Brunel University London

Department of Economics, Finance and Accounting

Working Paper No. 2511

Economics, Finance and Accounting Working Paper Series

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June 2025

https://www.brunel.ac.uk/economics-and-finance/research-and-phd-programmes/research-papers

# Gasoline Price Expectations as a Transmission Channel for Gasoline Price Shocks


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## Abstract

This paper uses data on 5-year gasoline price expectations from the US Michigan Survey of Consumers to investigate their role as a transmission channel for gasoline price shocks. Specifically, a Structural VAR model is estimated to carry out counterfactual analysis which shows that gasoline price expectations act as a transmitter of gasoline price shocks to US inflation and real activity. Further, nonlinear local projections with high-frequency instrumental variable identification indicate that gasoline price expectations propagate gasoline price shocks to inflation even when headline inflation expectations appear to be anchored, although their effects are not persistent and the strength of the transmission depends to some extent on the chosen definition of anchoring.



**Keywords:** Gasoline price expectations; inflation expectations; anchoring; transmission channel; counterfactual analysis; Structural VAR; nonlinear local projections

**JEL Classification:** C32, E31, E52, Q43



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## 1. Introduction

Anchoring inflation expectations is a key objective for central banks with an inflation-targeting or dual mandate owing to their importance as a transmission channel for economic shocks. Most studies analysing this issue have focused on headline inflation expectations obtained from household, firm or professional forecaster surveys, and a general consensus has been reached that these have been anchored in the US since the global financial crisis of 2008 (Strohsal et al., 2016; Buono and Formai, 2018; Grishchenko et al., 2019). However, there are different views concerning the most appropriate measure of anchored inflation expectations (Kumar et al., 2015). Moreover, it is still unclear exactly how economic agents form inflation expectations and whether those reported in surveys represent their true beliefs about future prices which inform their decision-making and spending patterns (Coibion et al., 2020a).

It should be noticed that, in addition to headline inflation expectations, further information concerning price expectations, which has not been exploited in the literature, is in fact available. For instance, in the US Michigan Survey of Consumers, consumers are asked not only about their expectations of overall price increases over the next year or five years, but also, in a separate question, specifically about those concerning gasoline prices. The latter commodity is an important component of the consumption basket, and thus the corresponding price expectations could have significant effects on the wage- and price-setting decisions of consumers and firms, and on the economy as a whole. Consequently, although gasoline price expectations are included in the aggregate measure of price expectations, investigating their specific role could provide new interesting insights, especially given their greater volatility compared to overall price expectations.

The present study focuses precisely on this issue, namely on the role of gasoline price expectations as a transmission channel for economic shocks. For this purpose, a Structural Vector Autoregressive (SVAR) model is estimated for the US, for which survey-based gasoline price expectations are readily available. To identify the gasoline price expectations channel of transmission a counterfactual analysis is conducted which allows to differentiate between direct and second-round effects. Another issue which is investigated is whether the transmission of gasoline price shocks through gasoline price expectations changes depending on whether or not headline inflation expectations are anchored. In this case, nonlinear local projections are estimated with high-frequency instrumental variable identification to take into account the headline inflation expectations anchoring regime. The pass-through for different definitions of headline inflation expectations anchoring is then assessed by using separately four dummies, which indicate whether or not headline inflation expectations are anchored. The instrument is constructed as daily movements in the entire term structure of gasoline future prices on EIA announcement and release days, following the method of Inoue and Rossi (2021) and Kilian (2024).

The remainder of this paper is organised as follows: Section 2 reviews the literature on the anchoring of inflation expectations and their role as a transmission channel; Section 3 introduces the modelling framework; Section 4 describes the data and presents the empirical results; Section 5 offers some concluding remarks.

## 2. Literature Review

There is an extensive literature examining the anchoring of inflation expectations and how it can be measured. For instance, Kumar et al. (2015) consider five different definitions of anchoring, including distance from the target and disagreement amongst participants, and using firm survey data for New Zealand reach the conclusion that expectations are not anchored, regardless of the chosen definition. Strohsal and Winkelmann (2015) assess the degree of anchoring on the basis of the mean reversion of inflation expectations and report heterogeneities across countries. Other approaches are news-based and define anchored expectations as the absence of movements in inflation expectations in response to news (see, for instance, Gürkaynak et al., 2010) – such studies generally find support for anchoring in credible inflation targeting environments. Using a time-varying parameter model, Strohsal et al. (2016) find that expectations in the US were de-anchored during the global financial crisis of 2008 but have been firmly anchored since then. Similar evidence is provided by Buono and Formai (2018), who test movements between short- and long-term expectations and provide evidence for anchored US inflation expectations after the financial crisis of 2008. Finally, Grishchenko et al. (2019) account for time-varying uncertainty around survey-based inflation expectations, and again confirm that expectations in the US have been anchored since the financial crisis of 2008.

A related strand of the literature focuses on the importance of inflation expectations for the transmission of economic shocks. For instance, Bems et al. (2021) show that consumer prices respond more strongly and persistently to terms-of-trade shocks when expectations are poorly anchored than when they are well anchored. Falck et al. (2021) find that contractionary US monetary policy shocks affect positively (negatively) inflation and inflation expectations during periods of high (low) disagreement about future inflation between survey participants. Diegel and Nautz (2021) report that long-term inflation expectations in the US respond to monetary policy shocks and play an important role in the stabilisation of inflation and unemployment. Recently, there has also been much interest in investigating the response of expectations to energy price shocks. According to Güntner and Linsbauer (2018), inflation expectations represent one of the main transmission channels of oil supply and demand shocks to the US economy. Hammoudeh and Reboredo (2018) find that oil price shocks have a stronger effect on inflation expectations when oil prices are above 67 US dollars per barrel. Using a structural VAR model of the US economy, Geiger and Scharler (2019) show that oil market shocks increasing the price of crude oil also raise consumer inflation and unemployment expectations.

In addition to oil price shocks, gasoline price shocks have also been examined for their impact on consumer expectations and spending decisions. In particular, Edelstein and Kilian (2009) report that, although consumption expenditure does respond to gasoline price shocks, the latter cannot be considered the most important determinant of real consumption growth in the US. In the case of the euro area Clerides et al. (2022) find that consumer sentiment deteriorates in response to gasoline price shocks, but less so in response to crude oil price or demand shocks. In the context of a structural VAR model, Kilian and Zhou (2022a) show that cumulative gasoline price shocks account for over 40% of the movements in 1-year headline consumer inflation expectations in the US. Focusing on long-term expectations, Kilian and Zhou (2022b) conclude that these are not affected by gasoline price shocks. Vatsa et al. (2025) investigate the response of 1-year US headline and gasoline price expectations to gasoline price shocks and find that the response of headline inflation expectations is more persistent than that of gasoline price expectations. However, this literature does not examine the extent to which gasoline price expectations transmit gasoline price shocks to other economic aggregates, which is the focus of the present paper. The empirical approach used for this purpose is outlined in the following section.

