UCD CENTRE FOR ECONOMIC RESEARCH

WORKING PAPER SERIES

2023

Oil Prices and Inflation Forecasts

Constantin Bürgi Prachi Srivastava Karl Whelan
University College Dublin

WP23/27

November 2023

UCD SCHOOL OF ECONOMICS
UNIVERSITY COLLEGE DUBLIN
BELFIELD
DUBLIN 4

Oil Prices and Inflation Forecasts

Constantin Bürgi* Prachi Srivastava† Karl Whelan‡

University College Dublin

November 2023

Abstract

We examine how people's forecasts for oil or gasoline prices influence their forecasts for broader inflation. We find little evidence from two US household surveys that people over-react to their beliefs about gasoline prices when formulating their forecasts about inflation, with much of the evidence pointing towards under-reaction. We also show that the participants in the ECB's Survey of Professional Forecasters and the Wall Street Journal survey of economists appear to place too little weight on their subjective forecasts for oil prices when making their forecasts for total inflation.

JEL Codes: E31, E52, D84, Q47

*constantin.burgi@ucd.ie
†prachi.srivastava@ucdconnect.ie
‡karl.whelan@ucd.ie

1. Introduction

After a gap of over forty years, high energy prices and high inflation have been back at the top of the list of macroeconomic policy concerns around the world. The direct impact of higher energy prices on inflation has already been significant but an important additional concern for central banks is that the higher inflation triggered by a jump in energy prices could fuel higher inflation expectations in the coming years. In this paper, we examine the relationship between people's perceptions of oil prices and their expectations for inflation, looking at both households and professional economists.

We make two contributions. First, we use US data to examine how household expectations of gasoline prices affect their expectations of inflation. Second, we examine how beliefs about oil prices affect the inflation expectations of professional forecasters.

In relation to US households, Coibion et al. (2020) have argued these households are sensitive to gasoline prices and various researchers have put forward the theory that gasoline prices have an outsized inflation on inflation expectations because of their greater salience than prices for other products that are not purchased as often or as important to household budgets. However, Kilian and Zhou (2020) address the relationship between gasoline prices, headline inflation and core inflation for Michigan household survey and find no evidence that gasoline price shocks move long-run household inflation expectations. Binder (2018) models inflation and inflation expectations for both gasoline and non-gasoline prices. After disentangling the indirect effects of gasoline prices on non-gasoline prices, she concludes that the response of household inflation expectations to changes in their expectations about gasoline prices are consistent with the weight of gasoline in the CPI.

This process of identifying direct and indirect effects of gasoline prices is complex and requires identifying assumptions that may not hold. We use a simpler methodology, asking a less complex question: When people change their expectations of gasoline or oil price inflation, do their overall inflation expectations adjust by more or less than the historical aggregate relationships suggests they should? To answer this question, rather than using a cross-sectional dataset, we need to use a panel that allows us to track people's changing expectations over time. For both the Michigan survey and the newer Survey of Consumer Expectations from the New York Fed, we find that the answer is that people adjust their inflation expectations when they change their expectations of gasoline prices but they do so by a smaller amount than implied by the historical macroeconomic relationship between total inflation and gasoline inflation.

We also examine the expectations of professional forecasters for both oil prices and consumer prices. The expectations of professional forecasters are important for a number of reasons. Even if most households don't pay careful attention to the data on inflation, market participants whose job it is to forecast inflation can have a considerable influence. For example, trade unions can use the forecasts for inflation provided by economists to bargain for higher wage increases, thus potentially triggering second-round effects on inflation. Forecasts of inflation also clearly have an impact on long-term nominal interest rates as well as perceptions of the ease of monetary stance as measured by expected long-term real interest rates.

We use data from the Wall Street Journal Economic Forecasting Survey and the ECB's Survey of Professional Forecasters (SPF), which, unlike the equivalent US Survey, asks participants to provide a forecast for the price of oil. We find that the professional forecasters in this survey place less weight on their forecast for oil prices when formulating their expectations of inflation than is implied by the historical relationship. Indeed, we show a regression model adding the oil price forecasts from the SPF to the participants' inflation forecasts produces better forecasts for inflation. Rather than over-react, forecasters seem to under-react to oil price developments. This may have implications for ECB monetary policy. It is well known that ECB Governing Council members pay close attention to the SPF's inflation expectation figures when considering inflation developments. Our results show that in an environment of rising energy prices, these forecasts may not be reliable.

Section 2 presents our estimates of the historical relationships between oil prices and inflation. Section 3 describes the data sets used for the empirical analysis and our methodological approach for micro-level data. Section 4 describes results for household and Section 5 presents our results for professional forecasters.

2. The Relationship Between Oil Prices And the CPI

We start with monthly macroeconomic data to measure the empirical relationship between inflation and changes in oil or gasoline prices. We run regressions that match those we run for individuals using microeconomic survey data later in the paper. Specifically, we measure inflation, π_t as the year-over-year percentage change in consumer prices and estimate the following equation

$$\pi_t = \beta_1 + \beta_2 \pi_t^O + \epsilon_{t,t-h} \tag{1}$$

where π^O is the year-over-year percentage change in the price of either oil or gasoline: We vary the measure to be consistent with the questions asked in surveys.

