Winners and Losers from Monetary Policy: Evidence from the UK Rental Market

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Very Preliminary - comments welcome

Abstract

This paper estimates the heterogenous effects of monetary policy across a novel dimension, housing tenure. Using microdata from one of the UK's largest property rental and sales websites, we show that a contractionary shock to the policy rate leads to 1) an increase in rental prices and simultaneously 2) a fall in house prices. The granular microdata also allows us to demonstrate that a contractionary shock leads to a decrease in the listing rate of rental properties, suggesting that this heterogeneous response across rents and house prices is not solely driven by household tenure decisions, but also by a rental supply channel. Finally, our identification approach does not lead to the typical 'price puzzle' found in many monetary VARs, suggesting that while contractionary policy lowers inflation, inflation incidence is heterogenous across housing tenure and implies a new distributional channel of monetary policy.

1 Introduction

This paper focuses on estimating the impact of monetary policy shocks in the United Kingdom, seeking to identify how key macroeconomic variables respond to monetary policy. While the monetary policy transmission mechanism has been much studied, both in the UK and elsewhere, relatively little work focuses on the effects of monetary policy in housing markets. Those papers that have examined the issue, tend to focus on the role of owner-occupied housing through a house price or investment channel. Such work ignores the sizeable proportion of the population that instead rents their housing, currently around 40% of households in the UK rent privately or through a housing association.

A rapid increase in housing rents occurring at the same time as a monetary tightening cycle in the UK has led to new interest in the effects of monetary policy in the housing market. Figure 1 shows the ONS' rental price index from 2020 to 2023, with the dashed vertical line indicating the start of the current tightening cycle. This tightening cycle coincided with an acceleration in the rent price index. The theoretical prediction about the effect of monetary policy on the rental market is a-priori ambiguous, when housing is treated as an asset, standard assessments of monetary policy transmission would predict that contractionary monetary policy lowers the value of the asset, putting downward pressure on prices. Furthermore, if landlords who rent out a mortgaged property face an increase in their housing costs (i.e an increase in mortgage costs), which is then passed on to renters, there is upward pressure on rental prices. On the other hand, ff we consider housing as a consumption good, the contractionary shock applies downward pressure on aggregate demand, and lowers the price of consumption goods, including rent. As a consumption good, housing forms a large proportion of the household consumption basket, in London, currently estimated at around 50% of household income, and so shocks to house prices and rents are seen as having first-order welfare effects on consumers.

Our main finding echoes that of Dias and Duarte (2019), who perform a similar analysis for the United States[1]. We find that following a contractionary policy innovation, our measure of rental prices increases, while our index of house prices declines, additionally, we find that a contractionary shock leads to a decline in the rent posting rate, suggesting that the response of the market does not consist solely of a housing demand channel, rather that suppliers of housing also respond to the shock. Finally, we demonstrate that our preferred specification and identification approach does not lead to the often discussed "price puzzle" common in much of the monetary policy transmission literature. We interpret this finding as suggesting

[1]The main difference is that we build a bottom-up rent index from web postings

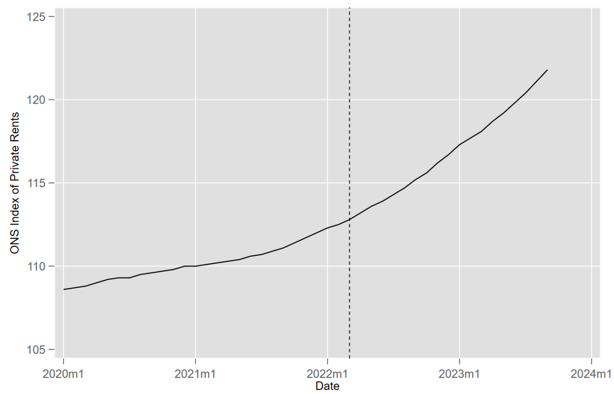


Figure 1: ONS index of private rents

that even though the headline measure of inflation responds in line with standard macroeconomic theory, the inflation rate that is felt by individual households is heterogeneous across their housing tenure type, suggesting a new channel through which monetary policy has redistributive effects.

Although we do not explicitly consider it in this paper, our results also have important implications for the transmission mechanism. Our results demonstrate that the overall elasticity of the price level with respect to a monetary policy shock depends upon the relative elasticities of housing and non-housing elements of the CPI basket. Given the increase in rents following a monetary shock, our results suggest that the elasticity of non-housing consumption is greater than that of housing consumption, suggesting that the Central Bank should consider the source of any inflationary pressure as well as the relative elasticities of the components.