## 3. Empirical Framework

### 3.1 The structural VAR model

In the first instance we estimate a linear structural VAR model of the following form:

$$A_0 y_t = c_0 + \sum_{i=1}^{p} A_i y_{t-i} + \varepsilon_t \tag{1}$$

where $y_t$ is a $(n \times 1)$ vector of endogenous variables, $A_0$ is a $(n \times n)$ matrix of contemporaneous coefficients, $c_0$ is a $(n \times 1)$ vector of constants, $A_i$ is a $(n \times n)$ matrix of autoregressive coefficients and $\varepsilon_t$ is a $(n \times 1)$ vector of serially uncorrelated structural innovations. Initially, the variables included are 5-year gasoline price inflation expectations, headline inflation, a measure of economic activity (specifically, real industrial production growth), the real price of gasoline and the shadow rate. We later replace the real price of gasoline with the real price of oil. The lag length is set to 12 months to account for long and variable lags in the transmission of energy price shocks (Hamilton and Herrera, 2004). To achieve identification we use zero and sign restrictions. These are preferable to a Choleksy identification scheme when dealing with both inflation and inflation expectations due to their endogeneity and the general ambiguity regarding their ordering (Coibion et al., 2020b; Casoli et al., 2024). By contrast, when imposing zero and sign restrictions one does not have to determine a priori the exogeneity status of the variables. The reduced form model is then the following:

$$y_t = A_0^{-1} c_0 + \sum_{i=1}^{p} A_0^{-1} A_i y_{t-i} + u_t \tag{2}$$

where the reduced form errors are $u_t = A_0^{-1}\varepsilon_t$ with impact matrix $A_0^{-1}$. We impose the following set of restrictions:

$$u_t = \begin{bmatrix} gasexp_t \\ inf_t \\ act_t \\ gas_t \\ sr_t \end{bmatrix} = \begin{bmatrix} + & 0 & 0 & + & * \\ * & + & + & + & - \\ * & - & + & - & - \\ * & + & + & + & - \\ 0 & * & + & + & + \end{bmatrix} \times \begin{bmatrix} gasoline\ price\ expectations\ shock \\ aggregate\ supply\ shock \\ aggregate\ demand\ shock \\ gasoline\ price\ shock \\ monetary\ policy\ shock \end{bmatrix} \tag{3}$$

where $+$ is a positive restriction, $-$ is a negative restriction, 0 is a zero restriction and $*$ indicates that no restriction has been imposed. Specifically, the gasoline price expectations shock is restricted to increase expectations only, while all other responses are left unrestricted with the exception of the monetary policy response, since we assume that the Fed does not directly respond to changes in gasoline price expectations. A negative aggregate supply shock raises both inflation and the price of gasoline, but lowers real activity. It is uncertain whether the Fed responds to this type of shock, since it has a dual mandate. An aggregate demand shock raises inflation, gasoline prices and real activity. The shadow rate also increases since we assume that the Fed responds to higher inflation and economic activity. Due to the timing of the Michigan survey, which takes place during the month, we assume that gasoline price expectations do not respond to domestic macroeconomic variables (inflation and real activity) within the same month, but that they respond contemporaneously to gasoline price shocks, since they can be observed in real time at the pump. We assume, however, that survey participants have contemporaneous information about interest rates and yields (see Geiger and Scharler, 2021). A gasoline price shock raises spot gasoline prices and gasoline price expectations as well as headline inflation. Real activity is expected to fall, and we assume that the Fed responds to gasoline price shocks by increasing the shadow rate. Finally, a contractionary monetary policy shock raises the shadow rate. In response, the price of gasoline, overall inflation and real activity decrease. We leave the response of gasoline price expectations unrestricted, since it is not clear whether and how these respond to a monetary policy shock. The model is estimated using Bayesian methods, specifically a Normal-Inverse-Wishart prior and the algorithm by Arias et al. (2018).

### 3.2 Counterfactual analysis and robustness

To assess the role of gasoline price inflation expectations as a transmission channel for gasoline price and other types of shocks to the wider economy we conduct a counterfactual exercise. Counterfactual analysis is useful to separate the direct effects of a shock from the second-round effects, which take place through the inflation expectations, or in our case gasoline price expectations, channel. The counterfactual works as follows. For a given shock, for instance a gasoline price shock, the response of the corresponding expectations to the shock is set to be zero. In practice, this requires creating a sequence of gasoline price expectations shocks that offset the response of gasoline price expectations to the shock of interest at all response horizons. This offsetting shock sequence $\tilde{\varepsilon}_{t+h}^{gasexp}$ takes the following form:

$$\tilde{\varepsilon}_{t+h}^{gasexp} = -\frac{1}{\theta_h^{gasexp,gasexp}}\left(\theta_h^{gas,gasexp}\varepsilon_t^{gas} + \sum_{j=0}^{h-1}\theta_j^{gasexp,gasexp}\right) \tag{4}$$

where $\theta_h^{gas,gasexp}$ is the impulse response of gasoline price expectations to the gasoline price shock, $\theta_h^{gasexp,gasexp}$ is the response of gasoline price expectations to the gasoline price expectations shock, and $\varepsilon_t^{gas}$ is the gasoline price shock. The counterfactual shock in period $h$ depends on the gasoline price shock itself and on the counterfactual gasoline price expectations in all periods up until $h-1$. The counterfactual impulse responses of the other variables in the model to the gasoline price shock are then:

$$\tilde{\theta}_h^{gas,i} = \theta_h^{gas,i}\varepsilon_t^{gas} + \sum_{j=0}^{h}\theta_h^{gasexp,i}\,\tilde{\varepsilon}_{t+h-j}^{gasexp} \tag{5}$$

where $\theta_h^{gas,i}$ is the standard impulse response of variable $i$ to the gasoline price shock at response horizon $h$, and $\tilde{\theta}_h^{gas,i}$ is the counterfactual response. The term $\sum_{j=0}^{h}\theta_h^{gasexp,i}\,\tilde{\varepsilon}_{t+h-j}^{gasexp}$ offsets the part of the gasoline price shock that is transmitted to variable $i$ through gasoline price expectations. This approach is common in the counterfactual literature; further details can be found, for instance, in Wong (2015) or Diegel and Nautz (2021).

