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FUEL PRICE INFLATION AND CONSUMER CONFIDENCE IN THE EURO AREA: EVIDENCE OF LAGGED, ASYMMETRIC AND REGIME-DEPENDENT TRANSMISSION

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Abstract. The sharp increase in energy prices following the COVID-19 pandemic, the war in Ukraine, and subsequent geopolitical tensions in the Middle East has reignited interest in the relationship between fuel prices and household expectations. While previous studies have focused primarily on international crude oil prices, considerably less attention has been given to retail fuel price inflation and its effect on consumer confidence. This study uses monthly data covering the period from January 2018 to June 2026 to investigate the dynamic relationship between annual fuel price inflation, as measured by the Harmonised Index of Consumer Prices (HICP), and the Consumer Confidence Indicator (CCI) in the euro area. The empirical analysis employs correlation analysis, ordinary least squares regression, and the Chow structural break test to examine the timing and stability of the transmission mechanism. The results indicate an optimal transmission lag of nine months, suggesting that changes in fuel price inflation are gradually reflected in household expectations. Regression analysis revealed a statistically significant inverse relationship between fuel price inflation and the consumer confidence indicator. Furthermore, the estimated effect was significantly stronger during the inflation build-up phase preceding the fuel price peak in April 2022 than during the subsequent unwinding period. The Chow test confirms the presence of a statistically significant structural break, showing that the transmission mechanism depends on the regime rather than remaining constant over time. These findings contribute to existing literature by providing new evidence based on retail fuel prices. They identify the optimal transmission lag and demonstrate the asymmetric response of consumer confidence across the different phases of the inflation cycle.

Keywords: fuel inflation, consumer confidence, HICP, euro area, asymmetry, structural break.

JEL Classification: C22, D84, E31, E32, Q41

1. Introduction

Consumer confidence is widely recognised as a leading indicator of future economic activity. This is because it reflects households' expectations regarding their financial situation, purchasing power, and the overall economic outlook. As changes in consumer sentiment often precede changes in private consumption, the Consumer Confidence Indicator (CCI) is important for macroeconomic analysis and economic policymaking. Previous empirical evidence from the euro area shows that the consumer confidence indicator is closely associated with real economic growth and can signal emerging economic downturns, especially during periods of heightened uncertainty (Borisov, 2021; Borisov, 2022). The period from 2018 to 2026 was one of the most turbulent in the euro area's recent economic history. The unprecedented volatility in energy markets and substantial increase in inflationary pressures generated by the effects of the COVID-19 pandemic, the subsequent recovery, the Russian invasion of Ukraine and the renewed geopolitical tensions in the Middle East have been well documented. According to recent research by the European Central Bank, energy-related shocks accounted for a significant proportion of the surge in inflation following the pandemic and have become one of the main challenges for monetary policy in the euro area (Mihaylova-Borisova, 2023; Bańbura et al., 2024). The European Central Bank has also highlighted the persistence of energy-driven inflation as a key challenge for maintaining price stability in the post-pandemic period (Lane, 2026). Although inflation has gradually moderated since peaking in 2022, uncertainty in energy markets has remained high due to ongoing geopolitical risks and

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concerns about the global oil supply. Fuel prices are of particular significance within the Harmonised Index of Consumer Prices (HICP) given their direct impact on household expenditures, whilst concurrently increasing transportation, production and distribution costs across the economy. Consequently, fuel price fluctuations influence consumer confidence not only by reducing purchasing power but also by shaping households' expectations regarding future inflation and overall economic conditions (Battistini et al., 2022). The Euro area therefore provides an appropriate framework for examining the relationship between fuel price inflation and the consumer confidence indicator, since the harmonised statistical methodology ensures full comparability of both variables across countries. Despite the growing body of literature on the macroeconomic effects of energy price shocks, most empirical studies focus on crude oil prices and how they affect inflation, economic growth and financial markets. Relatively little attention has been given to the effects of retail fuel price inflation on the Consumer Confidence Indicator, particularly within the euro area. Furthermore, previous research has rarely examined whether this relationship changes across the different phases of the inflation cycle. This study addresses these gaps by analysing the relationship between annual HICP fuel inflation and the consumer confidence indicator in the eurozone. Particular attention is given to the period surrounding the exceptional fuel price shock of 2022, when annual fuel inflation peaked before gradually declining. Therefore, the analysis investigates whether consumer confidence responds differently during periods of accelerating and declining fuel inflation.

This study aims to examine the relationship between annual fuel price inflation and the consumer confidence indicator in the euro area, investigating whether this relationship varies across different phases of the inflation cycle. The analysis focuses on annual HICP fuel inflation and the Consumer Confidence Indicator (CCI), using monthly euro area data from January 2018 to June 2026.

The main hypothesis is that annual fuel price inflation has a statistically significant negative impact on the consumer confidence indicator in the euro area. It is also hypothesised that the relationship is asymmetric, meaning that households react more strongly to rapidly increasing fuel prices than to declining inflation.

The study's contribution extends beyond merely identifying a statistically significant relationship between the two variables. Firstly, it empirically determines the optimal transmission lag between fuel price inflation and the consumer confidence indicator. Secondly, it estimates separate regression models for the inflation build-up and unwinding phases. Thirdly, the Chow structural break test is applied to examine whether the transmission mechanism changed following the peak in fuel prices in April 2022. The study provides new evidence on the dynamic and regime-dependent relationship between fuel price inflation and the Consumer Confidence Indicator in the euro area by combining these approaches within a unified empirical framework.

