An economic prediction of the impact of a collapse in the London Housing Market, and how it compares to the impact of a collapse in the UK Housing Market – A VAR approach

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1 Introduction

Back in 2007, we saw rising interest rates in the economy combined with firmer lending conditions, which, contributed to the accelerated price falls in the Housing Market in 2008 due to the Global Financial Crisis. Northern Ireland saw the "biggest fall" of 41.9%, while, in London House Prices fell by 23.3% in real terms (Global Property Guide, 2018). This led to "strong growth in transaction volumes" (ONS, 2018), to the Housing Market "bubble to burst" and to a recession in the UK.

The house prices in the economy are now much higher than their 2007 peak (Global Property Guide, 2018), and it seems that we have let the Housing Market once again taking too much importance in the economy, which means that anything negative happening to the Housing Market, will be reflected in the economy on GDP growth for example, or even deflation.

We use an econometrics model called Vector Autoregressive to try and estimate the impact of a sudden shock in House Prices on the economy. We first go through the Impulse Response Function, which helps us analyse the expected dynamic consequences of shocks in the London and UK Housing Markets. The second feature of the VAR model which is used, is the Historical Decomposition which shows how in the past, the Housing Markets analysed, have contributed to the structural accumulated shocks in our variables of interest. We also have a look at how financial liberalisation might have affected the economy and lead the Housing Market in the UK to have too prominent a place in the economy, by examining the expected dynamic consequences of such shocks before and after 1992, the starting point of the different monetary approach.

To achieve its objectives, this paper proceeds as follows. In Section 2 previous research within economic literatures relevant to the current analysis are reviewed. Drawing upon and extending themes in these literatures, Section 3 presents the methods employed in the present study along with a discussion of the data examined, the empirical results derived from the analysis of the impact of a London Housing Market collapse on the economy, along with a comparison with the UK Housing Market's impacts. Concluding remarks are provided in Section 5.

2 Literature Review

Following the 2016 Brexit Referendum, in which the UK decided to leave the EU, PwC and Knight Frank published House Prices forecasting of both London and the UK. While PwC estimated that the Brexit would only disturb the UK Housing Market and create "decelerating growth" for house prices, a housing market crash was not anticipated at this point "despite considerable uncertainties and risks" in the economy. They also added that there will be region variations, but expect "the impact of Brexit to be the most acute in London" (PwC, 2016). Similarly, Knight Frank awaited a market "slowdown"; but, predicted, however, high house prices growth in the UK Housing Market "once the Brexit deal is completed" (Knight Frank, 2017). Savills contributed to these predictions by adding that in 2019 we shall see "regional balancing" in which "the markets of the Midlands and North of England outperform those of London and the South"; and, that "house price movements are more likely to be dictated by buyer confidence than affordability" (Savills, 2019).

Marc Carney, the governor of the Bank of England, issued a statement in September 2018, warning that a "no-deal Brexit" could lead to a 35% collapse in the Housing Market (Which?, 2019). He added that those looking to buy a house, "should proceed with caution" (Money Check, 2018). Following this, the political situation of the UK became more difficult as Brexit

negotiations were taking longer than expected since the Parliament is in disagreement. Because of that, Marc Carney, added in February 2019, that "UK growth would be 'guaranteed' to fall in the event of a no-deal Brexit" (Which?, 2019) and which, "could lead to a financial crisis as bad as the crash 10 years ago" (The Independent).

While, some property experts believed that a housing market crash was "very unlikely", but that there was a possibility of "a few years of real price falls", such as Richard Werth, CEO of Troy Homes. He added that the capital house prices needed to adjust "from this euphoria" created by unstoppable high prices. Chris Taylor, Managing Director of Regency Residential, also added that "the decline in the market is mainly a correction where London is concerned" (Express, 2018).

Nevertheless, in March 2019, it was observed that the House Prices in the capital fell by 3.8%, year-on-year growth – and the average asking prices in London fell by 1.1% from February to March, and by 5.5% compared to March 2018. The House Prices in the South East fell by 1.5% and in the North East the asking prices were 1.3% down (The Guardian, 2019). House prices in England, fell by 0.7% which was "driven by declines in London and the South East". Other parts of the UK are showing house prices growth – a trend, which, Robert Gardner, Nationwide's Chief Economist, qualifies as "not entirely unexpected" as the London Housing Market has been suffering from "sustained out-performance", which, increased affordability constraints (The Independent, 2018). Sam Mitchell, Chief Executive of online estate agent Housesimple, mentioned in an interview that "until the EU situation is resolved, the impacts of protracted Brexit negotiations drag on the UK Housing Market, and more heavily on the London Market" (The Independent, 2018). The estate agent, Foxtons, announced that the London Housing Market was in a "prolonged downturn" and that the uncertainty created over