The remainder of the paper is structured as follows. Section 2 sets out the methodology we use in the paper, Section 3 introduces the data that we use, Section 4 presents our results, and Section 5 concludes and offers some areas for future work that we will pursue.

2 Methodology

To examine the effect of policy shocks on the rental and housing markets, we estimate a proxy SVAR model in the vein of Mertens and Ravn (2013), Stock and Watson (2012), and Gertler and Karadi (2015). In the following subsection, we briefly set out the approach we use.

2.1 Proxy SVARs

Consider the reduced form SVAR:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + u_t, \operatorname{cov}(u_t, u_s) = 0, t \neq s \tag{1}$$

Or, using lag-operator notation, $A(L)Y_t = u_t$, where $u_t = \theta\varepsilon_t$ and $A(L) = I_n - A_1 L - \ldots - A_p L^p$. We assume that the lag order p is known, that the shock variance matrix $\Sigma_\varepsilon = E[\varepsilon_t \varepsilon_t']$ is positive definite, and that the structural shocks are mutually uncorrelated.

The effect of a structural shock j on the elements of the vector Y_t can be determined by examining the j^{th} column of the matrix θ. In what follows, we refer to a singular monetary policy shock, ordered first in the VAR and denoted as θ_1 (i.e. the first column of the structural matrix θ). The IRF of any element of Y_t with respect to the structural monetary policy shock, element ε_{1t} of the vector ε_t, can be expressed as:

$$\frac{\partial Y_t}{\partial \varepsilon_{1t}} = A(L)^{-1}\theta_1 \tag{2}$$

To identify θ_1, we follow Gertler and Karadi (2015) and combine the High-Frequency Identification approach of Gurkanyak et al (2005) and Campbell (2012) with the Proxy SVAR methodology proposed in Mertens and Ravn (2013). With one structural shock ε_{1t} and one candidate instrumental variable for the structural shock M_t, identification relies upon two conditions:

1. $E[\varepsilon_{1,t} M_t] = \alpha \neq 0$ (Relevance)
2. $E[\varepsilon_{2:n,t} M_t] = 0$ (Exogeneity)

Which can be viewed as the SVAR analogue of the standard assumptions for identification with an instrumental variable. Note that identification here is achieved with a two-stage least squares regression of u_{1t} on $u_{2:n,t}$ with the instrument M_t.

Combined with a unit effect normalisation for the effect of ε_{1t} on Y_{1t}, it follows that:

$$E[M_t u_{1t}] = \theta_{11} E[M_t \epsilon_{1t}] = \alpha \tag{3}$$

$$E\left[M_t u_{jt}\right] = \theta_{j1} E\left[M_t \epsilon_{1t}\right] \Rightarrow \theta_{j1} = \frac{E\left[M_t u_{jt}\right]}{E\left[M_t \varepsilon_{1t}\right]} \tag{4}$$

Which is used to identify θ_1 and consequently we can obtain the IRF of any element of the vector Y_t to the monetary policy shock ϵ_{1t}.

2.2 Instrument Series

Gurkaynak, Sack and Swanson (2005) show that futures on interest rates are accurate predictors as to market expectations of future policy. Thus, any price adjustment around the date of a policy announcement can be measured as the unexpected and exogenous component of monetary policy, as shown by Bernanke and Kuttner (2005). This methodology relies upon certain assumptions. Firstly, financial markets incorporate all new information instantaneously. Secondly, that the risk premium takes longer to adjust than the measurement window used to measure movements in futures contracts, otherwise the high-frequency approach risks combining the exogenous component of monetary policy with changes in perceived risk. Finally, the central bank and market participants have the same information set available. Using the notation of Miranda-Agrippino (2016), the contracts can be decomposed as:

$$p_{t-\Delta t} = f(\Pi_{t|t}^{M\hat{a}rket}) + \zeta_t^{Market} \tag{5}$$

Where $p_{t-\Delta t}$ is the market's expected price movement prior to a policy announcement, $f(\Pi_{t|t}^{M\hat{a}rket})$ is the expected policy decision given market participants information set, and ζ_t^{Market} is the risk premium. After the policy decision is announced, the contract is then updated to:

$$p_t = f(\Pi_{t|t}^{\hat{C}B}) + e_t + \zeta_t^{CB} \tag{6}$$

Where $f(\Pi_{t|t}^{\hat{C}B}) + e_t$ is the new policy rate and ζ_t^{CB} is the new risk premium. The new price then, is a function of the central bank's information set $f(\hat{\Pi_{t|t}}^{CB})$, as well as a stochastic shock e_t. It then follows that the monetary policy surprise is equal to:

$$MPS = p_t - p_{t-\Delta t} \tag{7}$$

$$MPS = e_t + f(\Pi_{t|t}^{\hat{C}B} - \Pi_{t|t}^{M\hat{a}rket}) + (\zeta_t^{CB} - \zeta_t^{M}) \tag{8}$$