2. Literature Review

The relationship between oil prices and macroeconomic performance is one of the central topics in energy economics and has long been recognised as such. Fluctuations in the oil price influence economic activity through various channels, such as production costs, transportation expenses, household purchasing power, inflation expectations, and financial market conditions. Although earlier studies often treated oil price shocks as homogeneous supply-side disturbances, more recent research shows that their economic consequences depend on the source of the shock, the state of the wider economy and the level of uncertainty in energy markets. Hamilton (2009) made a fundamental contribution to this literature by re-examining the oil price surge that preceded the Global Financial Crisis of 2007–2008. Unlike earlier oil crises, which were primarily associated with supply disruptions, Hamilton demonstrates that the 2007–2008 oil price shock was mainly caused by exceptionally strong global demand and stagnating world oil production. Despite their different origins, the macroeconomic consequences were remarkably similar to those of previous oil crises. These consequences included substantial reductions in household consumption and declining purchases of durable goods, as well as a significant economic slowdown. These findings fundamentally altered the way in which oil price shocks were interpreted, by demonstrating that oil price increases from different sources may generate comparable macroeconomic outcomes. Subsequent research has considerably broadened this perspective by acknowledging the varied nature of oil market shocks. Instead of assuming a constant relationship between crude oil prices and macroeconomic variables, recent studies increasingly emphasise non-linear responses and regime-dependent dynamics. Ozcelebi et al. (2026) analyse three major European fuel oil trading hubs and show that fuel oil prices are determined by the complex interplay of crude oil prices, exchange rates, macroeconomic conditions, clean energy sentiment, and policy uncertainty. The authors' findings reveal significant asymmetries across market regimes, indicating that the impact of crude oil prices on fuel prices is substantially stronger during periods of exceptionally high fuel prices than under normal market conditions. They conclude that conventional linear models cannot adequately explain how fuel prices are formed because market conditions play a decisive role in determining the extent to which prices change. Similar evidence is provided by Bouri

et al. (2026), who analysed the impact of structural oil price shocks on indicators of stock market bubble risk. Their results show that the macroeconomic consequences of oil price shocks depend on their source. While current demand shocks generally strengthen positive market expectations, supply shocks increase downside risks by raising production costs, inflationary pressures, and macroeconomic uncertainty. Together, these studies suggest that the impact of oil price shocks depends on the magnitude of the price change, the source of the shock, and the state of the economy. This conclusion is particularly pertinent to the euro area during the study period, which encompasses the impact of the pandemic, the subsequent recovery, the Russian invasion of Ukraine, and the resulting geopolitical tensions in the Middle East. These events caused fuel price shocks through various mechanisms, indicating that their effect on consumer confidence may differ depending on the stage of the inflation cycle.

A substantial body of empirical research has examined the transmission of oil and fuel price shocks to consumer prices. Rising fuel prices increase transportation, production and logistics costs, thereby generating inflationary pressures that extend well beyond the energy sector. Retail fuel prices have a much stronger impact on inflation than international crude oil prices (Kpodar & Liu, 2022). Therefore, analyses based solely on crude oil prices may underestimate the actual pass-through to consumer inflation, since households and firms primarily respond to retail fuel prices. This distinction is particularly important when analysing HICP fuel inflation, as this reflects the prices actually paid by consumers. The interaction between the energy and food markets is also well documented. Notably, significant spillover effects have been identified between crude oil and agricultural commodity markets, particularly during periods of heightened uncertainty, such as during the COVID-19 pandemic (Cao & Cheng, 2021). These findings suggest that volatility in the energy market is quickly transmitted to the food market, particularly in the short term. Positive gasoline price shocks have been shown to generate statistically significant increases in aggregate food prices and in the prices of individual food categories, due to higher transportation, fertiliser and livestock feed costs (Diab & Karaki, 2023). Similarly, rising fuel and fertiliser prices substantially increase production costs throughout agri-food systems, while also reducing the affordability of food, particularly in lower-income economies (Arndt et al., 2023). Overall, the available evidence indicates that fuel prices are a significant factor in food inflation and food security. Transportation and logistics are another important transmission channel. Logistics expenditure has been identified as one of the main factors affecting the costs and competitiveness of the food industry, with rising fuel prices quickly leading to increased distribution costs and creating further inflationary pressures, even in sectors not directly linked to energy production (Popa et al., 2025). Recent research further suggests that the pass-through of commodity prices is nonlinear and highly dependent on prevailing macroeconomic conditions. According to Nyabagabo et al. (2026), global commodity price shocks are considerably stronger during periods characterised by supply-chain disruptions and heightened geopolitical uncertainty. Although international food prices have a rapid impact on domestic inflation, the effect of oil prices is slower but more persistent. These findings suggest that, during periods of elevated uncertainty, monetary policy should explicitly account for state-dependent transmission mechanisms. Nonlinear econometric models also provide evidence of asymmetric adjustment. Positive oil price shocks generate substantially stronger inflationary pressures than the disinflationary effects associated with falling oil prices (Dily & Rasheed, 2026). Consequently, inflation responds more rapidly and intensely during periods of rising energy prices, which supports the distinction between the build-up and unwinding phases of inflation. The empirical literature collectively provides strong evidence that oil and fuel price shocks affect inflation through various channels, such as transportation costs, agricultural production, logistics, commodity markets, and inflation expectations. The available evidence further suggests that these transmission mechanisms are non-linear and asymmetric, and are strongly influenced by prevailing macroeconomic conditions. However, most existing studies focus on crude oil prices or aggregate energy indices rather than retail fuel prices. Furthermore, few studies have examined annual HICP fuel inflation within the euro area, nor have they investigated whether the relationship between fuel price inflation and broader economic indicators changes across different phases of the inflation cycle. It is these gaps that provide the principal motivation for the present study.