Further, we carry out robustness checks by using different measures for inflation and economic activity in the model. Specifically, we also estimate the SVAR model using personal consumption expenditure (PCE) inflation instead of consumer price (CPI) inflation. Moreover, we introduce the output gap and the unemployment rate instead of real industrial production growth as alternative measures of economic activity.[1]

### 3.3 Nonlinear local projections

The extent to which gasoline price expectations propagate the effects of gasoline price shocks on the economy matters in general, and even more when headline inflation expectations are

[1] While the restrictions on the responses are the same whether one uses economic activity or the output gap, they need to be reversed when using the unemployment rate instead. Specifically, the latter is assumed to respond positively to a gasoline price shock, a contractionary monetary policy shock and an aggregate supply shock, but negatively to an aggregate demand shock.

anchored. To investigate this issue we use nonlinear local projections, since these can more easily incorporate regime-dependence than structural VAR models, which makes them an attractive choice for nonlinear analysis. The model takes the following form:

$$y_{j,t+h} = \alpha_h^j + \beta_{h,0}^j s_t^0 + \beta_{h,1}^j s_t^1 + \delta_h^j X_t + \varepsilon_{j,t+h} \quad (6)$$

where $y_{j,t+h}$ is the outcome of the local projection of variable $j$ at horizon $h$ to the gasoline price shock $s_t$ which is identified by an instrument $Z_t$, $X_t$ is a vector of control variables, $\beta_{h,0}$ indicates the effect in regime 0, and $\beta_{h,1}$ in regime 1. The regimes are determined by a binary dummy variable $D_t$, which specifies whether long-term headline inflation expectations are anchored or not. Given the lack of a general consensus on the most appropriate measure of anchored inflation expectations, we consider four different definitions of anchored inflation as in Kumar et al. (2015), namely: (i) average expectations should be close to the inflation target; (ii) there should be little dispersion of expectations across individual survey participants; (iii) individual respondents should show little uncertainty about their expectations; (iv) forecast revisions should be small.[2] In each case, the dummy takes a value of 1 if headline inflation expectations are anchored and a value of 0 if they are not. For the first definition of anchoring, this means that the dummy takes a value of 1 when 5-year headline inflation expectations fall within a 200-basis point range [3] around the inflation target of 2%, and a value of 0 when they fall outside this range. For the second definition, the dummy takes a value of 1 (0) if the individual agents' beliefs are within (outside) a one standard deviation range of the average belief of all participants. For the third definition, the dummy takes a value of 0 (1) if an individual participant's expectations lie within (outside) a one standard deviation band of the their average. For the fourth definition, the dummy takes a value of 0 (1) if the individual respondents' forecast revisions at any point in time are larger (smaller) than their average forecast revision. As in the linear VAR model case, we also conduct a counterfactual analysis within the nonlinear local projections framework following the process outlined by Jordà (2007). The counterfactual now works differently than in the structural VAR case. Specifically, the model is the following:

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[2] Kumar et al. (2015) propose a fifth definition which states that there should be little to no co-movement between short- and long-run expectations. However, under this definition there would be an insufficient number of observations for the dummy variable in regime 0 to estimate the model.

[3] When using a 100-basis point range, the number of observations in regime 1 is insufficient for the model to be estimated.

$$y_{j,t+h} = \alpha_h^j + \beta_{h,0}^j s_t^0 + \beta_{h,1}^j s_t^1 + \gamma_{h,0}^j y_{gasexp,t+h}^0 + \gamma_{h,1}^j y_{gasexp,t+h}^1 + \delta_h^j X_t + \varepsilon_{j,t+h} \quad (7)$$

where $y_{gasexp,t+h}^i = \beta_{h,i}^{gasexp} \cdot s_t^i$ for $i = \{0,1\}$, which shows the response of gasoline price expectations to the gasoline price shock in each regime and for each response horizon. In the counterfactual, this response is set to zero.

For the nonlinear local projections we focus only on the transmission of a gasoline price shock. To identify the single gasoline price shock, we use an instrumental variable approach. A suitable instrument is required to be relevant and exogenous, namely it should be correlated with the endogenous regressor but uncorrelated with the error term. Following a similar approach to the crude oil surprise literature, we construct a high-frequency instrument as monthly aggregates of daily movements in gasoline futures prices around announcements and releases by the EIA (US Energy Information Administration). As in Inoue and Rossi (2021), we represent the movements in gasoline futures prices as functional shocks defined as shifts in the entire gasoline futures price term structure on an announcement day. For this purpose we consider movements in all maturities from one month to twelve months, and use the Diebold-Li term structure model to estimate the level, slope and curvature parameters. This approach differs from that of Känzig (2021) who, in the case of crude oil, considers changes in futures prices of individual maturities separately and then uses the first principal component of the surprises at all maturities from 1 to 12 months as an instrument. Following Kilian (2024), for the aggregation we choose weights for the daily surprises over the course of the month depending on their timing. We carry out a weak instrument test to test instrument suitability, specifically a first-stage F-statistic (Staiger and Stock, 1997).

## 4. Data and Empirical Results

### 4.1 Data description

We use monthly series from November 1992[4] until February 2025, most of which are obtained from the Federal Reserve Economic Data (FRED) of the Federal Reserve Bank of St. Louis. Gasoline spot prices are the city average of regular unleaded US gasoline retail prices while

[4] This is the earliest date for which gasoline price expectations are available.

the crude oil price is WTI. Both gasoline and crude oil prices are divided by CPI to obtain real prices and then expressed as yearly growth rates. For the inflation series we obtain headline CPI and PCE series. Industrial production is converted to its real annual growth rate. The output gap is constructed using the Hodrick-Prescott filter. The unemployment rate is the total seasonally adjusted series. Finally, the Wu-Xia shadow rate is transformed to month-on-month changes. The log futures gasoline price data are the HU1 to HU12 series until October 2005 and the XB1 to XB12 series afterwards. They are obtained from Bloomberg and include all horizons from 1 to 12 months. The daily announcements and releases used to construct the instrument are obtained from the EIA. They contain all EIA Weekly Petroleum Status Report releases and all monthly EIA Short-term Energy Outlook releases during our sample period. We also include announcements related to gasoline market trends, refining industry news, petroleum taxation and subsidy changes and crude oil capacity information. All together they sum up to a total of 2,580 releases over the sample period.

Inflation expectations are obtained from the Michigan Survey of Consumers. The survey asks around 500 households each month about their inflation expectations, including those related to gasoline prices. The survey questions related to gasoline prices are worded as follows: "*About how many cents per gallon do you think gasoline prices will (increase/decrease) during the next twelve months compared to now?*" and "*About how many cents per gallon do you think gasoline prices will (increase/decrease) during the next five years compared to now?*". Since the raw series obtained from these questions are expressed in cents per gallon, they need to be transformed to represent expected gasoline price inflation according to the approach by Binder (2018), namely by dividing the expected increase in cents per gallon by the US regular conventional gas price to obtain the gasoline price inflation expectations measure. We use the 5-year median gasoline price expectations series, which is available since November 1992.[5] We also obtain headline inflation expectations for the 5-year horizon from the survey to create the anchoring dummy variables.