Brexit was “impacting consumer confidence” (BBC News, 2019). Jonathan Hopper, Managing Director of Garrington Property Finders, emphasised in an interview that “with prices in the capital now falling at their fastest rate for a decade, London’s seven successive quarters of declining prices can no longer be dismissed as a brief correction” (The Guardian, 2019); and Richard Taylor of London’s Surveyors & Valuers quoted that the “a deal on Brexit is required to give some certainty, which will then encourage investors and purchasers” (Global Property Guide, 2018). The London Housing Market is not seeing the “traditional spring bounce period” due to the “extension of the EU leaving date” (The Independent, 2018); and spokesman Miles Shipside said that “have yet to rise in the housing market as buying activities remain cooler than usual and buyers await amore settled political climate” (The Guardian, 2019). Whether, this is going to lead to a Housing Market collapse or not, there is “little data yet to back it up” (The Conversation, 2018), and we shall await and see once more information on the leaving conditions of Brexit are given.

Furthermore, the uncertainty created by Brexit situation is not on its own affecting the housing market. Indeed, RICS’s survey participants also mentioned that, “stock shortage”, “affordability constraints” and “recent interest rate hikes” were affecting the market. They also demonstrated that they were “pessimistic” about “sales activity picking up in the coming months”. The effects of greatly increased stamp duties and the Right-to-buy scheme extension (Global Property Guide, 2018), as well as some “internal migration flows away from London”, have been participating in the house prices downturn (The Conversation, 2018).

The London Housing Market is one of the most expensive market in the world where now a “typical home costs a shocking £578,381”, which is “nearly 12 times average earnings, compared with just under 4 times earnings in 1996”. The percentage growths of London’s

neighbourhoods are absurd such as Hackney seeing a 702% increase in an average growth, which is just over 9 times average local earnings, whereas in 1996, it only cost over three times average local earnings. Kensington and Chelsea neighbourhood is around 11.2 times the local earnings, and Westminster, the neighbourhood which "has seen the largest rise over the past 20 years", costs 18.5 local average salary (Mail Online, 2017). Furthermore, the gap between London House Prices and England House Prices has been multiplied by ten – in 1996, the price gap between London and England House Prices was of £33,834, while in 2016, a London home cost £299,631 more than one in England (Mail Online, 2017). The London Housing Market has the same value of "more than twice the combined worth of property assets in the nine largest cities in the UK – Birmingham, Manchester, Leeds, Bristol, Reading, Edinburgh, Nottingham, Sheffield and Glasgow" (The Telegraph, 2018).

Without any doubt, we can assess the London Housing Market as the main driver of the UK House Prices. The London Housing Market has always been "the mainstay" of the UK Housing Market (The Conversation, 2018); and, it has been established that "changes start in inner London before moving outwards to the rest of the capital and the rest of the country" (ONS, 2018).

Comparing the UK Housing Market with European Housing Markets, we notice eight important differences that make the UK Housing Market, "one of the most expensive place on the continent to live". For example, for 200,000€, you would be able to purchase a 40 square-meter flat in the UK, but in Germany and the Netherlands, you would be able to afford "nearly a 100 square-meter flat". Similarly, comparing London to European capitals, we see that for the same amount of money, the space you will be able to obtain in Budapest is "15 more times" the space you can get in London. The UK is one of the most expensive housing market in

Europe, and the square-meter rate is at 5,000€, which is twice the going rate in Italy. The UK is "least affordable country" in Europe, with people needing to save "their whole salary for almost 11 years to pay for a new apartment", while, in Germany, only 3.2 years of entire salary savings is required to purchase a new flat. (BuzzFeed, 2017).

There are many factors affecting the striking house prices growth in the UK and particularly in London, such as "strong immigration and population growth", extremely low interest rates and "expansion of the money supply through 'quantitative easing'", London's financial centre keeps seeing rising activity, and low housebuilding activity (Global Property Guide, 2018). It is also argued that London has "safe haven and socio-cultural characteristics", and the estate market and professionals' behaviour and organisation are contributing to the "safe deposit box" characteristic London benefits from, which leads to "transnational wealth elite buying property in London", which they rather see as an "investment". This obviously contributes to the high prices in London and can result in overvaluation of the London House Prices (Fernandez, Hofman and Aalbert, 2016).

London has been identified "among the top cities most at risk of a housing bubble", and considered as one of the "world's most overpriced property markets" (City A.M, 2018). This contributes to the pessimistic view of the future of the London Housing Market, as "house price bubbles benefit almost no one", and usually lead to "lower growth and higher unemployment", which, then causes "a financial crisis" in the economy ().