In recent decades, the relationship between oil price shocks and consumer confidence has attracted increasing attention, reflecting the growing recognition that household expectations play a central role in macroeconomic dynamics. As consumer confidence influences consumption and saving decisions, as well as expectations regarding future economic conditions, it is an important leading indicator of economic activity. Praet & Vuchelen (1988) provide early empirical evidence for Europe, showing that consumer confidence responds systematically to exogenous macroeconomic shocks and contains valuable information about future economic developments. They found that consumer confidence should be viewed not only as a reflection of current economic conditions, but also as an indicator of households' expectations regarding future income,

employment, and overall economic performance. More recent studies have focused specifically on the impact of oil price fluctuations on consumer expectations. Using a structural vector autoregressive framework, Güntner & Linsbauer (2018) demonstrate that consumer confidence reacts differently depending on the structural origin of oil shocks. While supply shocks have relatively limited effects, aggregate demand and oil-specific demand shocks have considerably stronger and more persistent influences on consumer sentiment, via channels such as inflation expectations, expected household income, and perceptions regarding vehicle and housing purchases. The importance of distinguishing between different types of oil shock is further confirmed by Alsalman (2021). The study uses a structural VAR model to show that consumer confidence responds differently to domestic and foreign oil supply shocks, while aggregate demand shocks account for a much larger proportion of sentiment fluctuations. Further historical decomposition indicates that the decline in oil prices in 2014 significantly improved consumer confidence. Evidence from emerging economies also supports the idea of heterogeneous responses. When analysing China, Li and Ouyang (2023) found that oil supply and demand shocks associated with rising oil prices had a positive effect on both consumer and entrepreneurial sentiment, although the effect was stronger for entrepreneurs. Higher satisfaction with current income and more optimistic employment expectations primarily improve consumer sentiment. Similarly, Dery & Azad (2026) demonstrate that oil price uncertainty and supply shocks significantly diminish consumer and business confidence in major emerging economies, whereas demand-related shocks boost economic sentiment. Their results also reveal considerable cross-country differences in the magnitude and persistence of these effects. In summary, the literature provides compelling evidence that oil price developments are a key factor in determining consumer confidence. However, the relationship is neither linear nor constant over time. Consumer responses vary according to the structural origin of oil shocks, prevailing macroeconomic conditions, uncertainty, and country-specific characteristics. This suggests that empirical analyses should explicitly account for non-linear and heterogeneous transmission mechanisms.

Although the existing literature provides substantial evidence that oil price shocks influence inflation and consumer expectations, several important issues remain under-explored. For example, most empirical studies rely on international crude oil prices rather than retail fuel prices, and relatively little attention has been devoted to consumer confidence within the euro area. Furthermore, there is limited evidence on the delayed transmission of fuel price inflation, and on how this relationship changes across the different phases of the inflation cycle. It is these gaps that provide the main motivation for the present study, which builds on existing research by examining the dynamic relationship between HICP fuel inflation and consumer confidence in the euro area.

3. Methodology

The empirical analysis is based on monthly data for the euro area, obtained from two official European statistical sources. Fuel price inflation is measured by the year-on-year percentage change in the Harmonised Index of Consumer Prices (HICP) for liquid fuels and fuels and lubricants for personal transport equipment, as published by Eurostat. Consumer confidence is represented by the seasonally adjusted Consumer Confidence Indicator (CCI), which is published monthly by the European Commission as part of its Business and Consumer Surveys framework. The CCI series runs from January 2018 to June 2026, and HICP fuel inflation data is available from January 2018 to May 2026. The empirical analysis is therefore based on a standard observation period, taking into account the selected lag structure. The study covers a period during which several major economic and geopolitical events occurred that had a significant impact on European energy markets and household expectations. These include the final stage of the pre-pandemic expansion; the subsequent crisis caused by the outbreak of the COVID-19; the recovery of global demand; the energy price shock following Russia's invasion of Ukraine in 2022; and the renewed volatility associated with geopolitical tensions in the Middle East and concerns regarding the transportation of oil through the Strait of Hormuz. Consequently, the sample incorporates both periods of rapidly increasing fuel prices and periods characterised by a gradual decline. This provides an appropriate framework for analysing the dynamic relationship between fuel price inflation and the consumer confidence indicator. Unlike many previous studies, which relied on international crude oil prices, the present analysis employs annual HICP fuel inflation. This indicator reflects the actual prices faced by households, making it a more appropriate measure for examining consumers' behavioural responses. As consumer confidence reflects households' perceptions of current and anticipated economic conditions, it is anticipated that retail fuel price inflation will have a more direct impact on consumer expectations than fluctuations in crude oil prices observed on international commodity markets.