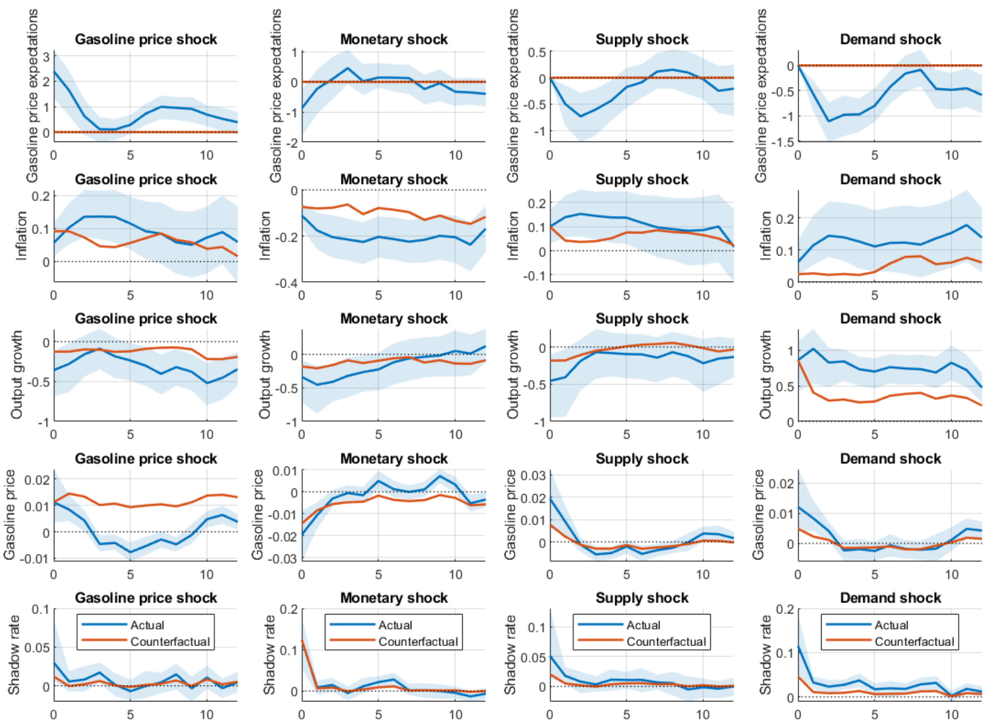
### 4.2 Transmission through the gasoline price expectations channel

This section discusses the results from the linear Structural VAR model. Figure 1 presents the results for the model with headline CPI and real output growth. The solid blue line is the actual

[5] The 1-year median series is only available continuously since October 2005, which would substantially reduce our sample size.

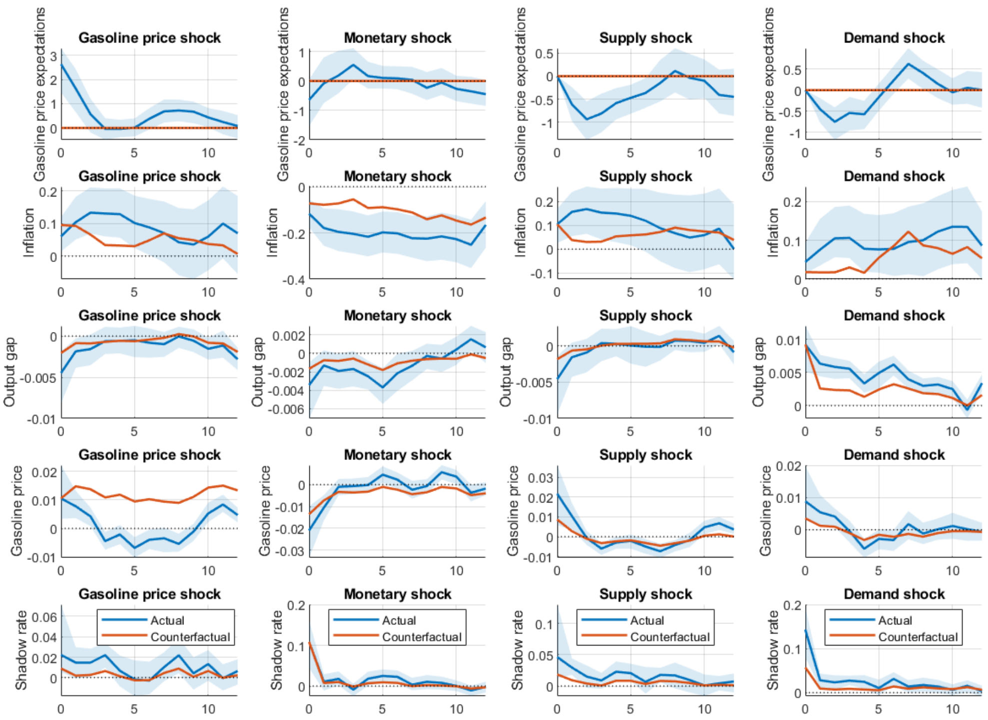
response and the solid orange line the counterfactual one. The second-round effects correspond to the difference between the two lines. In response to a gasoline price shock, gasoline price expectations initially increase, then fall before reaching a second peak after around seven months. Inflation increases initially by less when the gasoline price expectations channel is open, and reaches a peak after around three months, when gasoline price expectations have already fallen again. Output growth falls more severely due to the second-round effects, initially and again after five months. The shadow rate increases by a slightly larger amount when gasoline price expectations are allowed to respond to the gasoline price shock. In response to a contractionary monetary policy shock gasoline price expectations fall, and so do inflation and output growth. In both cases the contraction is stronger due to the gasoline price expectations response to the monetary policy shock.

**Figure 1. Results in the model with real output growth**




Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

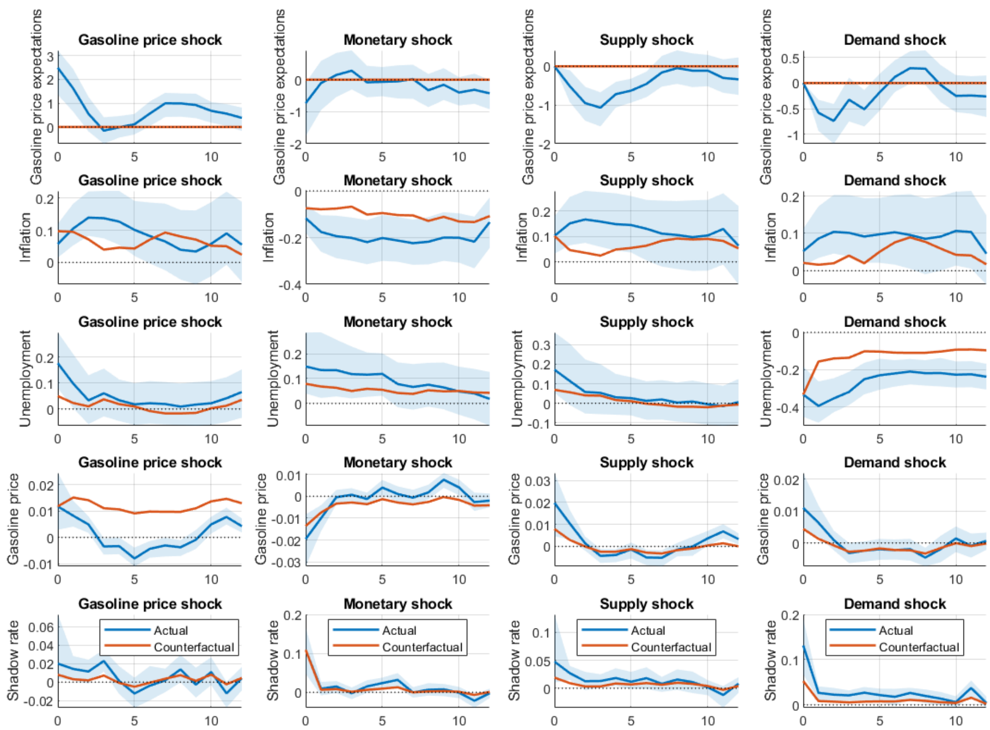
**Figure 2. Results in the model with the output gap**




Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

While gasoline price expectations do not respond initially to a supply shock (which is consistent with the fact that the expectations are surveyed before information for inflation and real activity becomes available), they fall for two months afterwards. Inflation increases more strongly due to second-round effects, despite the negative response of gasoline price expectations to the negative supply shock. Output growth contracts by a larger amount and has a more pronounced upward trajectory in the counterfactual case. The response of gasoline price expectations to a demand shock is very similar to that of a supply shock but with a larger magnitude. A possible reason why gasoline price expectations fall in response to these two shocks might be that consumers expect them to be short-lived or that there will be a monetary tightening in response (Geiger and Scharler, 2019). Since the gasoline price expectations series used represents longer term (5-year ahead) views, this suggests that the supply and demand shocks are expected to affect gasoline prices only temporarily. In the case of a negative supply shock, individuals might anticipate a reduction in the use of energy for production and personal consumption due to lower activity, which would reduce expected price increases for gasoline, but not necessarily for other goods. There could also be a wealth effect, specifically the expectations of falling gasoline prices might encourage increased consumer spending on other goods and services which would lead to higher inflation.

**Figure 3. Results in the model with the unemployment rate**




Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

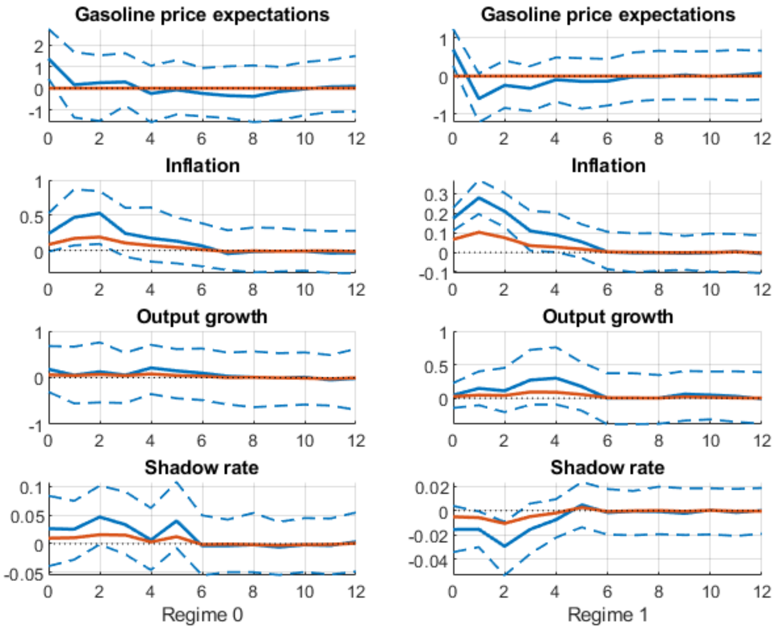
Figures 2 and 3 present the results with different activity measures included in the model, more precisely, the output gap in Figure 2 and the unemployment rate in Figure 3. In the case of the former the difference between the actual and counterfactual is much smaller over the entire response horizon. In the case of the latter the initial impact is larger, i.e. unemployment increases more due to the second-round effects and remains high over the entire horizon. Appendix A presents additional results using PCE instead of CPI inflation and crude oil prices instead of gasoline prices. The differences in either case are only marginal compared to the baseline models with CPI inflation and gasoline prices.

### 4.3 Propagation during anchored and unanchored times

After establishing that gasoline price expectations act as a transmitter of gasoline price (and other economic) shocks, next we investigate whether the transmission still occurs when headline inflation expectations are anchored and whether the strength of the propagation differs depending on the anchoring regime. In this section we focus on the transmission of gasoline price shocks only, since gasoline price expectations unsurprisingly respond most strongly to them. In all figures, regime 0 (1) is the state where headline inflation expectations are not anchored (anchored).

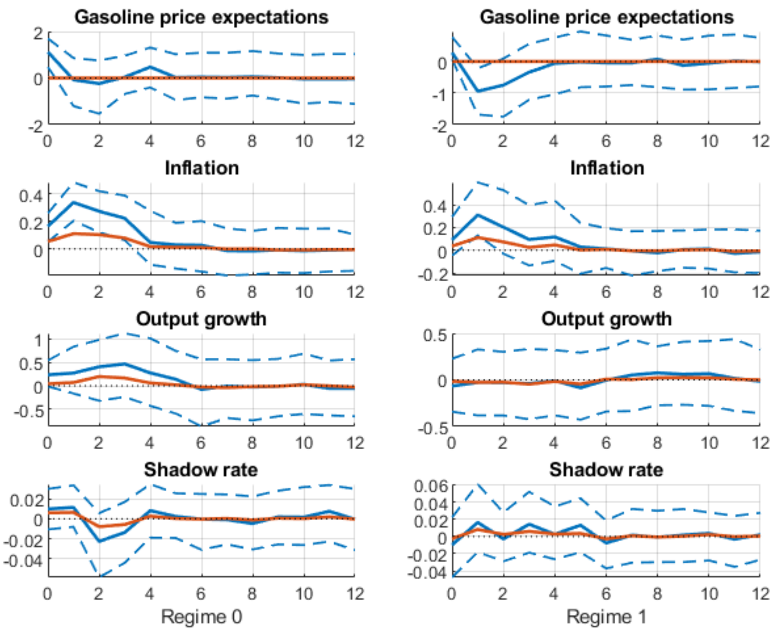
Figure 4 shows the results in the model with the first regime dummy, which indicates the deviation of headline inflation expectations from the 2% target. The response of gasoline price expectations to the gasoline price shock is only short-lived and even turns briefly negative after the initial impact in the anchored regime, consistently with findings by Vatsa et al. (2025). The response of inflation to the shock and the strong second-round effects are equally large in both regimes. However, these effects only last for six months before dying out completely. This is good news for the Fed in terms of persistence and can help gauge the duration of short-term inflationary pressures arising from these second-round effects. The results are similar in the model with the second regime dummy, which is based on the dispersion of individual agents' beliefs. Despite a smaller response of gasoline price expectations to the gasoline price shock, second-round effects on inflation still exist in the anchored regime, but they are also smaller. This suggests that the size of gasoline price expectations changes after a gasoline price shock matters for agents' decision-making and the impact of the transmission to inflation. The results are also similar in the case of the model with the third regime dummy, which shows the uncertainty around individual forecasts. Finally, they are slightly different for the fourth model, which defines the regimes according to the size of agents' forecast revisions. In this case, it seems that inflation responds more strongly to the gasoline price shock in the anchored regime (when forecast revisions are small), but second-round effects appear to still be present in both regimes.

