Movements in Real Estate Uncertainty in the United States: The Role of Oil Shocks
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Movements in Real Estate Uncertainty in the United States: The Role of Oil Shocks

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Abstract: In this paper, we analyse the role played by disaggregated oil shocks in driving real estate uncertainty (REU) over the monthly period of 1975:02 to 2017:12, based on impulse response functions generated from the local projection method. We find that the oil-specific consumption demand shock is statistically the strongest predictor of higher future REU, followed by the significant negative impact from the aggregate supply shock especially for long-run REU. While the oil inventory demand shock has a short-lived positive impact on REU, global economic activity shock virtually play no role in driving the same. Our results have important implications for policymakers and investors.

Keywords: Oil shocks, real estate uncertainty, local projection model, impulse response functions

JEL Codes: C22, Q41, R30

1. Introduction

Following the “Great Moderation”, the world economy experienced a substantial increase in financial and macroeconomic volatility in the last decade. As a result, the analysis of the role of volatility and uncertainty in the macroeconomy has regained a prominent role in recent years (see, Chuliá et al., (2017), and Gupta et al., (2018, 2019, 2020) for detailed reviews of this literature), with the majority of these studies concluding that unexpected large changes in uncertainty represent an important source of macroeconomic fluctuations. In this regard, given that the source of the recent financial turmoil originated in the housing market of the United

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States (US), Nguyen Thanh et al., (2018) construct a new uncertainty measure that is specific to the real estate sector, and shows that real estate uncertainty (REU) not only negatively impact the housing market, but also overall macroeconomic activity.

A growing consensus is that uncertainty actually arises as an endogenous response to other macroeconomic forces, such as specific aggregate demand or aggregate supply shocks, thus contributing to amplifying their effects (Mumtaz and Musso, 2019; Ludvigson et al., forthcoming). Given this, a question of paramount importance for policymakers is to determine the possible factors that can drive uncertainty, would allow policy authorities to determine in which direction the macroeconomy and financial markets are headed, and accordingly decide on the appropriate policy response. In this regard, a series of recent studies (see Degiannakis et al., (2018) and Hailemariam et al., (2019) for detailed literature reviews) demonstrate that oil shocks, in particular aggregate demand innovations, are a major driver of macroeconomic uncertainty.

Against this backdrop, we aim to add to this line of research, by analysing for the first time the predictive role of disentangled oil (supply, global economic activity, oil-specific consumption demand and oil inventory demand) shocks as derived by Baumeister and Hamilton (2019), which is expected to be affected through the same channels the oil market impacts on overall macroeconomic uncertainty (MU) and financial uncertainty (FU). As pointed out above, REU has been shown to be an important leading driver of not only the housing market, but also output, hence, predicting real estate uncertainty remains an important policy question. This is more so since Gabauer and Gupta (2020) point out that REU actually spillover to also MU and FU as well, which in turn implies the prolonged effect of an uncertainty shock on the economy due to the interactions between various sectoral measures of uncertainty.
From an econometric perspective, the four structural oil shocks are used to obtain impulse response functions for the REU by feeding them into the local projection method of Jordà (2005). The remainder of the paper is organized as follows: Section 2 discusses the data and outlines the econometric methodology, while Section 3 presents the results, with Section 4 concluding the paper.

2. **Data and Methodology**

Our data set covers the monthly period of 1975:02 to 2017:12, by the availability of oil shocks of Baumeister and Hamilton (2019), and real estate uncertainty (REU) index developed by Nguyen Thanh et al. (2018), whose methodological framework for the construction of the REU measure follows that of Jurado et al. (2015). Specifically speaking, the macroeconomic uncertainty (MU) and financial uncertainty (FU) measures of Jurado et al. (2015) and Ludvigson et al. (forthcoming), is the average time-varying variance in the unpredictable component of 134 macroeconomic and 148 financial time-series respectively, i.e., it attempts to capture the average volatility in the shocks to the factors that summarize real and financial conditions.\(^1\) The various uncertainty indices are available for three forecasting horizons of 1-, 3-, and 12-month-ahead, which in turn enables us to analyze short, medium- and long-term impact of the structural oil shocks on REU1, REU3 and REU12, controlling for the effects of MU1 and FU1; MU3 and FU3, and; MU12 and FU12. As far as the four structural oil-shocks, i.e., supply, global economic activity, oil-specific consumption demand and oil inventory demand concerned, these are obtained from the structural vector autoregressive (SVAR) model of Baumeister and Hamilton (2019), who formulate a less restrictive framework (than what has been traditionally used in the literature following Kilian (2009)), by incorporating uncertainty

\(^1\) The MU and FU indices are available for download from the website of Professor Sydney C. Ludvigson: [www.sydneyludvigson.com/data-and-appendixes](http://www.sydneyludvigson.com/data-and-appendixes).
about the identifying assumptions of the SVAR. In other words, the obtained oil shocks can be considered to be relatively more accurately estimated.