The empirical analysis follows a sequential, multi-stage framework designed to identify, estimate and evaluate the dynamic relationship between fuel price inflation and the consumer confidence indicator. The analysis begins with a descriptive examination of the two time series to identify their main trends

and significant turning points during the observation period. Particular attention is given to the exceptional surge in fuel prices recorded during 2021–2022, followed by a period of declining inflation. The second stage consists of a lag identification procedure. As changes in fuel prices are unlikely to affect consumer confidence instantly, the HICP fuel inflation series is shifted sequentially across alternative lag structures. The Pearson correlation coefficient is calculated for each lag to determine the delay that produces the strongest statistical association between the two variables. The lag associated with the highest statistically significant correlation coefficient is considered the optimal transmission lag. Following identification of the optimal lag, a regression analysis is performed to estimate the magnitude and statistical significance of the relationship between lagged fuel inflation and the consumer confidence indicator. Ordinary Least Squares (OLS) estimation was used throughout the analysis. The estimated coefficients provide information on the direction and strength of the transmission mechanism. To examine whether this relationship remains stable throughout the inflation cycle, the full sample is divided into two economically meaningful sub-periods. The first phase, the 'inflation build-up', covers the period from January 2018 to April 2022. It represents the gradual acceleration of fuel price inflation, which culminates in an all-time high. The second phase (inflation unwinding) runs from May 2022 to May 2026, capturing the subsequent moderation of fuel price inflation. Creating separate regression models for these two phases allows for an assessment of how households respond to rapidly increasing and declining fuel prices. Finally, the stability of the estimated relationship is formally evaluated using the Chow structural break test. This procedure establishes whether the regression coefficients remain constant throughout the two inflation phases, or if the underlying transmission mechanism changed significantly after the fuel price peak in April 2022.

4. Results and Discussion

4.1 Evolution of Fuel Inflation and Consumer Confidence in the Euro Area

Figure 1 shows how annual HICP fuel inflation (year-on-year) and the Consumer Confidence Indicator (CCI) have changed in the euro area between January 2018 and June 2026. Both indicators show significant fluctuations, reflecting the series of major economic and geopolitical shocks that impacted the European economy during this period. Although the two series follow different trajectories, the presence of several common turning points suggests a dynamic relationship between fuel price inflation and consumer confidence. Prior to the onset of the COVID-19 pandemic, fuel inflation remained relatively moderate and consumer confidence remained stable, reflecting favourable macroeconomic conditions within the eurozone. The pandemic caused a sharp decline in consumer confidence and a temporary fall in fuel inflation due to the collapse in energy demand. Following the economic recovery in 2021, however, fuel inflation accelerated rapidly due to recovering demand, supply-chain disruptions, and the ensuing energy crisis associated with Russia's invasion of Ukraine. Annual fuel inflation peaked at 47.2% in April 2022, while consumer confidence reached its lowest point during

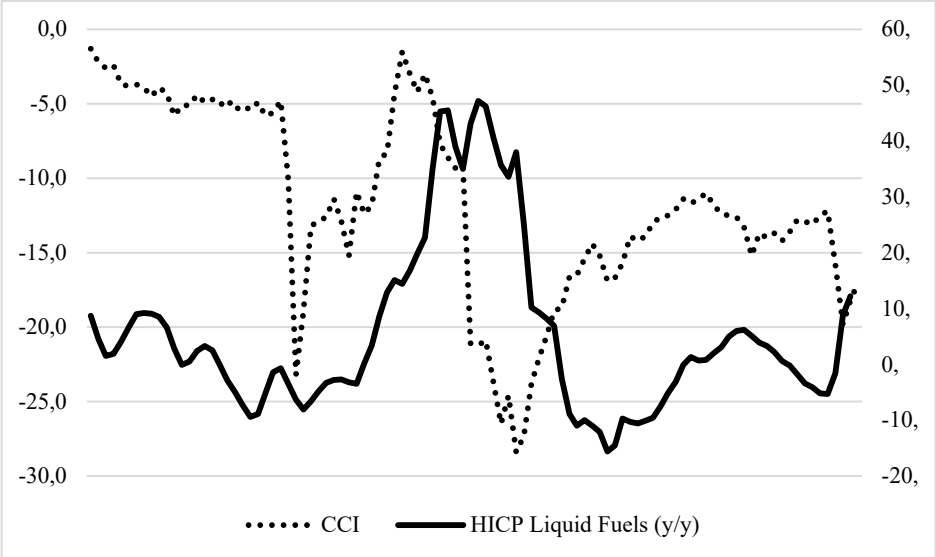


Figure 1. Evolution of annual HICP fuel inflation (y/y) and the Consumer Confidence Indicator (CCI) in the euro area, January 2018–June 2026

Source: Eurostat, European Commission, own calculation

the sample period. Following the peak in fuel prices, inflation moderated rapidly as energy markets gradually stabilised. Although consumer confidence also recovered, it did so considerably more slowly, suggesting that households adjust more gradually to improving economic conditions than to rapidly increasing energy costs. Further visual inspection indicates that major turning points in consumer confidence generally occur after substantial changes in fuel price inflation, rather than simultaneously. This provides preliminary evidence of a delayed transmission mechanism. While graphical evidence alone cannot prove causation, it does support subsequent correlation and regression analyses, which aim to identify the optimal transmission lag and quantify the relationship between the two variables.