**Figure 4. Nonlinear local projection results with regime dummy 1**



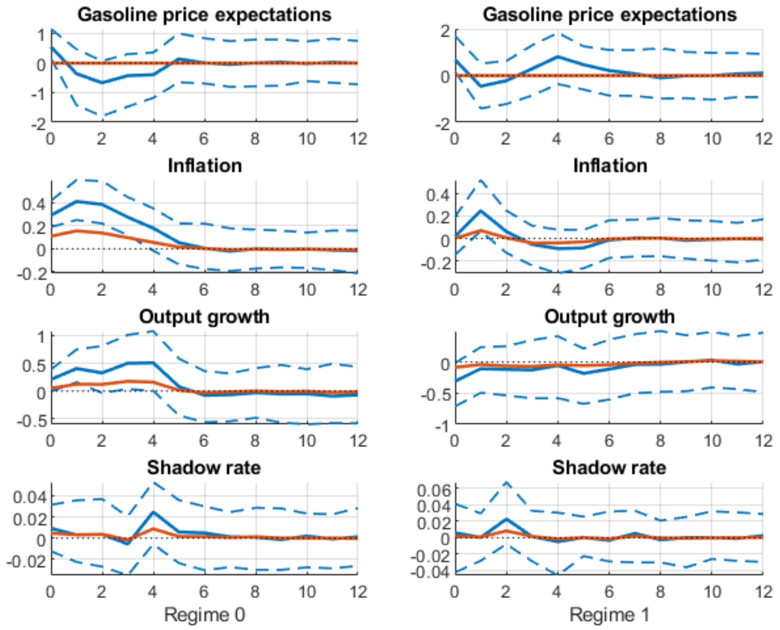

Notes: Responses to a gasoline price shock. The solid blue line shows the median response while the dashed blue lines indicate the 90% bootstrapped confidence intervals. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure 5. Nonlinear local projection results with regime dummy 2**



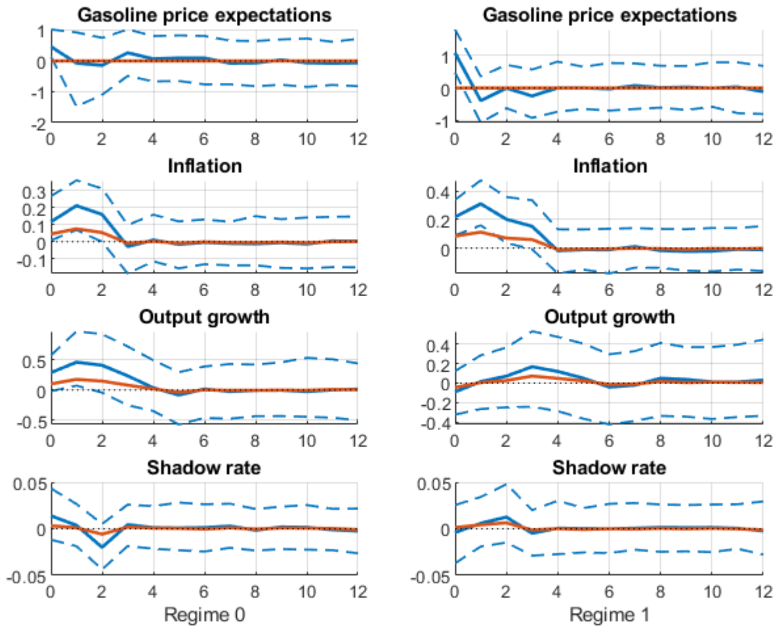

Notes: Responses to a gasoline price shock. The solid blue line shows the median response while the dashed blue lines indicate the 90% bootstrapped confidence intervals. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure 6. Nonlinear local projection results with regime dummy 3**




Notes: Responses to a gasoline price shock. The solid blue line shows the median response while the dashed blue lines indicate the 90% bootstrapped confidence intervals. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure 7. Nonlinear local projection results with regime dummy 4**




Notes: Responses to a gasoline price shock. The solid blue line shows the median response while the dashed blue lines indicate the 90% bootstrapped confidence intervals. The solid orange line is the counterfactual response. All responses are in percentage points.

Concerning the definitions of anchoring, it appears that for definitions (ii) and (iii), which relate to individual agents' beliefs and how they deviate from their own and all agents' average beliefs, the second-round effects are smaller in the anchored regime. This suggests that the entire distribution of gasoline price expectations might be relevant to capture accurately the transmission channel. In the case of forecast revisions, however, the transmission is stronger when these are small. Forecast revisions tend to be small (large) when little (a lot of) new information becomes available that causes agents to revise their expectations. This can also mean that the error made in the previous agents' forecast was small (large). In the absence of significant new information or economic developments, agents might be more likely to act on their expectations than when unforeseen information or events require large revisions in expectations, which can carry additional uncertainty that keeps agents from acting on them. Similarly, individuals might be quicker to act on their expectations when they perceive to have made small forecast errors rather than large ones.

## 5. Conclusions

This paper investigates the role of gasoline price expectations as a transmission channel for economic shocks. Using 5-year gasoline price expectations data from the Michigan Survey of Consumers in a Structural VAR model of the US economy, we conduct a counterfactual analysis to isolate the second-round effects of gasoline price and other shocks on macroeconomic aggregates through the gasoline price expectations channel. Further, we estimate nonlinear local projections to examine regime-dependence in the transmission of gasoline price shocks through gasoline price expectations depending on whether or not headline inflation expectations are anchored. Four different definitions of anchoring are used for the analysis.

The main findings can be summarised as follows. First, the results from the Structural VAR model and counterfactual analysis show that gasoline price expectations transmit economic shocks to inflation and economic activity. They also provide evidence of large second-round effects, especially in the case of real output growth and unemployment; thus they contribute to the growing literature on this topic (Wong, 2015; Diegel and Nautz, 2021) by showing that such effects are sizeable even in the case of disaggregate price expectations. Second, it appears that gasoline price expectations propagate gasoline price shocks to inflation even when headline inflation expectations are anchored. This represents a novel result for the literature on anchoring, which is primarily concerned with headline inflation expectations and has so far neglected disaggregate price expectations (Kumar et al., 2015, Strohsal and Winkelmann, 2015; Grishchenko et al., 2019). When considering four different definitions of anchoring to determine the regimes, it appears that the strength of transmission depends to some extent on the definition used. In particular, although second-round effects are found when headline inflation expectations are anchored, they are not persistent.

These findings have important implications for policymakers. Specifically, the assumption of well-anchored long-term inflation expectations often made by central banks might need to be reconsidered given the fact that second-round effects can also occur through disaggregate price expectations. In addition, policymakers and academics should reflect further on the various definitions of anchoring and the extent to which they are useful in capturing a state of the economy where shocks are not propagated by either aggregate or disaggregate expectations. In this respect, a better understanding of the extent to which gasoline price expectations more accurately reflect consumers' true beliefs about future prices and inform their decision-making would be useful. Lastly, central banks might want to consider survey expectations for additional disaggregate prices, such as food prices, as beliefs about them might differ substantially from those concerning aggregate headline prices. Future research could examine the relative importance of other disaggregate prices in the expectations formation and as a transmission channel in comparison to headline inflation expectations.