Property experts have different views of how the Housing Markets in both London and the UK will continue to react to the complicated situation the UK is seeing. So far, we identified three assumptions on the London Housing Market – (i) it is overpriced and at risk of being in a

"housing bubble", (ii) it might be driving the UK Housing Market, as usually a collapse in the London Housing Market results in one in the UK Housing Market, and (iii) we are already seeing some house prices growth decline in London, which is affecting England's house prices growth already.

3 Analysis

3.1 Objectives

The general objective of this paper is to (i) test whether a collapse in the London Housing Market (LHM) would affect the UK economy and (ii) see if its impact on the economy is more significant than the impact of a UK Housing Market (UKHM) shock.

We use a Vector Autoregressive model (VAR) to analyse how GDP, Inflation and Uncertainty might react to a shock in either the London or the UK Housing Market. To do that, we go through the Impulse Response Function (IRF), which, helps us identify the sign, significance and duration of the responses of our variables to a simulated shock in one the Housing Market. We then go through the Historical Decomposition, which, calculates the contribution of the housing markets to the different structural accumulated shocks of our variables; and, helps us estimate whether the results found through the IRFs make empirical sense. We expect GDP to fall, Inflation to slow down, and Uncertainty to be negatively affected. We also consider the possibility of a recession being created in the economy, if GDP growth is affected negatively for more than three quarters. Lastly, we suppose that the LHM will have a more significant impact on the economy.

Section 3 is organised as follows. Section 3.2 introduces the methodology and the data. Section 3.3 reports the results – both the IRFs and Historical Decomposition – obtained from our benchmark model. Section 3.4 evaluates the sensitivity of our model by conducting robustness checks and estimating new updated models. Critics and limitations of our model are explained in Section 3.5, while, Section 3.6 concludes.

3.2 Methodology and Data

This section introduces the empirical model, the data and the identification strategy.

3.2.1 Empirical Model and the Data

We estimated the following reduced form VAR model for the UK:

$$Z_t = C + B_1 Z_{t-1} + B_2 Z_{t-2} + B_3 Z_{t-3} + E_t,$$

$$where\ Z_t = \begin{pmatrix} y_t \\ x_t \\ l_t \\ w_t \\ u_t \end{pmatrix},\ C = \begin{pmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{pmatrix},\ B_1 = \begin{pmatrix} b_{11}^1 & b_{12}^1 & b_{13}^1 & b_{14}^1 & b_{15}^1 \\ b_{21}^1 & b_{22}^1 & b_{23}^1 & b_{24}^1 & b_{25}^1 \\ b_{31}^1 & b_{32}^1 & b_{33}^1 & b_{34}^1 & b_{35}^1 \\ b_{41}^1 & b_{42}^1 & b_{43}^1 & b_{44}^1 & b_{45}^1 \\ b_{51}^1 & b_{52}^1 & b_{53}^1 & b_{45}^1 & b_{55}^1 \end{pmatrix},\ and\ E_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{pmatrix}.$$

Z_t is the matrix of endogenous variables for the UK and includes a proxy for GDP (y_t), Inflation (x_t), London House Prices (l_t), UK-wide House Prices (w_t) and an Uncertainty Instrument (u_t). The Uncertainty Instrument measures policy-related economic uncertainty in the UK through an index based on newspaper articles regarding policy uncertainty. All variables are transformed in quarterly on quarterly natural logarithms, with the exception of

Inflation and the Uncertainty Instrument. The data that we use is at quarterly frequency and runs from 1973Q3 to 2018Q4. The lag length is set to 3 [(Ivanov and Kilian 2005) demonstrated that the Hannan-Quinn Criterion (HQC) seems to be the most accurate for quarterly VAR models that have a sample size greater than]. We relegate to the Appendix A for a detailed description of the data.

The structure of the model offers two key advantage that are relevant to our study. First, the IRF can be computed to obtain estimates. This allows the comparison of GDP, Inflation and Uncertainty responses to a LHM shock versus a UKHM shock. Second, we compute the Historical Decomposition to see how the Housing Markets in the past might have contributed to the structural accumulated shocks in GDP, Inflation and Uncertainty. From this approach, we can therefore consider with carefulness whether our results found through the IRFs are accurate and in line with empirical data.

3.2.2 Identification strategy

We base our empirical results on the identification of two structural shocks, namely a shock in the LHM and another one in the UKHM. The identification strategy is based on the Cholesky decomposition. The simplicity of this approach is suitable to the purpose of our analysis, as it is easily applicable to different estimated models.

In line with economic theory, it is assumed that GDP and Inflation are not affected straight away by a shock in the LHM or UKHM, but rather take time to adjust. The macroeconomic variables are, therefore, ordered first. Following GDP and Inflation, we have the London and UK House Prices variables, and our Uncertainty Instrument is ordered last. This choice can be

justified on the grounds that intuitively uncertainty should be affected straight after a shock in the House Prices.