4.2 Lag Identification and Correlation Analysis

To identify the temporal relationship between fuel price inflation and consumer confidence in the eurozone, a cross-correlation approach is used to calculate Pearson's linear correlation coefficient. Monthly observations covering the common sample period are used. Consumer confidence is measured using the Consumer Confidence Indicator (CCI), while fuel price developments are represented by the year-on-year rate of change of the Harmonised Index of Consumer Prices (HICP) for liquid fuels and fuels and lubricants for personal transport equipment. As changes in fuel prices are unlikely to affect household expectations instantly, the HICP fuel inflation series is shifted sequentially by one-month intervals relative to the CCI. Correlation coefficients are estimated for alternative lag structures to identify the delay that produces the strongest statistical association between the two variables. This procedure enables the transmission horizon to be determined empirically rather than being imposed a priori. The lag corresponding to the highest statistically significant correlation coefficient is considered the optimal transmission lag and is used throughout the regression analysis. This lag must be identified in order to examine the dynamic relationship between fuel price inflation and consumer confidence, and to evaluate the extent to which changes in fuel prices precede changes in household economic expectations.

As can be seen in Table 1, there is a clear dynamic relationship between fuel price inflation and consumer confidence in the euro area. The Pearson correlation coefficient increases progressively as the HICP fuel inflation series is shifted forward, suggesting that changes in fuel prices are gradually rather than instantly incorporated into household expectations. The strongest relationship is observed at a nine-month lag, with a correlation coefficient of −0.5361. Beyond this point, the correlation gradually weakens, suggesting that the transmission effect diminishes over longer time periods. The negative sign of the correlation coefficient indicates an inverse relationship between the two variables. Higher fuel price inflation is associated with lower consumer confidence approximately nine months later, whereas a decline in fuel inflation is followed by a gradual improvement in household sentiment. These findings support the hypothesis that rising energy costs reduce households' purchasing power, increase inflation expectations, and worsen perceptions of future economic conditions. Based on these results, a nine-month lag was selected for subsequent regression and structural break analyses.

Figure 2 shows the relationship between annual HICP fuel inflation and the consumer confidence indicator after applying the nine-month transmission lag identified through empirical analysis. This graphical representation confirms the findings of the correlation analysis, showing that the two indicators exhibit a clear inverse relationship over time. Prior to the COVID-19 pandemic, both series remained

Table 1
Coefficient of linear correlation (Pearson)

CCI	Monthly HICP 'Liquid fuels and fuels and lubricants for personal transport equipment' (y/y)	Linear correlation coefficient
month – t	month – t-1	-0.2374
month – t	month – t-2	-0.3017
month – t	month – t-3	-0.3703
month – t	month – t-4	-0.4282
month – t	month – t-5	-0.4669
month – t	month – t-6	-0.4928
month – t	month – t-7	-0.5152
month – t	month – t-8	-0.5313
month – t	month – t-9	-0.5361
month – t	month – t-10	-0.5312
month – t	month – t-11	-0.5075
month – t	month – t-12	-0.4687

Source: Eurostat, European Commission, own calculation

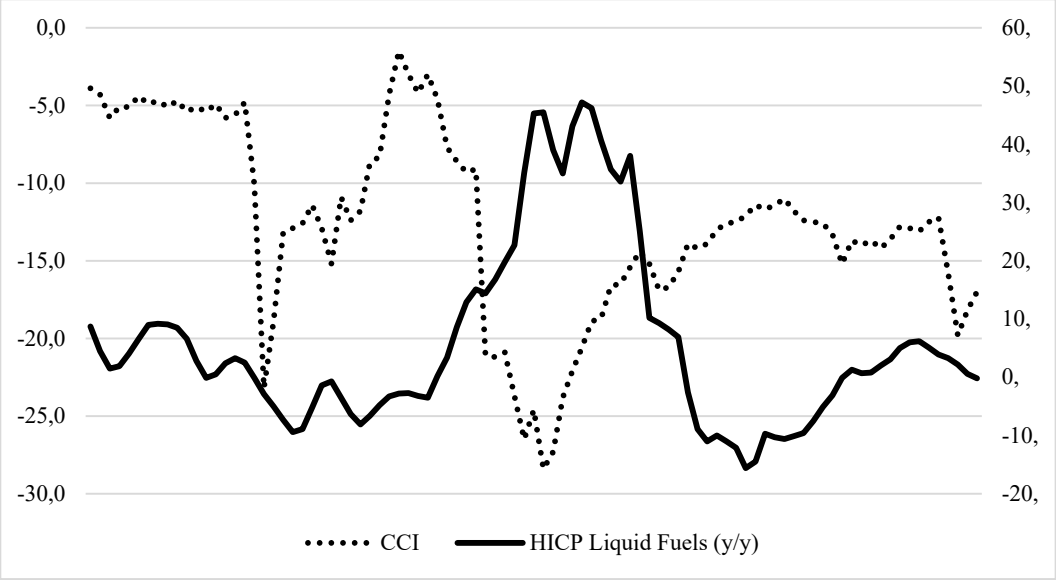


Figure 2. Annual HICP fuel inflation (y/y), lagged by 9 months, and Consumer Confidence, euro area