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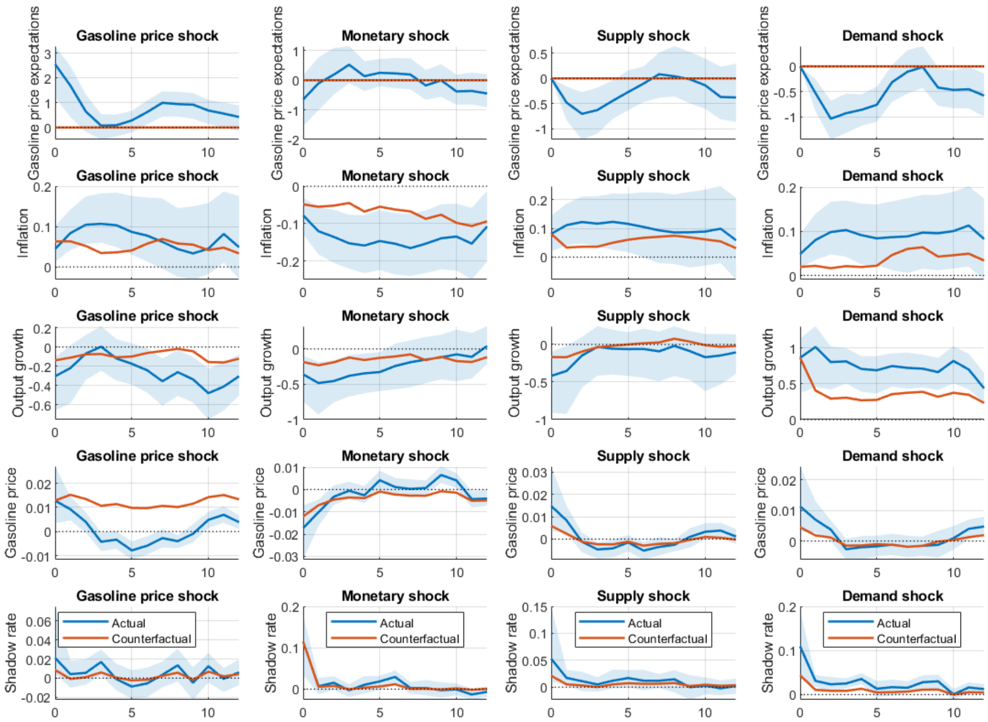
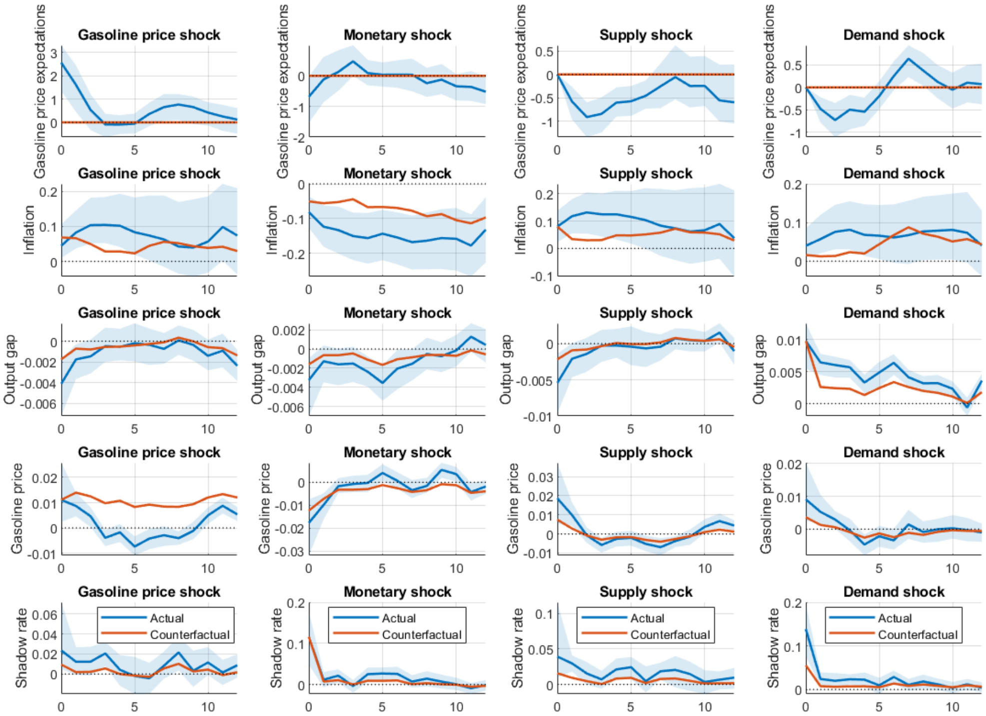
## Appendix A. Additional results for the linear model

**Figure A1. Results in the model with PCE inflation and real output growth**



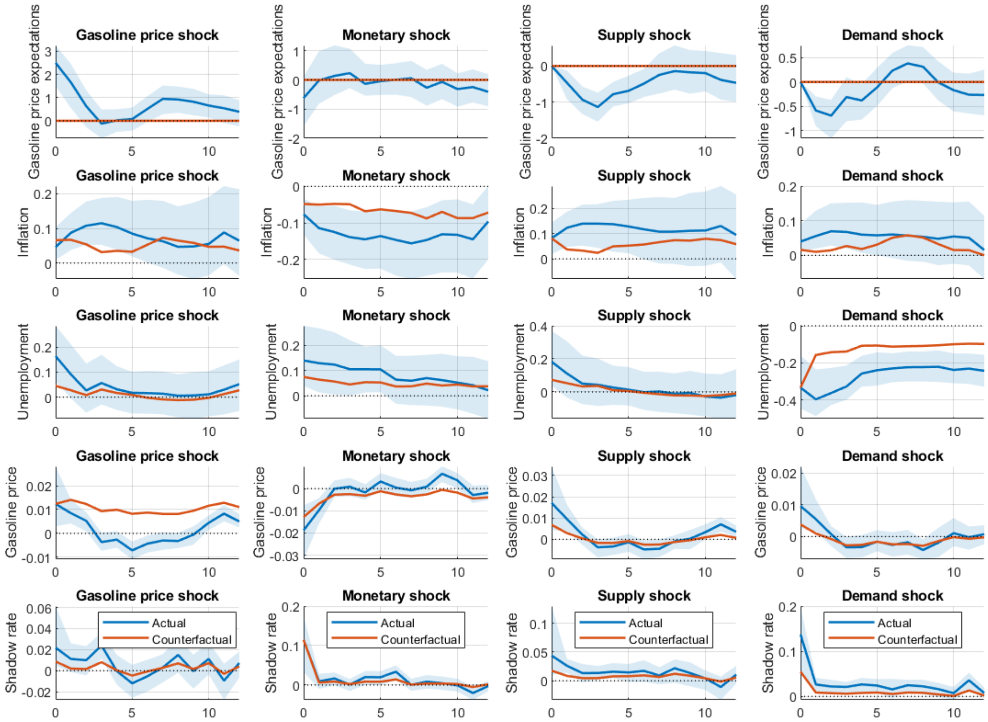

Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure A2. Results in the model with PCE inflation and the output gap**