We then use the local projection (LP) method of Jordà (2005) to estimate the impulse response functions (IRFs) of REU1, REU3 or REU12 for the various oil shocks, and controlling for the corresponding MUs and FUs, given the evidence of spillover across the measures of uncertainty as noted by Gabauer and Gupta (2020). The linear model for calculating IRFs is as follows:

$$REU_{j,t+s} = \alpha_s + \beta_s Oil\ Shock_t + \gamma_s(L)X_{t-1} + \epsilon_{t+s}, \text{ for } s = 0,1,2, \ldots h,$$

where $REU_{j,t}$ represents the real estate uncertainty at time $t$ for horizons $j=1, 3$ and 12, $Oil\ Shock_t$ captures an identified oil shock at time $t$, $X$ is a vector of control variables, $\gamma_s(L)$ is a polynomial in the lag operator, $s$ is the length of forecast horizons, $h$ is the maximum length of forecast horizons.\(^2\) Our vector of control variables $X$ contains MUs and FUs of the corresponding horizons, as well as lags of REU to control for any serial correlation in the variable. The four structural oil-shocks, i.e., the oil supply shock (OSS), economic activity shock (EAS), oil-specific consumption demand shock (OCDS) and oil inventory demand shock (OIDS) are considered one at a time in the model. $\beta_s$ measures responses of uncertainty at time $t + s$ to the identified oil price shock at time $t$. The IRFs can be constructed as a sequence of $\beta_s$ estimated in a series of single regressions for each horizon ($s$).\(^3\)

### 3. Empirical Results

In Figures 1(a), 1(b) and 1(c), we present the impact of the four structural oil shocks on REU1, REU2 and REU3. The figures track the responses calculated by local linear projections to the disaggregated oil shocks on the future path of the REUs for 1 to 24-month-ahead, along with the 68% confidence bands. First starting with the signs of the IRFs, we find that REU1, REU2 and REU3 respond differently to the oil shocks. The maximum length of forecast horizons is set to 24, which corresponds to 24-month forecast horizons. $\gamma_s(L)$ is a polynomial of order 12, which corresponds to 12-month lags for control variables.\(^2\) Technical details about LP IRFs can be found in Jordà (2005).\(^3\)

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\(^3\) Technical details about LP IRFs can be found in Jordà (2005).
REU3 and REU12 fall following positive aggregate supply and global economic activity shocks, while REUs increases in the wake of positive oil-specific consumption demand and oil inventory demand shocks. The sign of the effects is in line with intuition. A positive aggregate supply shock, which implies an increase in oil production and a decline in oil price enhances domestic economic uncertainty and reduces uncertainty associated with the real estate sector. Note both the increase in aggregate supply and global economic activity are perceived as positive news, and hence is associated with reduced uncertainty. As far as the oil-specific consumption demand and inventory demand shocks are concerned, these two oil market innovations are associated with oil price increases and are capturing precautionary and speculative behaviour in the oil market, which results in enhanced real estate uncertainty.

While the signs are economically meaningful, what is important is to check the statistical significance of the IRFs. The negative impact on REU1, and REU3 due to the aggregate supply shock is significant for the initial 3-months after the shock, and then after a year for 12 to 16 months and 12 to 20 months respectively. The most persistent significant impact of the supply shock is felt at by REU in the longer-run, i.e., REU12, whereby the impact is mostly significant till 20-month-ahead, probably suggesting that as high oil production feeds into low oil prices, it positively impact constructions in the housing sector, and hence affects longer-run uncertainty more strongly, as building takes time. Unlike the aggregate supply shock, the impact on the REUs across all horizons under the global economic activity shock is not significant. The increase in REU1 and REU3 due to the oil inventory shock is significant after a delay between the 4- to 8-month-ahead forecasting horizon, but the effect limited to between 6-to 8-month-ahead for REU12. Strong evidence of statistical significance is observed under the oil-specific demand shock, with the impact lasting for over one and a half-year. In sum, precautionary demand for oil over uncertainty about future oil supply, i.e., the oil-specific demand shock, just like the findings in the existing literature analysing the impact of oil shock
on macroeconomic and financial uncertainty (see for example Kang and Ratti (2013a, 2013b)), is the main driver of also real estate uncertainty. This is followed by the aggregate supply shock, particularly for long-run uncertainty, with some limited short-lived impact from the speculative inventory oil demand shocks.4

[INSERT FIGURE 1 HERE]

4. Conclusion

Uncertainty related to the real estate market has been shown to negatively impact the housing market and economic activity of the US. Given this, prediction of real estate uncertainty (REU) is invaluable to both investors and policymakers in gauging the future path of the housing sector and the overall macroeconomy. We find that oil-specific consumption demand shock is statistically the strongest predictor of higher future REU, followed by significant negative impact from the aggregate supply shock, especially for long-run uncertainty, with the oil inventory demand shock producing short-lived positive impact on REUs. Interestingly, global economic activity shocks virtually play no role in affecting the future path of REUs. Understandably, policy authorities and economic agents monitoring uncertainty in the real estate sector need to carefully follow the behaviour of oil prices, especially when it results from the precautionary oil-specific consumption demand shock, and in addition from the oil supply shock, in particular for long-run REU.

References


4 As a robustness check, we analysed the impact of the four oil shocks on the conditional volatility of nominal housing returns, often measured as housing market uncertainty (see for example, Christidou and Fountas (2018)). The IRFs follow a general pattern as those reported for REUs, but are more volatile. Complete estimation details of the underlying EGARCH model is available upon request from the authors.


(2005).


Figure 1. Impact of Disaggregated Oil Shocks on Real Estate Uncertainty (REU) at Horizons 1-, 3-, and 12-Month-Ahead:

Figure 1(a). Impact on REU at horizon 1 (REU1)

Figure 1(b). Impact on REU at horizon 3 (REU3)

Figure 1(c). Impact on REU at horizon 12 (REU12)

Note: The figures show impulse responses to a 1% increase in disaggregated oil shock. The shaded areas represent the 68% confidence bands; OSS: oil supply shock; EAS: economic activity shock; OCDS: oil-specific consumption demand shock; OIDS: oil inventory demand shock.