Source: Eurostat, European Commission, own calculation

relatively stable, reflecting favourable macroeconomic conditions in the euro area. Following the outbreak of the pandemic in early 2020, there was a sharp deterioration in consumer confidence, while fuel price inflation declined substantially due to the collapse in global energy demand. As economic activity gradually recovered in 2021, fuel inflation accelerated rapidly due to recovering demand, supply chain disruptions, and tightening energy markets. The subsequent energy crisis triggered by Russia's invasion of Ukraine further intensified this process, with annual HICP fuel inflation peaking at 47.2% in April 2022. Around nine months after the unprecedented rise in fuel prices, consumer confidence hit its lowest point in the analysed period. Similarly, the gradual moderation in fuel inflation observed from the second half of 2022 onwards was followed by a delayed recovery in consumer confidence. However, the improvement was much slower than the preceding deterioration. This asymmetric adjustment shows that households respond more quickly to negative energy price shocks than to subsequent improvements in the fuel market. Overall, the dynamic analysis visually supports the statistical evidence reported in Table 1. The close inverse relationship observed after the introduction of a nine-month lag suggests that fuel price inflation is an important leading indicator of consumer confidence in the eurozone. Nevertheless, correlation alone does not imply causation or quantify the strength of the relationship. The following section uses regression analysis to examine whether subsequent movements in consumer confidence can be statistically explained by lagged fuel inflation, and to evaluate the strength of this relationship.

4.3 Baseline Regression Analysis

To quantify the relationship between fuel price inflation and consumer confidence, an ordinary least squares (OLS) regression model was estimated using the nine-month transmission lag identified through empirical analysis. Based on the results of the correlation analysis, the explanatory variable is specified as annual HICP fuel inflation lagged by nine months, while the dependent variable is the Consumer Confidence Indicator (CCI). The estimated regression results are presented in Table 2.

The regression results confirm the presence of a statistically significant correlation between fuel price inflation and consumer confidence in the eurozone. The multiple correlation coefficient (Multiple R = 0.536) indicates a moderate association between the observed and estimated values of consumer confidence, and it is the same as the highest Pearson correlation coefficient obtained during the lag identification procedure. This consistency confirms that the nine-month lag selected captures the strongest linear relationship between the two variables. The estimated coefficient associated with fuel price inflation is −0.212, which is highly statistically significant ($p < 0.001$). This negative coefficient indicates that an increase of one percentage point in annual HICP fuel inflation is associated with an average decline of around 0.21 points in the Consumer Confidence Indicator nine months later. This finding lends support to the hypothesis that rising fuel prices gradually weaken household confidence by reducing purchasing power and increasing expectations of inflation and deterioration in future economic conditions. The estimated model is statistically significant as a whole (F

Table 2

Baseline regression results

SUMMARY	OUTPUT							
Regression	Statistics							
Multiple R	0.5361							
R Square	0.2874							
Adjusted R Square	0.2796							
Standard Error	5.2338							
Observations	93							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	1005,328	1005,328	36,701	3,06E-08			
Residual	91	2492,724	27,3926					
Total	92	3498.052						
	Coefficients	Standard Error	tStat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	-11,3135	0,5797	-19,515	2,79E-34	-12,465	10,162	-12,465	-10,162
X Variable 1	-0,2121	0,0350	-6,058	3,06E-08	-0,282	0,143	-0,282	-0,143

Source: Eurostat, European Commission, own calculation

= 36.70; $p < 0.001$), indicating that fuel price inflation is a meaningful factor in explaining subsequent changes in consumer confidence. The coefficient of determination ($R^2 = 0.287$) shows that around 28.7% of the variation in consumer confidence can be attributed to lagged fuel inflation. Although the explanatory power is moderate, such values are common in models of consumer sentiment, where expectations are influenced by a variety of simultaneous macroeconomic, financial and behavioural factors. The close similarity between R^2 (0.287) and Adjusted R^2 (0.280) also suggests that the estimated relationship is robust.

The estimated regression equation can be written as follows:

$$CCI(t) = -11.313 - 0.212 \times FUEL_lINFL(t-9),$$

where CCI(t) denotes the Consumer Confidence Indicator in month t and FUEL_lINFL(t−9) represents annual HICP fuel inflation observed nine months earlier.

In summary, the baseline regression analysis provides strong statistical evidence that increases in fuel price inflation are followed by a deterioration in consumer confidence approximately nine months later. However, the estimated coefficient represents the average relationship across the entire sample period and assumes stability of the parameters. In light of the exceptional fuel price volatility observed during 2021–2022, it is important to examine whether this relationship remained consistent throughout the inflation cycle. The following section therefore estimates separate regression models for the phases of inflation build-up and unwinding.

4.4 Inflation Build-Up and Inflation Unwinding: Sub-Period Regression Analysis

The baseline regression reported in the previous section estimates the average relationship between fuel price inflation and consumer confidence across the whole sample period. However, the exceptional energy price shock observed during 2021–2022 raises the question of whether this average coefficient obscures different behavioural responses at different stages of the inflation cycle. For example, households may react more strongly when fuel prices are increasing rapidly than when they are declining gradually. To examine this possibility, the sample is divided into two economically meaningful sub-periods. The first sub-period (inflation build-up) runs from January 2018 to April 2022, capturing the gradual acceleration in fuel inflation that culminated in a historical peak of 47.2%. The second sub-period (inflation unwinding), which covers May 2022 to June 2026, represents the subsequent moderation of fuel inflation. Separate OLS regressions are estimated for each phase, using the same nine-month lag identified previously.