The instrument constructed here is obtained by using the movement in the price of 3 month ahead Short Sterling Futures before and after a policy announcement, using the end-of-day price prior to the policy announcement and the price at the end of the day after the announcement[2]. The monetary policy surprises can then be computed as per equation (8). The monetary policy "events" used to measure surprises are meetings of the Monetary Policy Committee (MPC), the publication of minutes from previous MPC meetings, the publication of the quarterly inflation report and announcements relating to the Quantitative Easing program undertaken by the BoE[3].

3 Data

3.1 Housing and Macroeconomic Data

We use the WhenFresh/Zoopla data made available by the Consumer Data Research Centre. The data covers listings on Zoopla from 2014 - 2021 in both the rental and sales markets, though we can observe posted rent prices back to 2012. As we exclude the earliest dates we see in the Zoopla data where usage of the website was substantially smaller, we use the first month in which we observe more than 2,000 listings in our time series.[4]

The data is extremely granular, containing daily snapshots of Zoopla postings, with information on posted rents, listing dates, number of views on the listings, as well as housing characteristics and postcodes. This dataset has several advantages over the published index of private rents. We can see in quasi-real time the response of rents posted on the Zoopla website, and, importantly, as we focus on *new* listings, we do not have to impute the cost of existing rents as is done in the rental price index. While this means that we do not include renegotiated or renewed rents, it allows us to focus on changes in the flow of new rents. Figure 2 gives an example of the type of advert and associated information that we can see in the dataset.

In the first instance, we create indices for rent prices, rental listings, house prices, and house listings by averaging the daily data over each calendar month, deflating nominal values to real using monthly CPI, and

[2]We are currently in the process of cleaning the intraday futures contracts and will update the following results with a shorter event window

[3]Note that for the end of the day window, these events largely coincide but the differential timing is increasingly relevant as we use more granular financial transaction data

[4]We view this as a relatively conservative choice and do not obtain different results by including months immediately prior in our estimation

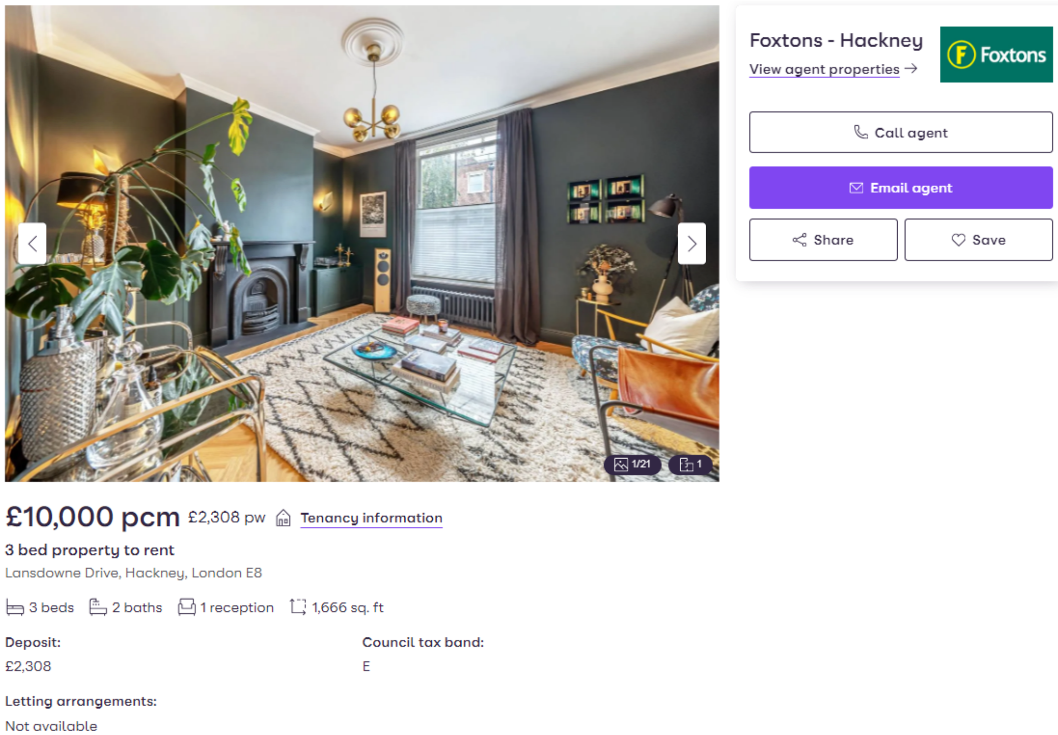
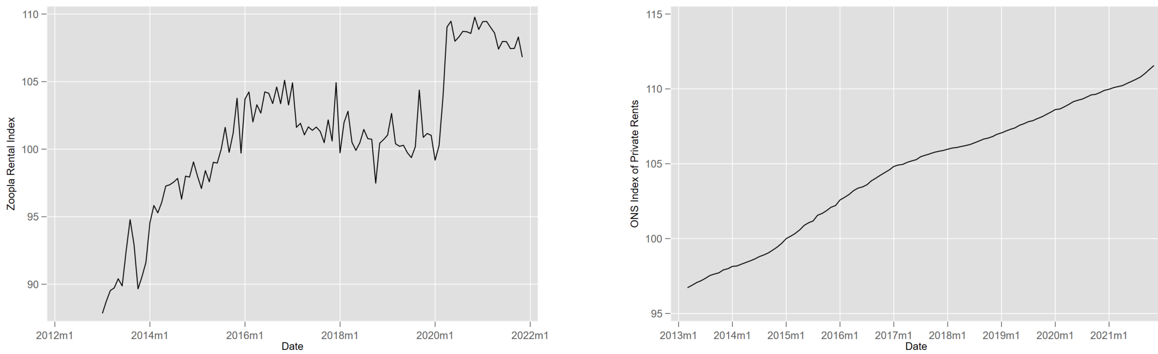