For US data, we use the Consumer Price Index (CPI) to measure inflation. We report a regression using the gasoline component of the CPI because household participants in the Michigan survey and the New York Fed Consumer Expectations survey are asked to forecast gasoline prices. We also report a regression using the West Texas Intermediate crude oil price (WTI) because participants in the Wall Street Journal's economic forecast survey are asked to forecast this variable. The results are reported in Table 1. We find that the coefficient on gasoline CPI inflation is 0.092, and the coefficient on WTI is 0.023. This smaller coefficient may reflect that WTI prices are somewhat more volatile than the gasoline CPI as well as the incorporation of federal and state-level gasoline taxes.

For the euro area, the measure of inflation is the Harmonized Index of Consumer Prices (HICP) and our measure of oil prices is the Brent crude oil price converted into Euros because participants in the ECB Survey of Professional Forecasters are asked to forecast both the Brent crude price in dollars and the euro-dollar exchange rate. Due to the much shorter sample, we run the regression at both the monthly and quarterly frequency. The results are presented in Table 2 and show that the coefficient of crude oil is around 0.011. This figure is lower than for WTI prices and US inflation, likely because of the much higher tax rate on gasoline in Europe.

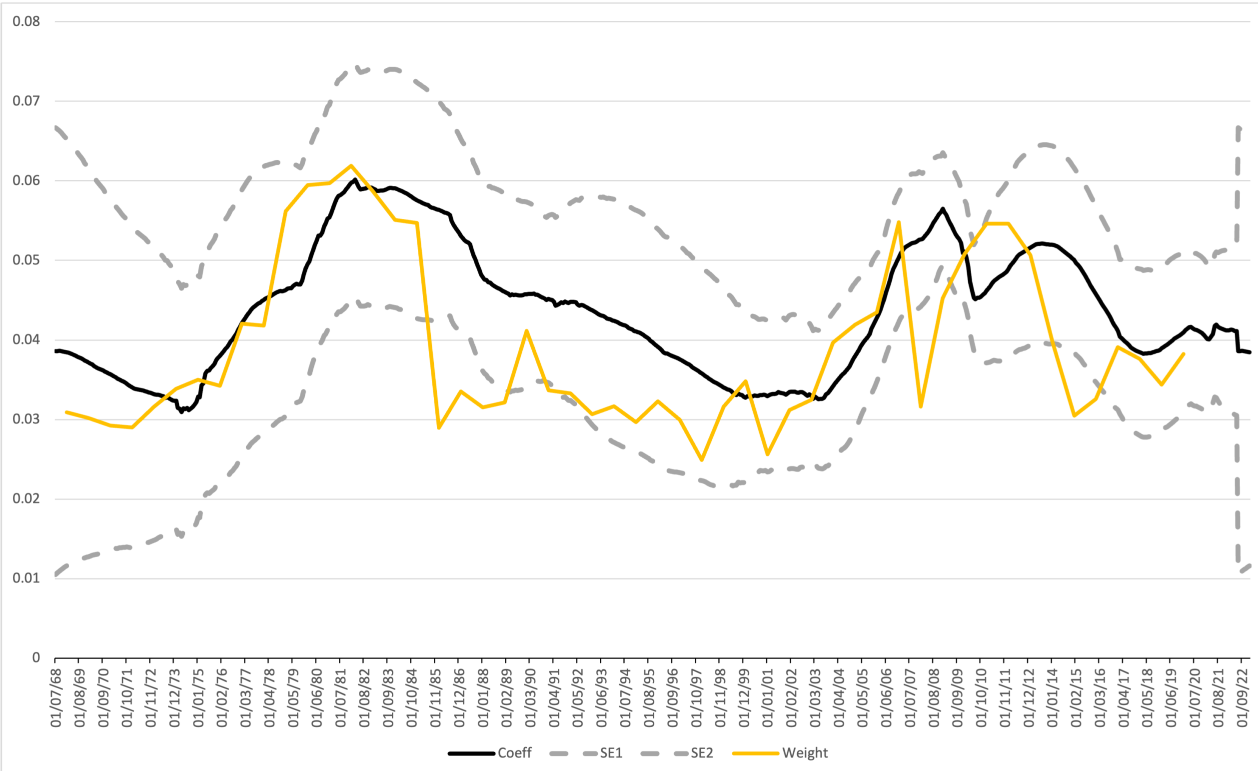
Note that these regressions are not intended to be interpreted as causal—there likely is causality running in both directions—and the coefficient on $\Delta InfOIL_{t,t+h}$ should not be interpreted as directly related to the weight of gasoline in the CPI. Changes in oil prices translate into changes in input costs and, thus, prices for many goods. The coefficients here just provide a simple reduced-form correlation that answers the question, "when gasoline or oil prices rise by 1%, what does this typically imply for the change in the total CPI?"

One concern about comparing these coefficients with the results from surveys where we see how households and economists adjusted their inflation forecasts given their oil or gasoline price forecasts is that the importance of oil prices for inflation may have changed over time. To address this, we also run a time-varying coefficients model for the relationship between US CPI gasoline inflation and total US CPI inflation using the Kalman filter and subsequently the Kalman smoother in Zhang and Li (1996). Specifically, we start with equation 1 and allow our coefficients to follow an autoregressive process of order one. So we have the state equation

$$\beta_t = G * \beta_{t-1} + w_t \tag{2}$$

where β_t is a vector that contains the two regression coefficients β_1 and β_2. The resulting β_{2t} coefficient with two standard deviations is plotted in Figure 1 along with the share of gasoline in the US CPI. They show the estimated β_{2t} has been relatively stable over time and has generally been somewhat larger than the weight for gasoline in the CPI.