3.3 Results

In this section, the focus is on the response of GDP, Inflation and Uncertainty to shocks in the London and UK House Prices – computed through the IRFs; and, on how the LHM and UKHM might have contributed to the structural accumulated shocks of our variables – computed through the Historical Decomposition.

3.3.1 Impulse Response

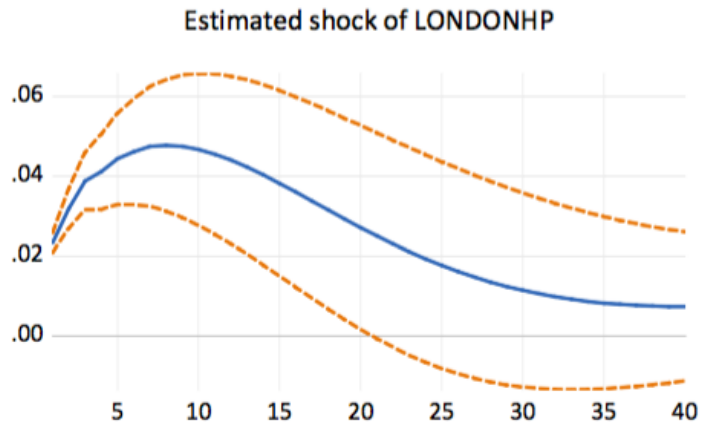
The IRF helps us answer two questions – (i) how does the economy reacts to a shock in the London or the UKHM, and (ii) for how long this reaction lasts? We therefore need to look at the sign, size and significance of our computed responses.

Please note that our model is estimated on EViews, which computes shock as positive – therefore, as we compute a negative shock, the response of our variables is considered negative when showing a positive response on our graph, and vice versa.

3.3.1.1 The London Case

In this case, we analyse how a simulated shock in the London House Prices affects GDP, Inflation, the UK House Prices and Uncertainty through the IRFs.

Figure 1: Estimated shock in the London Housing Market



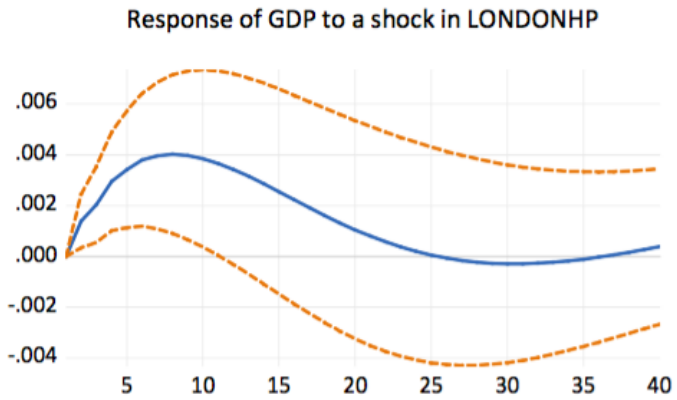
(i) The shock in the London Housing Market

Figure 1 shows the shock simulated in the London House Prices. The shock simulated in the London House Prices starts at period 0 and is of 2.5%. It reaches its maximum value of 4.8% around period 8, with a confidence interval showing a minimum shock of 3.2% and 6.2% at most. The estimated shock seems to last for a total of 40 quarters, and we are certain of seeing such a shock for a minimum of 20 periods, as showed by the confidence intervals.

(ii) The response of GDP

Turning to the response of GDP growth to a shock in the London House Prices, the impulse response for GDP is broadly in line with the literature and our expectations. Figure 2 shows the response of GDP to a shock in the LHM. We observe that a shock in the LHM has the expected negative effect on GDP growth. The peak impact is reached after around 8 quarters. As expected and along with our initial expectations, the GDP response is not imminent, and