Figure 2: Example Zoopla Posting

seasonally adjusting using the US Census Bureau's X-13ARIMA-SEATS package. All other macroeconomic data is publicly available and obtained through the ONS or the Bank of England Millennium Database. Figure 3 shows the time series of our rental index alongside the ONS index of private rents.

An important distinction to highlight is that our rental index encompasses solely the flow of new rents agreed, whereas the ONS index includes all rented property - note though that rental costs are imputed for several housing tenure groups. Consequently, our analysis focuses on the effect of monetary policy on new rentals, and not the existing stock. The Zoopla series is substantially noisier, but both series show the same raw properties, namely a large increase in rents over the sample period, although the Covid era appears to show a potential break in the Zoopla series where there is a large increase in our rental index - note that we exclude the Covid period from our subsequent analysis, although including it does not substantially alter our conclusions.

Figure 4 shows our series of house prices from Zoopla and the ONS equivalent series. Compared to the rental series, in this case, both series appear rather more similar, albeit with slightly steeper dynamics in the Zoopla series in the pre-COVID period than in the ONS series. We view this as largely unsurprising when

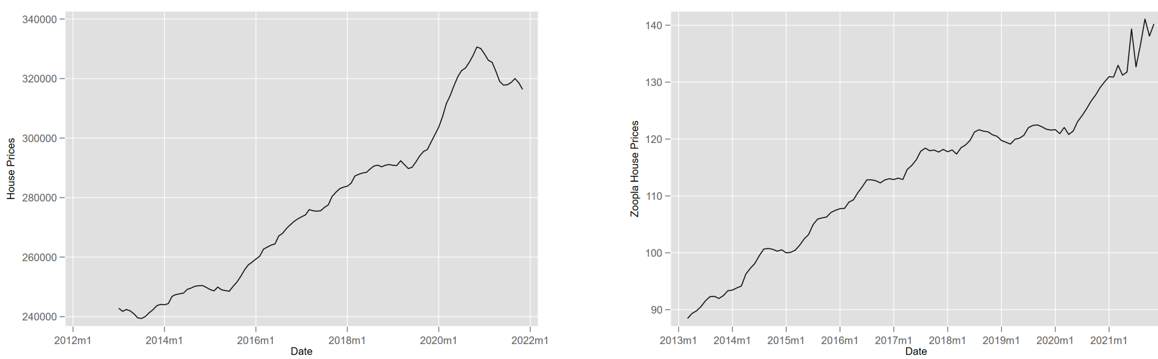


(a) Zoopla Rental Index (authors' calculations)

(b) ONS index of private rents

Figure 3: Rent indices

considering the differential lengths of time involved in purchasing vs renting, thus potentially minimising divergences from the national statistic.