Figure 1: Time-varying relationship between the US CPI and the Gasoline component



Note: The figure plots the estimated time-varying coefficient on the gasoline component based on equations 1 and 2 together with the 95% confidence intervals and the annual Bureau of Labor Statistics weights on gasoline.

Table 1: Regression with US monthly data (January 1948 to January 2023)

	Dependent variable: CPI Inflation (π_t)	
	(1)	(2)
Gasoline CPI Inflation (π_t^O)	0.092**	
	(0.043)	
Annual Percent Change in WTI (π_t^O)		0.023***
		(0.006)
Constant	3.492***	2.524***
	(1.060)	(0.610)
Observations	661	433
R^2	0.324	0.283

Note: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 2: Regression with euro area monthly data (January 1997 to January 2023)

	Dependent variable: HICP Inflation (π_t)	
	(Monthly)	(Quarterly)
Annual Percent Change in Brent (π_t^O)	0.019**	0.021***
	(0.009)	(0.006)
Constant	1.725	1.672***
	(1.099)	(0.631)
Observations	277	92
R^2	0.208	0.240

Note: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

3. Data Sources and Methodology

We now describe our data sources and the methodology used to estimate the micro-level relationships between oil-related inflation expectations and expected inflation across all goods and services.

3.1. Data Sources

We use four data sets to study the relationship between oil price forecasts and inflation expectations. For households, we used the Michigan Survey of Consumers and the New York Fed Survey of Expectations. For forecasters, we used the Wall Street Journal Economic Forecasting Survey and the ECB Survey of Professional Forecasters.

Michigan Survey

The monthly Michigan Consumer Survey covers around 500 households asking questions about attitudes and expectations. The survey includes questions about inflation expectations and gasoline or gas price expectations. The following questions address these two variables in the survey:

i) *"whether they expect prices to go up, go down or stay the same in the next twelve months"; followed by providing a quantitative response about the expected change;*

ii) *"About how many cents per gallon do you think gasoline prices will (increase/decrease) during the next twelve months compared to now?"*

While most of the survey is a repeated cross-section, a subset of consumers contributes a second time to the survey 6 months after their initial response. We use this subset for our analysis. The data are from 1982 to 1992 and then from 2005 to 2023 because these periods included questions about gasoline price expectations.

Because the survey asks about inflation expectations as a percentage but asks about gasoline price expectations in terms of cents, we need to adapt the data on energy price expectations to make it comparable to the response on inflation expectations. To do this, we use gasoline price data from the Energy Information Administration to get the gasoline price corresponding to the respective survey wave and then combined this with the survey answers calculate an expected percentage price in the gasoline price.[1]

Survey of Consumer Expectations

The Federal Reserve of New York launched an online monthly Survey of Consumer Expectations (SCE) in 2013, covering 1,300 households. We examine data from January 2013 to April 2022. The SCE covers a broader range of questions when compared to Michigan survey with detailed questions about their expectations including questions about the prices of various specific spending items such

[1] We also used regional gasoline prices and the results are qualitatively unchanged.

as gasoline, food, rent, medical care, and college education. As discussed by Armantier et al. (2017), new respondents are drawn each month to match various demographic targets from the American Community Survey (ACS) and stay on the panel for up to twelve months before rotating out of the panel.

The questions from the SCE that we use are:

i)"What do you expect the rate of [inflation/deflation] to be over the next 12 months?"
ii) "Twelve months from now, what do you think will have happened to the price of the following items? ... "I expect...The price of a gallon of gas to have increased by.."

Wall Street Journal

To capture the response of professional forecasters from the US, we use the Wall Street Journal Economic Forecasting Survey. The Wall Street Journal (WSJ) has been publishing forecasts of several economic variables since 1981. The WSJ asks professional economists to submit their projections of financial variables such as interest rates, unemployment rates, and Gross Domestic Product (GDP). The survey data is made publicly available with the names of individual forecasters, which likely encourages the forecasters to perform well. We use monthly data from December 2006 to March 2021. This period covers questions on expected inflation for the US economy and expected oil prices. After March 2021, the survey question regarding the oil forecast was dropped.

The survey has asked for point forecasts for year-over-year US CPI inflation in June and December of each year and WTI crude oil price predictions for the end of the same months. Using historical data, we convert the WTI price forecasts into year-over-year predictions.

ECB SPF

The European Central Bank's quarterly Survey of Professional Forecasters (SPF) started in 1999. It collects data on point forecasts for inflation, unemployment, and real GDP for the EU area. It also collects data on forecasts of four assumptions that forecasters have made when compiling their projections: Oil prices, the EUR/USD exchange rate, the ECB's policy rate and wage growth. Our sample includes 88 survey rounds conducted between 2002Q1 to 2023Q1, covering approximately 100 professional forecasters, which is more extensive than other professional forecaster surveys. The forecasting horizon for these assumptions is not provided for the current year but for the next five quarters. The expectations are asked at three different sets of horizons. Forecasters are asked about current and future calendar year expectations in the first and second quarters. They are asked to report for the next but one calendar year for the third and fourth quarters.