The regression results for the inflation build-up phase are reported in Table 3. Compared with the baseline model estimated over the full sample, the relationship between fuel price inflation and consumer confidence is substantially stronger in the period leading up to the fuel price peak. The multiple correlation coefficient rises to 0.672 and the coefficient of determination reaches 0.452. This suggests that around 45.2% of the variation in consumer confidence can be attributed to lagged fuel price inflation during this period. The estimated regression coefficient remains highly statistically significant ($\beta = -0.340$; $p < 0.001$) and is considerably larger in absolute value than that obtained from the full-sample estimation ($\beta = -0.212$). This suggests that an increase of one percentage point in annual fuel inflation is associated with an average decline of around 0.34 points in the Consumer Confidence Indicator nine months later. The results demonstrate that households reacted particularly strongly to the rapid increase in fuel

Table 3
Regression model: inflation build-up phase

SUMMARY	OUTPUT							
Regression	Statistics							
Multiple R	0.6723							
R Square	0.4519							
Adjusted R Square	0.4410							
Standard Error	5.8155							
Observations	52							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	1394,363	1394,363	41,22918	4,83E-08			
Residual	50	1690,99	33,8198					
Total	51	3085,353						
	Coefficients	Standard Error	tStat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	-8,6	0,9032	-9,522	8,15E-13	-10,414	-6,786	-10,414	-6,786
X Variable 1	-0,3399	0,05294	-6,421	4,83E-08	-0,446	-0,234	-0,446	-0,234

Source: Eurostat, European Commission, own calculation

prices, reflecting mounting concerns about inflation, falling purchasing power, and mounting economic uncertainty during the period of accelerating energy prices. The overall regression model is highly significant ($F = 41.23$; $p < 0.001$), which confirms the robustness of the estimated relationship. Taken together, these findings suggest that fuel price inflation was an important factor influencing consumer confidence during the phase of rising inflation, when households were exposed to sustained increases in energy costs and heightened macroeconomic uncertainty.

The regression results for the inflation unwinding phase are presented in Table 4. The estimated relationship remains statistically significant throughout the period, confirming that fuel price inflation continued to affect consumer confidence even after energy prices began to stabilise. The regression model is statistically significant ($F = 30.05$; $p < 0.001$) and has relatively high explanatory power ($R^2 = 0.435$). This indicates that lagged fuel inflation still accounts for a large proportion of the variation in household confidence.

Despite having comparable explanatory power, the estimated regression coefficient decreases markedly to -0.094 ($p < 0.001$). This suggests that an increase of one percentage point in annual fuel inflation is associated with an average reduction of just 0.09 points in the Consumer Confidence Indicator. This is significantly smaller than the effect estimated during the inflation build-up phase. The weaker coefficient suggests that households became less sensitive to fluctuations in fuel prices as energy prices began to decline and inflationary pressures gradually abated. The gradual recovery of energy markets, lower inflation expectations and the adaptation of households to the

Table 4
Regression model: inflation unwinding phase

SUMMARY	OUTPUT							
Regression	Statistics							
Multiple R	0,6597							
R Square	0,4352							
Adjusted R Square	0,4207							
Standard Error	1,7100							
Observations	41							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	87,858	87,858	30,045	2,72E-06			
Residual	39	114,043	2,924					
Total	40	201,901						
	Coefficients	Standard Error	tStat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	-13,9172	0,2736	-50,861	2,86E-37	-14,471	-13,364	-14,471	-13,364
X Variable 1	-0,0943	0,0172	-5,481	2,72E-06	-0,129	-0,060	-0,129	-0,060

Source: Eurostat, European Commission, own calculation

new price environment may all have contributed to this weaker response.

Comparing the two sub-periods reveals a clear difference in the way fuel price inflation and consumer confidence are transmitted. While the estimated relationship remains statistically significant in both phases, its magnitude differs substantially. The estimated coefficient declines from −0.340 during the inflation build-up phase to −0.094 during the inflation unwinding phase. This indicates that the effect of fuel price inflation on consumer confidence is approximately 3.6 times stronger when fuel prices are increasing than when they are falling. Notably, the explanatory power of the two models remains remarkably similar (R^2 = 0.452 and R^2 = 0.435, respectively). This suggests that fuel price inflation remains an important factor in consumer confidence throughout the entire inflation cycle. However, households' behavioural response differs substantially depending on whether fuel prices are rising or falling. Households appear to react more strongly to rapidly rising fuel prices than to subsequent declines, which provides evidence of an asymmetric adjustment process in household expectations. These findings complement the baseline regression results and confirm that the relationship between fuel price inflation and consumer confidence may not be consistent over time. To determine whether the differences observed between the two sub-periods reflect a statistically significant structural change or normal sampling variation, the following section applies the Chow structural break test.

4.5 Structural Break Analysis: Evidence from the Chow Test

Sub-period regression analysis suggests that the relationship between fuel price inflation and consumer confidence varies substantially between the inflation build-up and unwinding phases. While the estimated coefficients vary considerably between the two periods, these differences alone do not necessarily indicate a structural change in the underlying relationship. To ascertain whether these differences are statistically significant, the study employs the Chow structural break test. The Chow test evaluates the null hypothesis that the regression coefficients remain stable throughout the entire sample period, in contrast to the alternative hypothesis of a structural break occurring at a specific point in time. In the present study, the breakpoint is set to April 2022, which is the month when annual HICP fuel inflation in the euro area reached its maximum value. This date objectively separates the inflation build-up phase from the subsequent unwinding phase. The results of the test are presented in Table 5.