(a) Zoopla Price Index (authors' calculations)

(b) ONS index of House Prices

Figure 4: House Price Indices

We are also able to construct a measure of supply by looking at the number of listings posted on Zoopla each day and construct a similar monthly series as for rents, as shown in figure 5. The index is relatively well-behaved, with the exception of a considerable drop at the onset of the pandemic. Although the series has been seasonally adjusted in the same manner as the series of rental prices, the series does show considerable volatility. In future work, we hope to examine this volatility and explicitly account for the supply-side effect of landlord "entry" into the rental market, for the moment we use the rental listing data to show that there does appear to be a supply side effect of monetary policy on the rental market, although we do not take an explicit stance or make a causal claim as to the source of such fluctuations.

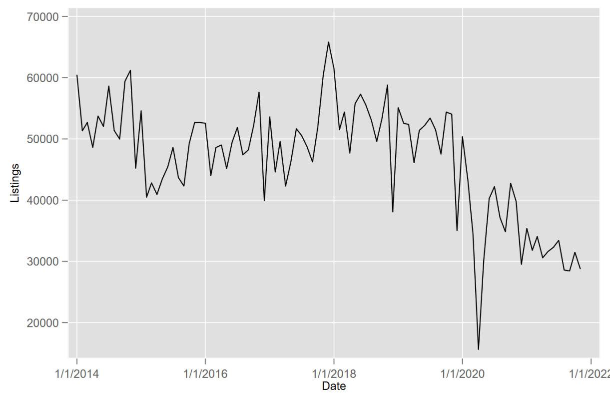


Figure 5: Zoopla Listings

3.2 Financial Market Data

Our futures data comes from publicly available series, though we have futures tick data we are still in the process of cleaning the data. We follow Cesa-Bianchi et al's (2020) implementation of the Gertler and Karadi methodology and use 3 months ahead Short Sterling Futures contracts to construct our series of policy surprises as set out in Section 2.

Our data on UK gilt yields comes from the UK debt management office, which provide estimates of the UK yield curve at the close of each day, this allows us to examine which segment (if any) best serves as the monetary policy indicator. However, as in Gertler and Karadi, we find that the one or two-year gilt yield has the strongest results for the instrument relevance test.

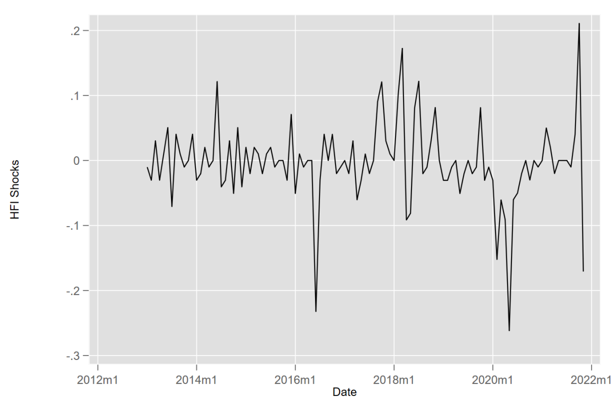


Figure 6: Monetary Policy Shocks

Figure 6 shows our constructed series of high-frequency monetary surprises as set out in section 2.2. The series has a mean of -0.005 basis points and is not statistically significantly different from zero. We also

Table 1: Predictability of HF shocks

	(1)	(2)	(3)	(4)
VARIABLES	Shocks_t	Shocks_t	Shocks_t	Shocks_t
Shocks_{t-1}	.0377	.0394	.0375	.101
Shocks_{t-2}		-.0214	-.0452	-.0464
Shocks_{t-3}			.0208	.0212
Shocks_{t-4}				.0279
F-Statistic	0.17	0.2	1.3	1.4

*** p<0.01, ** p<0.05, * p<0.1

perform similar diagnostic tests as in Cloyne and Hurtgen (2016), by testing whether our constructed series can be predicted from past values of the shock. Table 4 reports the results. We conclude from these results that our shock is not predictable from past information.

Our series also reflects anecdotal evidence about monetary policy surprises in the UK, the two largest negative surprises (in 2016 and 2020) correspond to immediately after the Brexit vote in June 2016 when the Bank of England lowered interest rates from 50 basis points to 25 basis points and engaged in a further round of asset purchases. The other corresponds to the first MPC meeting at the start of the Covid pandemic, where the Base Rate was cut from 25 basis points to 10 basis points and the asset purchase programme was restarted.