Figure 2: GDP's response to a shock in the LHM

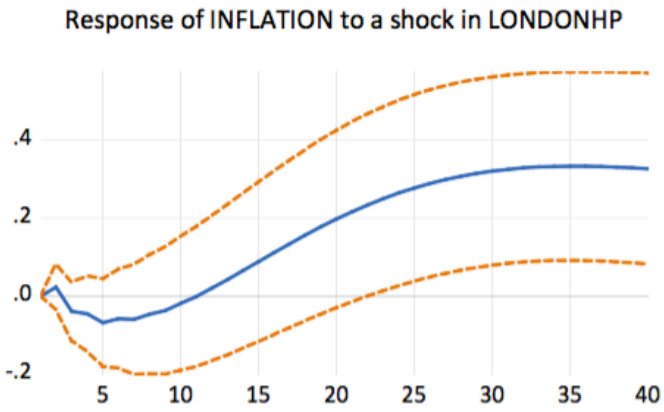


the effect of the shock in the LHM exhibits some persistence in the first year. The response is quite persistent, and seems to last for 25 quarters. It is also important to notice that the response of GDP is estimated to be negative for 11 quarters at least, and then there is a small possibility that GDP growth might recover by responding positively, as showed by the confidence intervals. The response of GDP might not seem large, however the shock in the London House Prices simulated through the impulse response function is very small compared to Marc Carney's prediction of a 35% collapse in the LHM. We can therefore expect a more severe response of GDP growth, especially considering that our result is significant.

(iii) The response of Inflation

Please refer to Figure 3. The response of Inflation to a shock in the London House Prices, which is statistically significant, is quite interesting. As expected, Inflation is not affected straight away but takes a bit of time to adjust. Inflation growth is slightly affected and the IRF suggests a very short period of 2.5 quarters of negative response. The size of the response is

Figure 3: Inflation's response to a shock in the LHM



very small, and we therefore expect the inflation rate to be lower than the Bank of England's Inflation target of 2%. Following this short negative response, Inflation's response turns to positive for 10 quarters, and then for the rest of the estimated period we see a negative response. The response of Inflation is therefore slightly unclear. The confidence intervals are showing that both a negative and positive response is possible, and a much higher negative response than the one estimated could be expected as well. If the response of Inflation is as dramatic as the one predicted by the confidence intervals of the IRF, we might see a period of extremely low inflation or even deflation in the economy. In any case, this result suggests that the Bank of England's Inflation Target might not be achieved.

(iv) The response of the UK Housing Market

The response of the UK House Prices is in line with the literature. Indeed, in Section 2, we mentioned that the London House Prices might be driving the UK House Prices. The response of the UK House Prices to a shock in the LHM is in accordance with our previous findings.

Figure 4: UKHM's response to a shock in the LHM

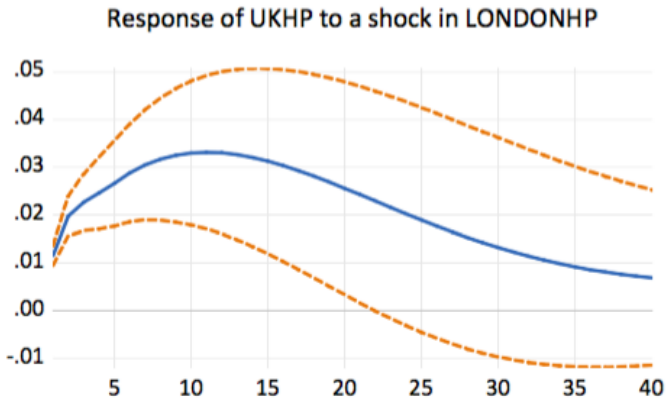
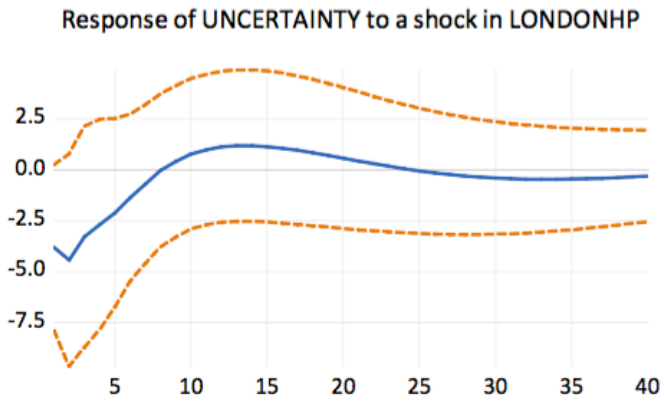


Figure shows the response of the UKHM to a shock in the LHM. The response of the UKHM is immediate and very persistent as it seems to last for the entire estimated period, which suggests that there will be no recovery during the 40 quarters, although the confidence intervals are showing the possibility of a recovery after 22 quarters. The peak impact is reached after 2.5 years of the shock, and is estimated at 3.4%, with our confidence intervals showing a possible response as high as 4.8%. The response of the UKHM is statistically significant, and it seems that a shock in the London House Prices creates quite an important reaction in the UKHM.

(v) The response of Uncertainty

The response of Uncertainty to a shock in the LHM is not in accordance with our initial prediction. We observe, from Figure 5, that a shock in the London House Prices has an unexpected positive effect on Uncertainty – meaning that following a shock in the LHM, we will see less uncertainty in the Economy. Though, it is important to note that, our result is

Figure 5: Uncertainty's response to a shock in the LHM



insignificant and we should not take it into account as there is not enough evidence to suggest that Uncertainty will react in such a way. This is a very interesting finding, which, could be justified by the fact that uncertainty is what created the shock in the LHM initially, and that, as the shock was predicted previously, it was no longer unexpected, and it therefore did not have the same impact of an unexpected shock.