Table 5
Chow structural break test results

Statistic	Value
Breakpoint	April 2022
Chow F- Statistic	16,95
Degrees of freedom	2,89
p-value	5,79E−07
Decision	Reject H_0
Conclusion	Statistically significant structural break

Source: Eurostat, European Commission, own calculation

The Chow test provides strong statistical evidence of a structural break in the relationship between fuel price inflation and consumer confidence. With an estimated F-statistic of 16.95, the null hypothesis of parameter stability is rejected at a significance level of $p < 0.001$. These results suggest that the regression coefficients varied significantly before and after the peak in fuel inflation observed in April 2022. The statistical evidence confirms the conclusions drawn from the sub-period regression analysis. Although fuel price inflation remains a statistically significant factor influencing consumer confidence throughout the entire sample period, its impact is much stronger during the phase of inflation build-up than during the subsequent unwinding period. The estimated regression coefficient decreases from −0.340 before the breakpoint to −0.094 afterwards. This suggests that households react much more strongly to rapidly increasing fuel prices than to subsequent declines in fuel inflation. These findings suggest that the relationship between fuel price inflation and consumer confidence depends on the current situation rather than remaining constant over time. This finding provides formal statistical support for the asymmetric transmission mechanism identified in the previous section. During periods of rapidly rising fuel prices, households appear to adjust their expectations more strongly as inflationary pressures intensify and uncertainty about future economic conditions grows. In contrast, improvements in fuel prices are transmitted more gradually to consumer confidence, suggesting an asymmetric behavioural response across the different phases of the inflation cycle. The Chow test confirms that a single regression estimate over the entire sample masks significant differences in household behaviour. The identified structural break justifies dividing the sample into inflation build-up and inflation unwinding phases, representing one of the study's key empirical contributions.

5. Conclusions

This study examined the relationship between annual fuel price inflation and consumer confidence in the eurozone, using monthly data from January

2018 to June 2026. Unlike previous studies, which relied on international crude oil prices, this analysis used annual Harmonised Index of Consumer Prices (HICP) fuel inflation data, focusing on the retail fuel prices actually paid by households. The study also examined whether the relationship varies during different stages of the inflation cycle, distinguishing between inflation build-up and unwinding periods. The empirical results consistently demonstrate a statistically significant inverse relationship between fuel price inflation and consumer confidence. Correlation analysis identified an optimal transmission lag of nine months, indicating that changes in fuel prices affect household expectations with considerable delay. Baseline regression confirmed that higher fuel price inflation is associated with lower consumer confidence. This suggests that increases in fuel costs gradually reduce households' purchasing power and worsen their expectations regarding future economic conditions. The sub-period analysis revealed that the transmission mechanism is not constant over time. During the phase of inflation build-up preceding the peak in fuel prices in April 2022, the estimated impact of fuel price inflation on consumer confidence was considerably stronger than during the subsequent unwinding period. Although fuel price inflation remained statistically significant throughout the sample period, the estimated regression coefficient decreased substantially after the peak. This suggests that households respond more strongly to rapidly rising fuel prices than to subsequent falls in inflation. The Chow structural break test formally confirmed the existence of a statistically significant structural change. This provides evidence that the relationship between fuel price inflation and consumer confidence varies depending on the phase of the inflation cycle. These findings make several contributions to the existing literature. Firstly, rather than focusing on international crude oil prices, the study focuses on HICP fuel inflation, providing evidence based on retail prices directly faced by consumers. Secondly, the study empirically identifies a nine-month transmission lag, shedding new light on the delayed adjustment of household expectations. Thirdly, the study demonstrates that the relationship between fuel price inflation and consumer confidence is asymmetric, with substantial differences between the inflation build-up and unwinding phases. Finally, applying the Chow structural break test provides formal statistical evidence that the transmission mechanism changed significantly in the wake of the 2022 energy price shock. The results also have important policy implications. As consumer confidence reacts with considerable delay to fuel price developments, fuel inflation could act as an early indicator of future changes in household sentiment. Monitoring developments in retail fuel prices could support more timely macroeconomic assessments and improve the calibration of fiscal and monetary policy responses during periods of heightened energy market volatility. Furthermore, the findings suggest that policymakers should pay particular attention to periods of rapidly rising fuel prices, as these appear to impact household expectations more strongly than periods of falling energy prices. Several limitations should also be acknowledged. Although the analysis considers fuel price inflation to be the main explanatory variable, consumer confidence is also influenced by labour market conditions, income expectations, interest rates, monetary policy, and broader geopolitical developments. Therefore, future research could extend the empirical framework by incorporating additional macroeconomic variables within multivariate models, examining non-linear dynamics using threshold or regime-switching approaches, or comparing the euro area with individual member states to investigate possible cross-country differences in the transmission mechanism. Overall, the findings demonstrate that fuel price inflation is an important factor influencing consumer confidence in the euro area, with its impact varying across different phases of the inflation cycle. The study provides new evidence on the dynamic and asymmetric transmission of fuel price shocks to household expectations in the euro area by combining lag identification, sub-period regression analysis and structural break testing within a unified empirical framework.

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