We also demonstrate that our candidate instrument satisfies the relevance condition for identification in the Proxy SVAR method as set out in Mertens and Ravn. To do this we estimate our first stage SVAR, obtain the reduced form residuals and regress the reduced form residuals for the monetary policy indicator on the instrument, the lags of the instrument and the other variables including in the first stage SVAR. We obtain a first-stage F-Statistic of 13.52, suggesting that our candidate instrument is relevant for the monetary policy indicator. As such, we do not require the weak-instrument robust confidence sets discussed in Olea, Stock, and Watson (2021)[5]. We do this for the one-year, two-year, five-year, and ten-year gilt yield, an F-Statistic over the 'rule of thumb' threshold suggested by Stock and Yogo (2005) for the one and two-year policy indicators. We use the two-year policy rate as our monetary policy indicator on the grounds that it has the highest first stage F-Statistic, though we include results in the appendix that demonstrate that using the

[5] Note though that these are asymptotically equivalent in the case of a strong instrument, which is the case in our application

one-year rate does not alter the results.

4 The Effects of Monetary Policy on the Rental Market

We then estimate the Proxy SVAR as set it out in section 2.2, using our candidate instrument introduced in section 2. All confidence intervals are shown as 68% confidence intervals and calculated using a residual based block moving bootstrap following the observation of Jentsch and Lunsford that the wild bootstrap proposed in Mertens and Ravn and Gertler and Karadi is invalid if there is heteroscedasticity present in the first stage residuals. We implement the procedure suggested by Jentsch and Lunsford (2016). We choose a block of length L and compute the number of blocks as $N^{block} = T/L$, where we round N^{block} up to ensure that $NL \geq T$. We then collect the blocks and draw with replacement from a uniform distribution bounded from 0 to L to determine which element from the block set is chosen in each position of the synthetic residual series. The final step involves recentering the residuals to ensure that they remain of zero mean. As is standard, we then re-estimate the model parameters and compute the impulse response for each of our synthetic series, and then compute the relevant percentiles of the ensuing distribution to recover the confidence intervals.

Figure 7 shows our results. All IRFs are scaled to a 100 basis point innovation in the two-year bond rate, which we use as our preferred measure of the monetary policy stance. The variables we include in addition to the measure of the policy stance are, CPI excluding housing, our constructed series of rents, the ONS series of house prices [6], the average mortgage rate on new mortgage products, and the price in pounds of Brent Crude.

This latter variable is somewhat non-standard in the proxy-SVAR literature but we demonstrate that our results are qualitatively consistent in a smaller scale VAR. We include the price in pounds of Brent Crude in an attempt to minimise any issues of non-invertibility that may arise from the length of our event window. Our inclusion of this variable is motivated by Christiano et al (2005), who include a measure of commodity prices in their estimated SVAR to capture forward-looking information that is available to agents, potentially addressing concerns about invertibility. An alternative to avoid issues of non-invertibility would be to estimate the response using the Jorda (2005) local projections method, which as discussed in Plagborg-Moller and Wolf (2021) is asymptotically identical to the Proxy SVAR method. Our preference for the

[6] the Zoopla series of house prices is available over a shorter period and we run into dimensionality issues estimating the VAR over this subset of observations

Proxy SVAR is driven by our interest in examining the responses of rents and house prices simultaneously in our framework.

The results of our variables are largely consistent with expectations from theory, following a contractionary innovation to the policy rate, the policy rate remains elevated for several periods, CPI decreases after one month reaching a peak 15 months after the innovation, in line with the Bank of England's assessment as to the time lags present in the monetary transmission mechanism. The mortgage rate increases significantly on impact, reflecting the innovation in the policy rate, and remains elevated, reflecting the persistent increase in the interest rate.

The results of rents and house prices are what we view as of primary interest. Following the contractionary shock, our Zoopla rental index increases significantly on impact and remains elevated for 5 months, while house prices decline on impact and remain negative for a similar period. It is important to note that the rent series is expressed as real rents (deflated by monthly CPI) and so the decline in CPI is included in this response, though we observe the same results when we estimate the Proxy SVAR using nominal rents.