The survey reports point forecasts for three quarters ahead forecast for inflation and Brent crude oil prices. Similarly to the Michigan survey, the SPF asks for the oil price forecasts in dollars instead of percentage changes. Since the HICP measures prices denominated in euros, we first convert the dollar prices into euro using the euro/dollar exchange rate predictions of the forecasters. We then calculate the year-over-year percentage change forecast in the euro-denominated oil price using the historic euro/dollar exchange rate and Brent crude oil prices, so it is comparable to the HICP forecast. Here, we use one-quarter differences of the forecasts.

ECB SPF data has been used in several studies to analyze inflation expectations Tsenova (2015). For instance, Oinonen et al. (2014) analyze short and long-term inflation expectations. Glas and Drechsel (2021) studies how these assumptions are associated with macroeconomic indicators. They find that inflation forecasts are closely associated with oil price expectations, and interest rates are associated with the prediction of output growth and unemployment. Conflitti and Cristadoro (2018) studies the impact of oil prices on long-term inflation in the euro area.

3.2. Methodology

We use the following approach to motivate our use of survey data to answer the question of how individuals jointly change their expectations for inflation and an oil-related sub-component. We assume that individual i has non-oil inflation expectations at time t of

$$E_i\pi_t^N = \mu_i^N + \beta_N z_t + \sigma E_i\pi_t^O + \epsilon_{it}^N \tag{3}$$

where z_t is a vector of macro variables, $E_i\pi_t^O$ is oil inflation expectations, ϵ_{it}^N is a mean-zero random component and μ_i^N is a fixed effect such that some people tend to be systematically optimistic or pessismistic about non-oil inflation. Oil-related inflation expectations are included as a direct determinant of non-oil inflation expectations because of the indirect effect oil prices have on prices for other goods and services. Assume also that individual i's oil inflation expectations are determined as

$$E_i\pi_t^O = \mu_i^O + \beta_O z_t + \epsilon_{it}^O \tag{4}$$

where μ_i^O is a separate fixed effect reflecting systematic optimism or pessimism about oil-related inflation and ϵ_{it}^O is a mean-zero random component. Assuming total inflation expectations are a weighted average of these two components, with ω as the weight on oil-related inflation, individual i's total inflation expectations are thus

$$\begin{aligned}
E_i\pi_t &= (1-\omega)\,E_i\pi_t^N + \omega E_i\pi_t^O & (5)\\
&= (1-\omega)\left(\mu_i^N + \beta_N z_t + \sigma E_i\pi_t^O + \epsilon_{it}^N\right) + \omega E_i\pi_t^O & (6)\\
&= (1-\omega)\,\mu_i^N + (1-\omega)\,\beta_N z_t + (\omega + (1-\omega)\,\sigma)\,E_i\pi_t^O + (1-\omega)\,\epsilon_{it}^N & (7)\\
&= (1-\omega)\,\mu_i^N + (1-\omega)\,\beta_N z_t + \psi E_i\pi_t^O + (1-\omega)\,\epsilon_{it}^N & (8)
\end{aligned}$$

where the coefficient

$$\psi = \omega + (1 - \omega)\,\sigma \tag{9}$$

captures both the direct and indirect effects of oil-related inflation expectations on total inflation expectations.

One approach to estimating ψ would be to estimate a cross-sectional regression of the form

$$E_i \pi_t = \alpha + \kappa z_t + \psi E_i \pi_t^O + \epsilon_{it} \tag{10}$$

However, in this case, the estimated α will be determined by the average value of the non-oil fixed effect, $\bar{\mu}_i^N$, and the residual will contain the individual deviations from this average, $(\mu_i^N - \bar{\mu}_i^N)$. It is likely, however, that the two sets of fixed effects, μ_i^N and μ_i^O are positively. In other words, people who are always pessimistic about inflation being high are probably also likely to also be always pessimistic about oil price inflation. If this correlated is positive, then estimate of ψ from cross-sectional data will will be biased upwards because the term $\mu_i^N - \bar{\mu}_i^N$ in the residual will be positively correlated with $E_i \pi_t^O$. This calls for the use of panel data. Specifically, with a panel, we can estimate a fixed effects regression of the form

$$E_i \pi_t = \alpha_i + \kappa z_t + \psi E_i \pi_t^O + \epsilon_{it} \tag{11}$$

where the introduction of individual-level fixed effects allows for the unbiased estimation of ψ.

4. Evidence for Households

Our empirical approach is to estimate regressions of the form

$$E_{it}\pi_{t+h} = \alpha_i + \gamma_t + \psi E_{it}\pi^O_{t+h} + \epsilon_{i,t} \tag{12}$$

where where $E_{it}\pi_{t+h}$ is the consumer price inflation rate forecasted by household i to occur between t and $t+h$ and $E_{it}\pi^O_{t+h}$ is the corresponding forecast for gasoline price inflation. The horizon h is set to one year. We use the time effect γ_t to soak up the impact of all macro variables rather than specifying a subset of potentially relevant variables.

One concern when estimating these regressions is the possibility that a small number of outliers could have a big influence on the estimated coefficients. Some of the participants in the household studies have relatively little knowledge of economics and provide extreme answers. This problem appears to be particularly relevant for the New York Fed's Survey of Consumer Expectations. For example, as described in Table 3, the largest entries in the Survey of Consumer Finances for the variables in our regressions are 10,500% for gasoline price inflation and 11,200% for total inflation while the minimum for gasoline inflation is -4040% and for total inflation is -100%. The corresponding values for the Michigan Survey are a maximum of 200% for gasoline inflation and 50% for total inflation, with minimums of -100% for gasoline inflation and -50% for total inflation. Beyond these very extreme values, the 1st and 99th percentile values are much smaller in magnitude and more similar across the two surveys.