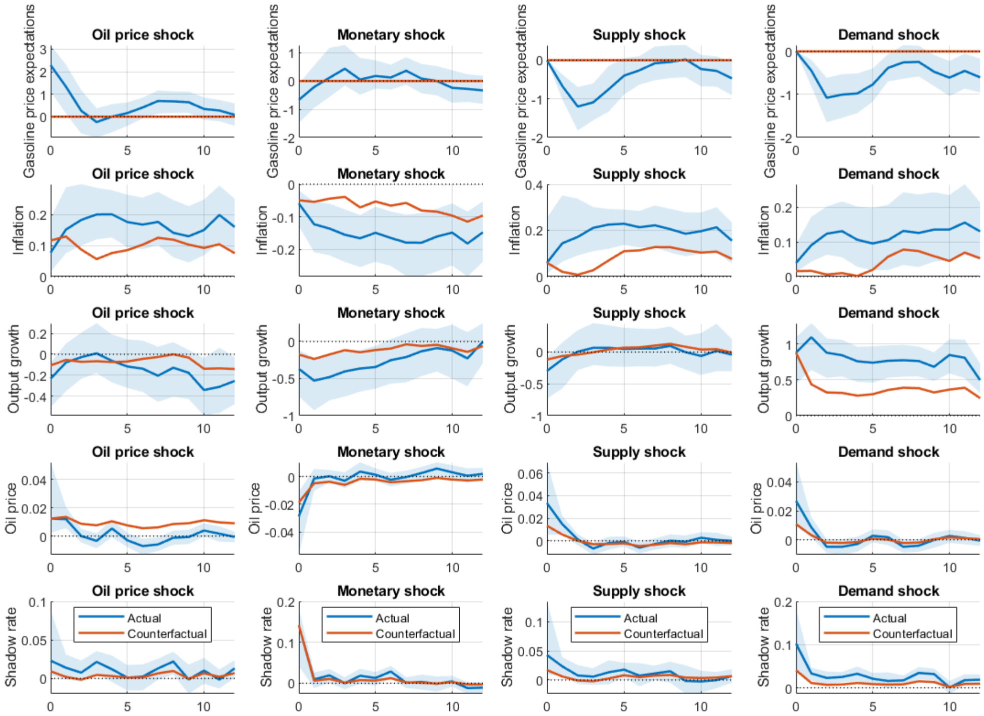

Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure A3. Results in the model with PCE inflation and the unemployment rate**



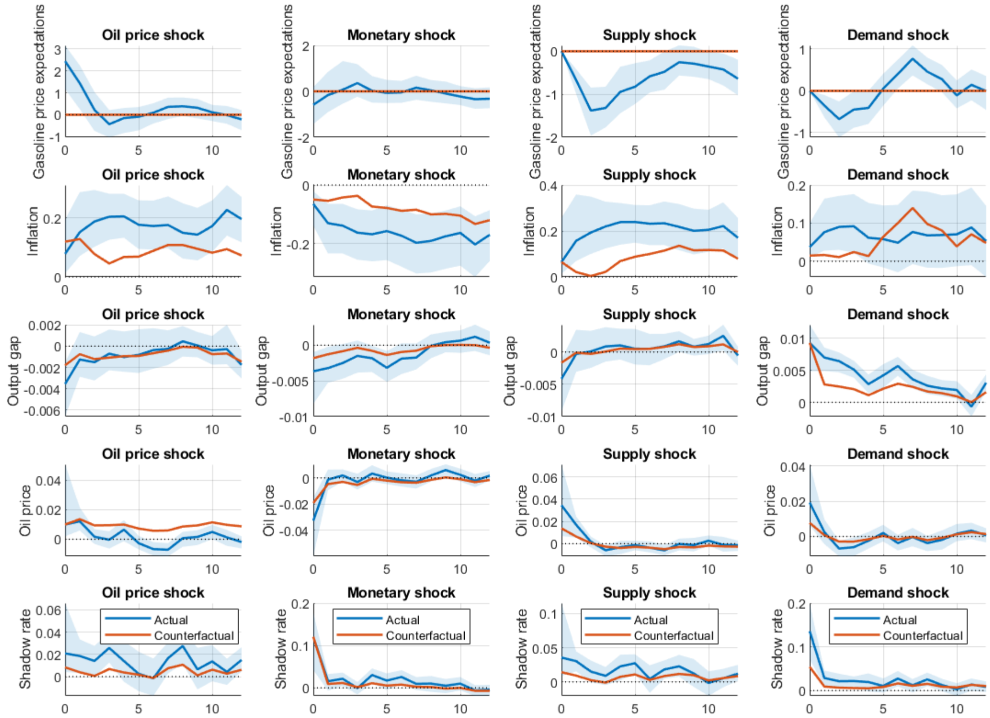

Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure A4. Results in the model with crude oil prices and real output growth**



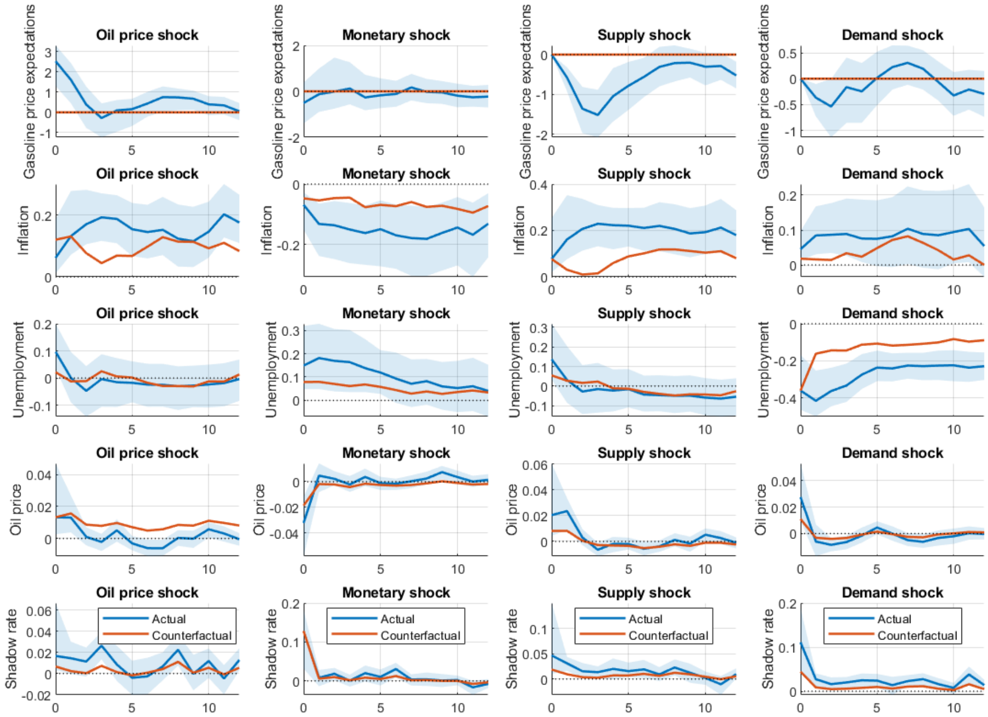

Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure A5. Results in the model with crude oil prices and the output gap**




Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.

**Figure A6. Results in the model with crude oil prices and the unemployment rate**




Notes: Impulse responses to a one standard deviation shock. The solid blue line shows the median response while the shaded blue area represents the 90% error bands. The solid orange line is the counterfactual response. All responses are in percentage points.