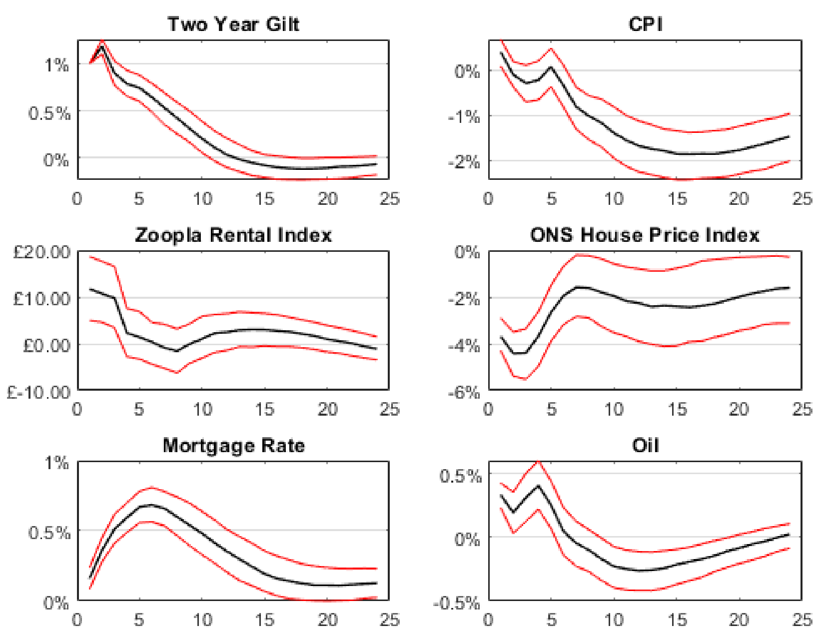


Figure 7: Response of our constructed index of real rent prices on Zoopla. Interest rate variables reflect the percentage point change, the response of the Zoopla rental index is shown in Pounds Sterling per week, all other variables are shown in percentages. All variables show the response to a 100 percentage point innovation to the two year Gilt Rate. Confidence intervals are at the 68% level and computed using a residual based moving block bootstrap.

We also estimate the response of the ONS rental index to the same shocks, figure 8 shows the results.

Examining the response of the ONS rental index potentially allows us to examine whether or not the Zoopla responses are driven by factors that are specific to the Zoopla website.

The results are qualitatively similar, but there are two important contrasts. The house price index again responds negatively to the contractionary innovation to the two-year gilt rate, but then increases and remains significantly higher after the innovation, whereas when using the Zoopla series there is no significant difference. It is not yet clear to us what is driving this difference. The result we draw attention to is the dynamics of the response of the rental index. There is initially no response of the rent index for the first 7 months, increasing and eventually peaking after 18 months. This hump-shaped response is notably different from that of the Zoopla index, where the response is on impact and relatively short-lived. Although these responses may seem contradictory, it is important to note the differences between the indices, namely that the Zoopla index is a flow of new rentals, while the ONS index is a weighted average of existing rentals as well as new rentals, in other words, it is the stock. Consequently, the apparent discrepancy between the results of the two indexes can be reconciled by viewing the "fast twitch" response of the Zoopla index as feeding into the index as new rents are agreed, leading to the hump-shaped response of the ONS rental index.

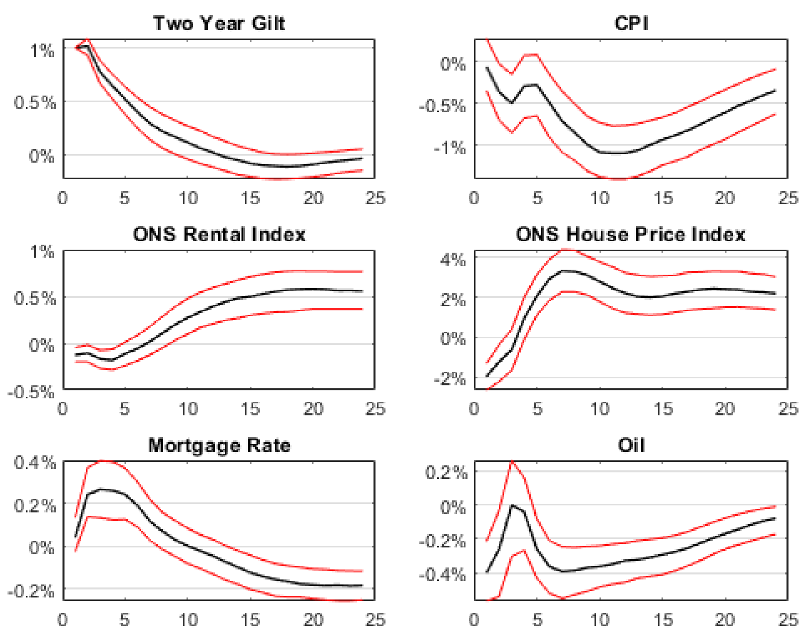


Figure 8: Response of the ONS private rental index. Interest rate variables reflect the percentage point change, all other variables are shown in percentages. All variables show the response to a 100 percentage point innovation to the two year Gilt Rate. Confidence intervals are at the 68% level and computed using a residual based moving block bootstrap.

We are also able to repeat our analysis including a measure of rental listings on Zoopla. We do this to examine the response of housing supply to monetary policy and view the number of listings on Zoopla as a reasonable proxy for aggregate supply while recognising that it may be imperfect. Existing work has focused on changes in the demand for housing, largely through price effects, so we wish to examine whether or not landlords respond to contractionary shocks as well. Figure 9 shows our results.