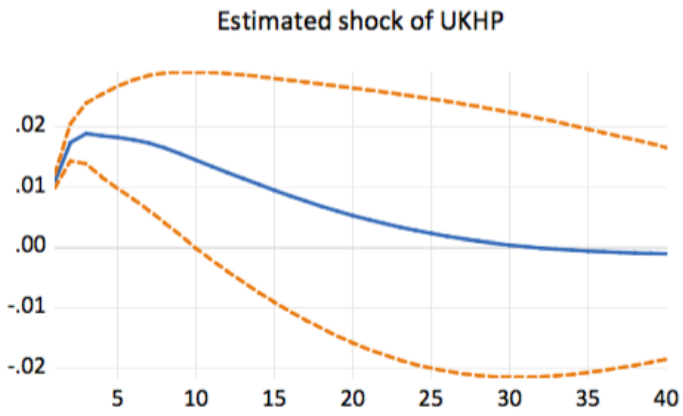
3.3.1.2 The UK Case

In this case, we analyse how a simulated shock in the UK House Prices affects GDP, Inflation, the UK House Prices and Uncertainty through the impulse function.

(i) The shock in the UK Housing Market

Figure shows the shock simulated in the UKHM, which, starts at period 0 and is of 1.2%. It reaches its maximum value of 1.9%, with confidence intervals showing a minimum shock of 1.4% and one of 2.8% at most. The estimated shock seems to last for a total of 30 quarters, and

Figure 6: Estimated UK Housing Market shock

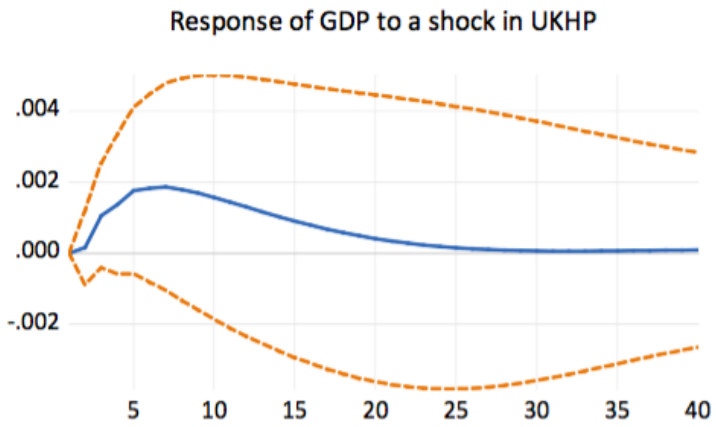


we are certain of seeing such a shock for a minimum of 10 quarters, as showed by the confidence intervals.

(ii) The response of GDP

The impulse response of GDP to a shock in the UKHM is broadly in line with our expectations and is statistically significant. Figure 7 shows the response of GDP to a shock in the UKHM. We observe that a shock in UKHM has the expected negative effect on GDP growth. The peak impact is reached after around 8 quarters, and is estimated at 0.19% with confidence intervals showing a response of at most 0.47%. As expected and along with our initial expectations, the GDP response is not imminent, and the effect of the shock in the UKHM exhibits some persistence in the first year. The response is quite persistent, and seems to last for 30 quarters. However, it is also important to notice GDP growth has a small probability of not being affected by such a shock in the UK House Prices, as the confidence intervals are estimating a possible positive response. The response of GDP to a shock in the UKHM might not seem large, however the shock in the UK House Prices simulated through the impulse response function is

Figure 7: GDP's response to a shock in the UKHM

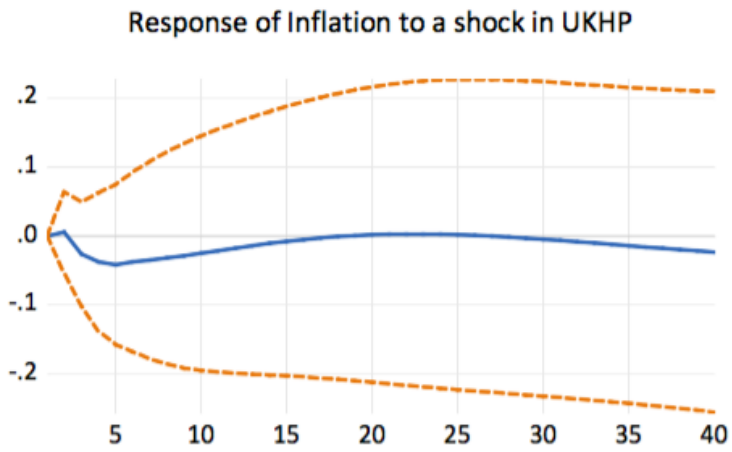


very small and from the literature, a larger shock is expected, which means that GDP's response will probably be more significant in size.

(iii) The response of Inflation

Please refer to Figure 8. As expected, Inflation is not affected straight away but takes a bit of time to adjust, which is in accordance with the ordering of our variables. Inflation is unaffected for two quarters, before responding positively, for the rest of the estimated period. Inflation growth is therefore not affected negatively by a shock in the UKHM. However, even though our result is significant and we can trust our estimate, the confidence intervals are suggesting that Inflation's response could be negative which could affect the Inflation Rate and draw it away from the Bank of England's Inflation Target.

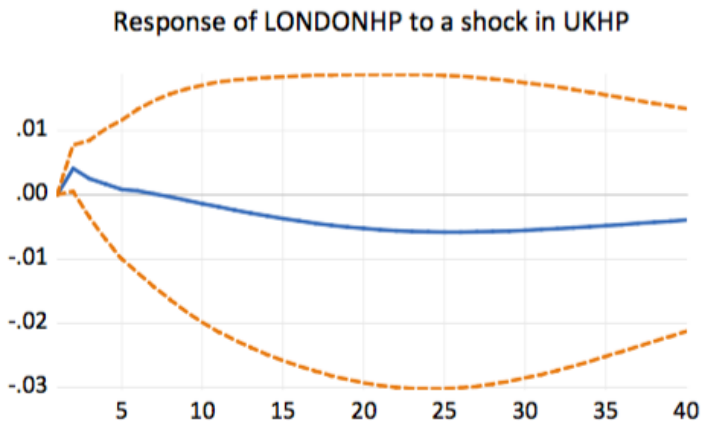
Figure 8: Inflation's response to a shock in the UKMH



(iv) The response of the London Housing Market

The response of the London House Prices is in line with the literature, and our previous findings. Indeed, in Section 2, we mentioned that the London House Prices might be driving the UK House Prices, which was then justified in Section 3.3.1.1 by the IRF of the UKHM to a shock in the LHM. We, therefore, expect that a shock in the UKHM would not affect the LHM, or at least not and the duration of the response to be very small. The response of the UK House Prices to a shock in the LHM is in accordance with our previous findings. Figure 9 shows the response of the LHM to a shock in the UK Housing Market. The response of the LHM is neither persistent nor important in size. London House Prices' response last for a total of 7 quarters. We see a three-month period in which London House Prices growth is affected and responds either negatively or is unaffected. The peak impact is reached after six months, and is estimated at 0.4%, with our confidence intervals showing a possible response as high as 0.8%. Even though our result is significant and to a certain extent we can trust this estimate, it is important to notice that our confidence intervals are showing the possibility of a negative,

Figure 9: LHM's response to a shock in the UKHM

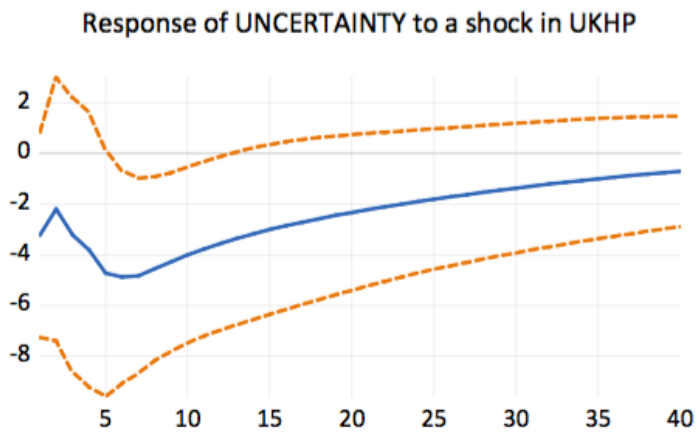


unaffected or positive response. There is therefore a possibility that following a shock in the UKHM, the London House Prices might still show positive growth.

(v) The response of Uncertainty

The response of Uncertainty to a shock in the UKHM is not in accordance with our initial prediction. We observe that a shock in the UK House Prices has an unexpected positive effect on Uncertainty for the 40 quarters-period – meaning that following a shock in the UKHM, we will see less Uncertainty in the Economy. However, our result is insignificant and we should not take it into account as there is not enough evidence to suggest that Uncertainty will react in such a way. This is a very interesting finding, but could be justified by the fact that Uncertainty is what created the shock in the UKHM initially, and therefore Uncertainty is no longer be affected, the economy "prepared" for such a situation arising.

Figure 10: GDP's response to a shock in the UK Housing Market shock



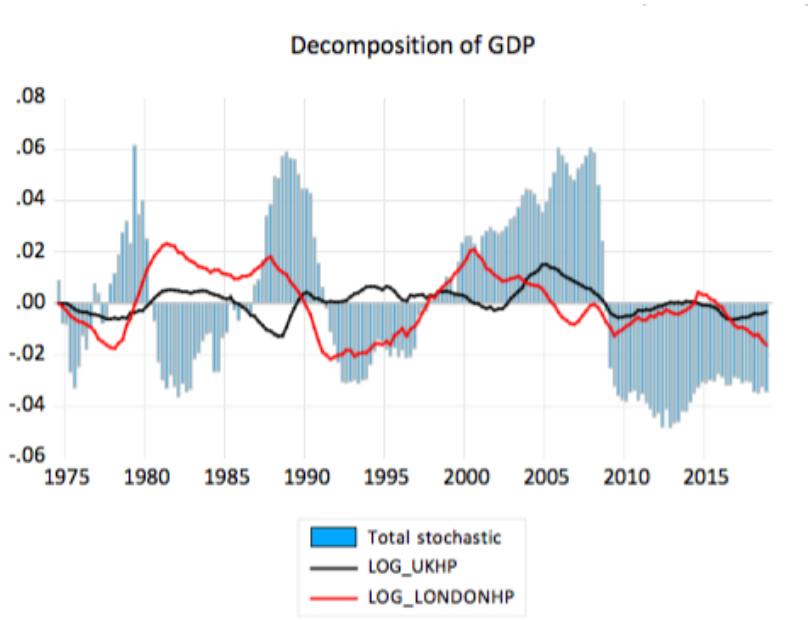
3.3.2 Historical Decomposition

In this section, we have a look at Historical Decomposition, which measures the contribution of each shock to the level of each series.

(i) GDP

Please refer to Figure 11. The historical decomposition of GDP shows that the London House Prices participate more to the contribution of the structural accumulated shocks of GDP rather than the UK House Prices, especially since 1985. For example, 3% of the shock in GDP 1993 can be explained by the LHM, while it seems that the UKHM did not contribute to GDP's structural accumulated shocks of that period. Similarly, looking at the recession created by the Global Financial Crisis of 2007, we observe that the London House Prices contributed by 2.25% to the structural accumulated shocks of GDP, while the UK House Prices only contributed by 0.75%. to the same shock of that period. This is proof to our initial hypothesis

Figure 11: GDP's decomposition

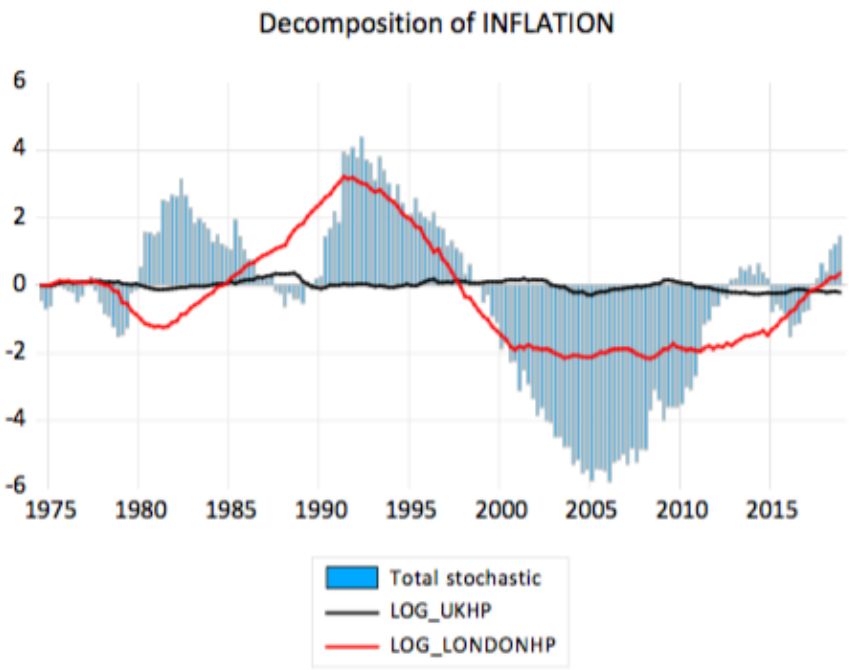


that the London House Prices affect the economy more than the UK House Prices. The only period of time the UKHM seemed to have contributed more to the structural accumulated shocks of GDP is during 2004-2008, otherwise the London House Prices show more contribution.

(ii) