short-term results:

Considering the probabilities associated to the t statistic, it can be observed that all variables are statistically significant at 10% (apart from the intercept and the ECM).

Dependent Variable: D2CPI				
Method: Least Squares				
Date: 11/11/24 Time: 19:25				
Sample (adjusted): 2003M01 2024M09				
Included observations: 261 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006400	0.030898	-0.207149	0.8361
D2CPI(-1)	-0.407911	0.046145	-8.839701	0.0000
D2CPI(-3)	-0.155297	0.050038	-3.103569	0.0021
D2CPI(-4)	-0.291315	0.050976	-5.714739	0.0000
D2CPI(-6)	0.239530	0.047531	5.039423	0.0000
DBRENT	0.034198	0.003983	8.585165	0.0000
DBRENT(-4)	0.009052	0.004326	2.092464	0.0374
DEURIBOR(-2)	-0.405072	0.232646	-1.741149	0.0829
DEURIBOR(-3)	-0.703238	0.285331	-2.464641	0.0144
DEURIBOR(-4)	1.026161	0.232612	4.411477	0.0000
DGDP(-1)	1.49E-05	2.82E-06	5.279625	0.0000
DGDP(-5)	1.46E-05	2.86E-06	5.094005	0.0000
DGDP(-6)	5.23E-06	2.71E-06	1.932731	0.0544
DGDP(-11)	1.40E-05	3.24E-06	4.331321	0.0000
DG	1.34E-08	5.52E-09	2.421961	0.0162
DG(-3)	1.16E-08	5.30E-09	2.184351	0.0299
DG(-8)	-1.18E-08	5.81E-09	-2.027517	0.0437
DDEFICIT	0.015927	0.003826	4.162518	0.0000
DDEFICIT(-7)	0.005457	0.003153	1.730434	0.0848
ECM	-0.597808	0.603902	-0.989909	0.3232
R-squared	0.726645	Mean dependent var	-0.003594	
Adjusted R-squared	0.705094	S.D. dependent var	0.738742	
S.E. of regression	0.401175	Akaike info criterion	1.084697	
Sum squared resid	38.78693	Schwarz criterion	1.357840	
Log likelihood	-121.5529	Hannan-Quinn criter.	1.194491	
F-statistic	33.71777	Durbin-Watson stat	2.290416	
Prob(F-statistic)	0.000000			

- The main interest in this research has been to explain with certainty the behaviour of the inflation in Spain not only in the short term but also in the long run.
- The energy sector, an efficient monetary policy, level of aggregate production, expansive fiscal policy and several years of deficit are some of the fundamental determinants of inflation, particularly during the pandemic.
- In fact, the main reasons behind the consumption price index increase after the post-pandemic economy re-opening are related to higher prices in the energy sector.

- Proxies for variables such as oil prices, the interest rate, the gross domestic product, the government expenditure, and the fiscal deficit are determinants in which the consumer price index depends on.
- Further research could be done in order to find if the interaction between the demand and the supply of good and services has a structural changes effect on inflation.



¡Thank you!

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