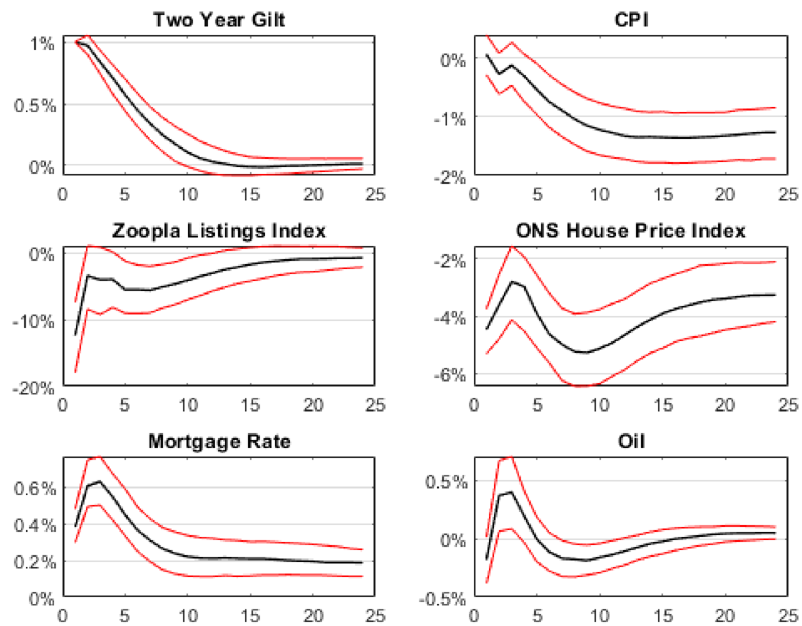


Figure 9: Response of our constructed index of rental supply on Zoopla. Interest rate variables reflect the percentage point change, all other variables are shown in percentages. All variables show the response to a 100 percentage point innovation to the two year Gilt Rate. Confidence intervals are at the 68% level and computed using a residual based moving block bootstrap.

The response of the other macroeconomic variables is largely consistent with the other specifications, while the reaction of listings is negative on impact before becoming insignificant for the rest of the impulse horizon. We plan to expand on the supply dimension in future work by disentangling the element of listing changes that reflects demand spillovers from monetary policy, though we view this response of listings as suggesting that there is a supply-side response in the rental market in addition to the price effects.

These results have important implications for the implementation and transmission of monetary policy. A growing literature focuses on the distributional consequences of monetary policy, examining heterogeneities across a range of distributions. Our results show that housing tenure is another channel of heterogeneity that needs to be considered when conducting monetary policy. For instance, if the source of inflationary pressure is believed to be in the housing sector, the policymaker may need to judge specifically where the pressure is coming from, as our results demonstrate that increasing interest rates may actually raise the price of renting over the short to medium term, potentially making the policymaker's job more difficult.

Our findings also contribute to a recent literature examining the heterogeneous impact of inflation across the income distribution. As they show that contractionary policy that may be implemented in an attempt to lower inflation may actually increase the price of a large element of the consumption basket of some households. Furthermore, our results using the stock of rents (the ONS rental index) suggest that the heterogenous effects of monetary policy across housing tenure may well be long lived, as well as offering a potential explanation for the price puzzle that is common in many monetary SVARs. The fast-twitch response of housing rents offers some potential explanation for why prices increase initially in some monetary SVARs. We rationalise this finding by noting that the adjustment cost of a price on Zoopla is essentially zero, the price can be adjusted relatively instantly by the potential landlord - a factor that is not captured in the index of the price of all housing stock. In other words there may be less price stickiness in the rental market than in some other goods markets - something we hope to examine in future work.

5 Conclusion

In this paper, we showed that rental prices - as measured from a novel index constructed from granular housing data - increase in response to contractionary monetary policy shocks, while house prices decrease in response to the same shock. In addition, we demonstrate that there appears to be a supply channel of new rental listings in response to the same shock, where contractionary policy results in fewer properties being made available to rent.

Our results have important implications for the transmission and implementation of monetary policy. They imply that housing tenure is an important dimension for policymakers to consider when setting policy. Both in terms of the welfare consequences arising from the distributional effects of contractionary monetary policy, but also that an inflation targetting central bank may need to take into account that a large portion of the consumption basket may increase in response to an interest rate rise. We plan to examine these distributional and price level consequences further by exploiting the cross sectional dimension of our dataset in future work.

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