To address this issue, we report our regressions both for the full dataset and for a trimmed version that excludes observations that contain entries in the top and bottom 5% of values for the two variables. Table 4 shows the results of our regressions using the full Michigan survey dataset while Table 5 shows the results from the trimmed dataset. Table 6 show results from using the full Survey of Consumer Expectations dataset and Table 7 shows the results from the trimmed version of this dataset. The estimates are not particularly sensitive to the extent of trimming. Results using 1/99 and 10/90 trimming are very similar.

As expected, the coefficients on expected gasoline price inflation in each of these regressions are lower than the coefficients for our preferred fixed effects estimator. For the Michigan survey, the estimated ψ from the cross-sectional regressions are $\hat{\psi} = 0.03$ when the full dataset is used and $\hat{\psi} = 0.026$ with the 5 percent trimmed dataset. These values are well below the coefficient estimated from the aggregate relationship but the fixed effects estimates are even smaller: These are $\hat{\psi} = 0.016$ for the full dataset and $\hat{\psi} = 0.014$ for the trimmed dataset.

For the Survey of Consumer Expectations, we find larger differences between the cross-sectional and fixed-effects estimators and also that extreme outliers have more influence on the results. Using the full dataset, we estimate $\hat{\psi} = 0.029$ using the cross-sectional regression and $\hat{\psi} = 0.001$ with the fixed effects estimator. However, given the extreme outliers for this survey, we are more comfortable using a version of this dataset that excludes these observations. For our 5/95 trimmed dataset, we obtain $\hat{\psi} = 0.13$ using the cross-sectional estimator, which is larger than the aggregate coefficient reported above. However, this coefficient is likely to be biased upwards and our preferred fixed effects estimator reports $\hat{\psi} = 0.051$, which is just over half as large as the aggregate coeficient reported in Table 1.

Overall, while we find a statistically significant relationship between people's expectations for gasoline price inflation and their expectations for total price inflation, the evidence points to people responding to changes in their gasoline price inflation expectations by adjusting their total inflation expectations by a smaller amount than would be suggested by the aggregate relationship between these two variables.

Table 3: Distribution of Inflation Expectations from Michigan and New York Fed Surveys

	Michigan Survey		**Survey of Consumer Expectations**	
	Total Inflation	Oil Inflation	Total Inflation	Oil Inflation
Minimum	-50	-100	-100	-4040
1 Percentile	-6	-39	-20	-19
5th Percentile	1	-4	-2.9	-4.8
10th Percentile	1	1	0.9	-2.7
25th Percentile	2	2	2	2
Median	3	5	3	5
75th Percentile	5	20	6	10
90th Percentile	9	49	14	19.7
95th Percentile	11	68	24	24
99th Percentile	24	99	56	49
Maximum	50	200	11200	10510

Table 4: Michigan Consumer Survey (All data)

	Dependent variable:	
	Expected CPI Inflation ($\pi_{t+12\|t}$)	
	Cross Section	*Individual Fixed Effects*
	(1)	(2)
Expected Gasoline ($\pi^O_{t+12\|t}$)	0.030***	0.016***
	(0.001)	(0.001)
Constant	3.535***	
	(0.016)	
Observations	115,377	115,377
R^2	0.028	0.707

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 5: Michigan Consumer Survey (Excluding outliers)

	Dependent variable:	
	Expected CPI Inflation ($\pi_{t+12\|t}$)	
	Cross Section	*Individual Fixed Effects*
	(1)	(2)
Expected Gasoline ($\pi^O_{t+12\|t}$)	0.026***	0.014***
	(0.001)	(0.001)
Constant	2.960***	
	(0.011)	
Observations	103,371	103,371
R^2	0.017	0.710
Note:	$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$	

Table 6: NY Fed Survey of Consumer Expectations (All data)

	Dependent variable:	
	Expected Inflation($\pi_{t+12\|t}$)	
	Cross Section	*Individual Fixed Effects*
	(1)	(2)
Expected Gasoline ($\pi^O_{t+12\|t}$)	0.029***	0.001
	(0.002)	(0.003)
Constant	5.400***	
	(0.092)	
Observations	122,762	122,762
R^2	0.001	0.161

Note: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 7: NY Fed Survey of Consumer Expectations (excluding outliers)

	Dependent variable:	
	Expected Inflation ($\pi_{t+12\|t}$)	
	Cross Section	*Individual Fixed Effects*
	(1)	(2)
Expected Gasoline($\pi^O_{t+12\|t}$)	0.130***	0.051***
	(0.002)	(0.002)
Constant	3.376***	
	(0.018)	
Observations	107,614	107,614
R^2	0.034	0.549
Note:		$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

5. Evidence for Professional Forecasters

For professional forecasters, we estimate the same regression as for consumers in equation 12, but replace the gasoline prices in the WSJ and ECB surveys with US-dollar denominated WTI and euro-denominated Brent crude oil prices, respectively. Tables 8 and 9 show that the coefficients are generally smaller than the respective coefficients in the aggregate data. Since these are professional forecasters, there is no issue with the definitions of the variables, so there is perhaps a stronger argument that the coefficients should closely match the estimates based on the aggregate data.

As the WSJ survey predicts year-over-year percentage changes in CPI and the oil price for every six months (June and December), we look at the relationship over three groups. Specifically, the first two columns in Table 9 show the results for the current semester and pools forecasts with horizons zero to five months ahead, the middle two columns pool forecasts with horizons six to eleven months ahead and the third sets of columns pools predictions twelve to seventeen months ahead. The last set of columns is closest to the consumer surveys as they do not contain any inflation or oil price information that will be included in the year-over-year percentage change. For the other four columns, the forecasters can already observe some inflation data within the year-over-year window (e.g. the prediction made in April 2022 for June and December 2022 already includes the CPI release for January and February 2022 that are included when calculating the June and December 2022 year-over-year percentage change).

So far, we have focused on the coefficient on the oil price forecast. This leaves out the possibility that some professional forecasters place a higher weight on their oil prediction than others. Unlike the U Michigan survey, the ECB survey is a panel, and we can track the forecasts made by each individual forecaster over time. We can thus estimate equation 1 at the individual forecaster level. We plot the resulting coefficient in Figure 2. It shows that clearly most of the forecasters have a negative coefficient and the aggregate results are not due to a small subset of forecasters.

This immediately raises the question of whether professional forecasters should place a weight of zero on their oil forecasts. As all forecasters know exactly which variable they forecast, we can estimate a forecast encompassing test of the form

$$\pi_{t+h} = \beta_1 + \beta_2 \pi_{t+h,t} + \beta_3 \pi^O_{t+h,t} \tag{13}$$

That is, inflation in period $t+h$ (π_{t+h}) depends on the prediction for inflation in period $t+h$ made in period t ($\pi_{t+h,t}$) and on the prediction for oil for period $t+h$ made in period t ($\pi^O_{t+h,t}$). All variables are in year-over-year percentage changes. If forecasters place the appropriate weight on their oil price prediction when predicting inflation, then we will get $\beta_3 = 0$. If they place too small a weight on the oil price prediction, $\beta_3 > 0$. As the regression results in Tables 10 and 11 show, forecasters generally place too small a weight on their oil price prediction. This suggests forecasters might substantially underestimate inflationary pressures resulting from increases in crude oil prices.

For the ECB SPF, we have so far combined the Brent crude oil forecast with the euro-dollar exchange rate forecast to obtain a EUR crude oil forecast. In column 3 of Table 10, we include the two forecasts separately. Interestingly, the coefficient roughly doubles when compared to the combined coefficients. This suggests that the US dollar crude oil forecast should be taken into account even more. At the same time, the euro-dollar exchange rate forecast has a positive coefficient, which suggests that forecasters place too much weight on their exchange rate prediction. A weaker Euro would lead to higher inflation. As the euro-dollar exchange rate prediction is how much US dollar one gets per euro, a higher value should decrease inflation, and the coefficient should be negative if too little weight is placed on the exchange rate prediction. A positive sign thus implies too much weight is placed on the exchange rate. This is also in line with the US dollar crude oil prediction coefficient. The higher-than-optimal weight on the exchange rate reduces the coefficient on oil, as it somewhat cancels out the lower-than-optimal weight on crude oil.

Table 8: ECB SPF Oil Assumptions and CPI Forecasts Cross Section Level Inflation

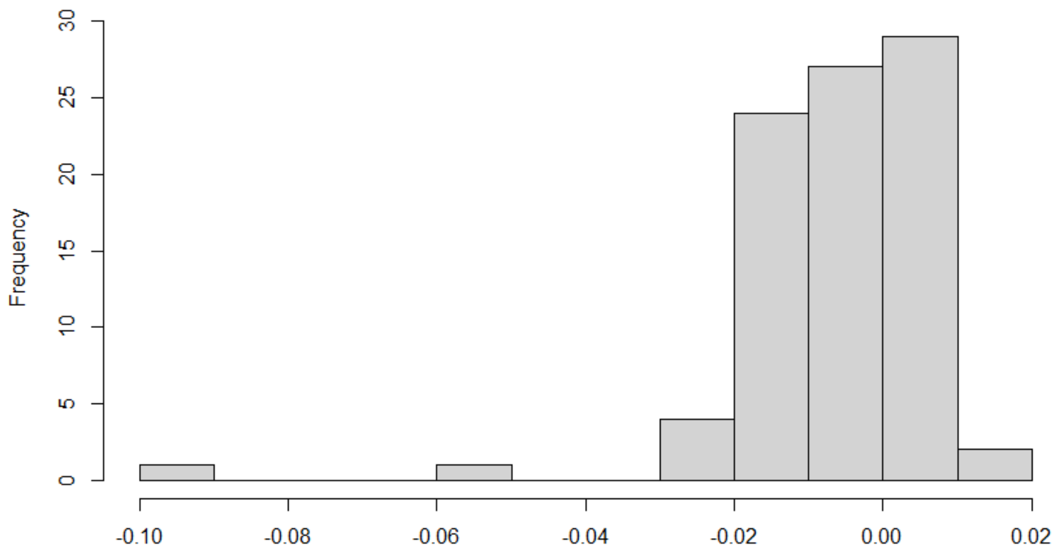
	Dependent variable:		
	Expected Inflation ($\pi_{t+12\|t}$)		
	Cross Section	*Individual FE*	*Individual and Time FE*
	(1)	(2)	(3)
Expected Oil (in euros) ($\pi^O_{t+12\|t}$)	-0.006^{***}	-0.005^{***}	0.005^{***}
	(0.001)	(0.001)	(0.001)
Constant	1.659^{***}		
	(0.012)		
Observations	3,281	3,281	3,281
R^2	0.018	0.068	0.503
Note:			$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 9: WSJ CPI And Oil Forecast Revisions

	Dependent variable:					
	Expected Inflation ($\pi_{t+h\|t}$)					
	Cross Section	*FE*	*Cross Section*	*FE*	*Cross Section*	*FE*
	(1)	(2)	(3)	(4)	(5)	(6)
Expected Oil ($\pi^O_{t\|t}$)	0.022***	0.009***				
	(0.001)	(0.001)				
Expected Oil ($\pi^O_{t+6\|t}$)			0.007***	0.009***		
			(0.001)	(0.001)		
Expected Oil ($\pi^O_{t+12\|t}$)					0.002*	0.007***
					(0.001)	(0.002)
Constant	1.842***		2.031***		1.982***	
	(0.023)		(0.028)		(0.086)	
Time and Individual FE	No	Yes	No	Yes	No	Yes
Observations	6,866	6,866	7,013	7,013	4,806	4,806
R^2	0.359	0.018	0.030	0.029	0.007	0.012

Note: We use Driscoll and Kraay (1998) standard errors for the panel estimation. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$. Forecasts are made for the end-of-semester values (June/December for CPI and end of June/December for Oil); due to this, the estimates include forecasts for different horizons. For example, $\pi_{t|t}$ is for the current semester and 0-5 months ahead, $\pi_{t+6|t}$ for next semester and $\pi_{t+12|t}$ for the semester after.

Figure 2: Histogram Of The Importance Of Oil Forecasts (ECB)



Note: The figure plots the histogram of estimated forecaster-specific coefficients on the energy component based on equations 1.

Table 10: Do Oil Price Forecasts Matter? - ECB SPF

	Dependent variable:		
	Actual CPI (π_{t+h})		
	Cross Section	*Fixed Effects*	*Fixed Effects*
	(1)	(2)	(3)
Expected CPI forecast ($\pi_{t+12\|t}$)	0.689***	0.716***	0.622***
	(0.060)	(0.056)	(0.064)
Expected Oil (in Euros) forecast ($\pi^O_{t+12\|t}$)	0.002	0.003**	
	(0.001)	(0.001)	
Expected Oil (in US dollar)			0.006***
			(0.001)
Expected Euro/dollar exchange rate			0.024***
			(0.005)
Constant	0.699***		
	(0.120)		
Individual FE	No	Yes	Yes
Observations	3,083	3,083	2,670
R^2	0.063	0.065	0.072

Note: We use Driscoll and Kraay (1998) standard errors for the panel estimations. $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Table 11: Should Forecasters Place A Higher Weight On Oil? (Wall Street Journal)

	Dependent variable:					
	Actual CPI (π_{t+h})					
	Cross Section	*FE*	*Cross Section*	*FE*	*Cross Section*	*FE*
	(1)	(2)	(3)	(4)	(5)	(6)
Expected CPI Forecast ($\pi_{t\|t}$)	0.288***	0.278***				
	(0.027)	(0.027)				
Expected Oil Forecast ($\pi^O_{t\|t}$)	0.024***	0.024***				
	(0.001)	(0.001)				
Expected CPI Forecast ($\pi_{t+6\|t}$)			0.049	0.040		
			(0.053)	(0.040)		
Expected Oil Forecast ($\pi^O_{t+6\|t}$)			0.029***	0.033***		
			(0.002)	(0.001)		
Expected CPI Forecast ($\pi_{t+12\|t}$)					−0.215***	−0.304***
					(0.081)	(0.085)
Expected Oil Forecast ($\pi^O_{t+12\|t}$)					0.030***	0.029***
					(0.003)	(0.002)
Constant	1.288***		1.853***		2.418***	
	(0.051)		(0.097)		(0.199)	
Individual FE	No	Yes	No	Yes	No	Yes
Observations	6,866	6,866	7,013	7,013	4,614	4,614
R^2	0.504	0.513	0.147	0.174	0.088	0.089

Note: We use Driscoll and Kraay (1998) standard errors for the panel estimation. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$. Forecasts are made for the end-of-semester values (June/December for CPI and end of June/December for Oil); due to this, the estimates include forecasts for different horizons. For example, $\pi_{t|t}$ is for the current semester and 0-5 months ahead, $\pi_{t+6|t}$ for next semester and $\pi_{t+12|t}$ for the semester after.

6. Conclusion

Most people drive cars and regularly have to go the filling station. This makes gasoline prices highly salient to consumers. For this reason, there has been concern that rising oil prices will contribute to consumers raising their expectations of future inflation, thus making it harder for central banks to return inflation to its credit after a supply shock has increased it to above target levels.

To address this issue, we have examined how people react to rising oil prices by examining the relationship between people's expectations for oil-related price inflation and their expectation for total inflation. As expected, we find a positive relationship at the individual level between these two sets of expectations. However, perhaps surprisingly, we do not find that people over-react in the sense that the positive coefficients we report tend to be less than the coefficient we estimate for the aggregate relationships between oil-related and total inflation. Also perhaps surprisingly, we find that this result holds more strongly for professional forecasters than for households.

References

Armantier, O., Topa, G., Van der Klaauw, W., and Zafar, B. (2017). An overview of the survey of consumer expectations. *Economic Policy Review*, (23-2):51–72.

Binder, C. C. (2018). Inflation expectations and the price at the pump. *Journal of Macroeconomics*, 58:1–18.

Coibion, O., Gorodnichenko, Y., Kumar, S., and Pedemonte, M. (2020). Inflation expectations as a policy tool? *Journal of International Economics*, 124:103297.

Conflitti, C. and Cristadoro, R. (2018). Oil prices and inflation expectations. *Bank of Italy Occasional Paper*, (423).

Driscoll, J. C. and Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *The Review of Economics and Statistics*, 80:549–560.

Glas, A. and Drechsel, K. (2021). Conditional macroeconomic forecasts: Disagreement, revisions and forecast errors. *Revisions and Forecast Errors (June 3, 2021)*.

Kilian, L. and Zhou, X. (2020). Oil prices, gasoline prices and inflation expectations: A new model and new facts.

Oinonen, S., Paloviita, M., et al. (2014). *Analysis of aggregated inflation expectations based on the ECB SPF survey*.

Tsenova, T. (2015). Are long-term inflation expectations well-anchored? evidence from the euro area and the united states. *Bulletin of Economic Research*, 67(1):65–82.

Zhang, Y. and Li, X. (1996). Fixed-interval smoothing algorithm based on singular value decomposition. In *Proceeding of the 1996 IEEE International Conference on Control Applications IEEE International Conference on Control Applications held together with IEEE International Symposium on Intelligent Contro*, pages 916–921. IEEE.

UCD CENTRE FOR ECONOMIC RESEARCH – RECENT WORKING PAPERS

WP23/02 Emanuele Albarosa, Benjamin Elsner: 'Forced Migration and Social Cohesion: Evidence from the 2015/16 Mass Inflow in Germany' January 2023
WP23/03 Xidong Guo: 'Hospital Efficiency and Consultants' Private Practices: Analysing the Impact of a Voluntary Reform' February 2023
WP23/04 Tadgh Hegarty, Karl Whelan: 'Calculating The Bookmaker's Margin: Why Bets Lose More On Average Than You Are Warned' February 2023
WP23/05 Tadgh Hegarty, Karl Whelan: 'Forecasting Soccer MatchesWith Betting Odds: A Tale of Two Markets' February 2023
WP23/06 Karl Whelan: 'How Do Prediction Market Fees Affect Prices and Participants?' March 2023
WP23/07 Kevin Devereux, Zuzanna Studnicka: 'Local Labour Market Concentration and Wages in Ireland' March 2023
WP23/08 Kevin Devereux, Zuzanna Studnicka: 'When and Where do Minimum Wage Hikes Increase Hours? Evidence from Ireland' April 2023
WP23/09 Karl Whelan 'Fortune's Formula or the Road to Ruin?The Generalized Kelly CriterionWith Multiple Outcomes' April 2023
WP23/10 Manuel E. Lago: '#MeToo...or not? Do salient shocks affect gender social norms?' April 2023
WP23/11 Cormac Ó Gráda, Tyler Anbinder, Simone A. Wegge: 'Gaming theSystem: The Not-So-Poor and Savings Banks in Antebellum New York' April 2023
WP23/12 Tadgh Hegarty, Karl Whelan: 'Disagreement and Market Structure in Betting Markets: Theory and Evidence from European Soccer' May 2023
WP23/13 Tadgh Hegarty, Karl Whelan: 'Do Gamblers Understand Complex Bets? Evidence From Asian Handicap Betting on Soccer' May 2023
WP23/14 Matthew Amalitinga Abagna: 'Special Economic Zones and Local Economic Activities in Ethiopia.' May 2023
WP23/15 Gregory Corcos, Stefanie Haller: 'Importer Dynamics: Do Peers Matter?' July 2023
WP23/16 Karl Whelan: 'How Does Inside Information Affect Sports Betting Odds?' July 2023
WP23/17 Michele Gubello: 'Social Trust and the Support for Universal Basic Income' July 2023
WP23/18 Constantin Bürgi, Zuzanna Studnicka: 'Online Interactions, Trade And The Gravity Model' August 2023
WP23/19 Juan S. Morales, Margaret Samahita: 'Can Social Pressure Stifle Free Speech?' August 2023
WP23/20 Fabrice Kämpfen, Xavier Gómez-Olivé, Owen O'Donnell, Carlos Riumallo Herl: 'Effectiveness of Population-Based Hypertension Screening: A Multidimensional Regression Discontinuity Design' August 2023
WP23/21 Annette Alstadsæter, Ronald Davies, Mathieu Parenti, Farid Toubal: 'The Real Effects of Tax Havens' October 2023
WP23/22 Ronald B. Davies, Dieter F. Kogler, Guohao Yang: 'Construction of a Global Knowledge Input-Output Table' October 2023
WP23/23 Taipeng Li, Lorenzo Trimachi, Rui Xie, Guohao Yang: 'The Unintended Consequences of Trade Protection on the Environment' October 2023
WP23/24 Constantin Bürgi, Mengdi Song: 'Do Professional Forecasters Believe in Uncovered Interest Rate Parity?' November 2023
WP23/25 Morgan Kelly, Kevin Hjortshøj O'Rourke: 'Industrial policy on the frontier: lessons from the first two industrial revolutions' November 2023
WP23/26 Morgan Kelly, Kevin Hjortshøj O'Rourke: 'Industrial policy on the frontier: lessons from the first two industrial revolutions' November 2023

UCD Centre for Economic Research
Email economics@ucd.ie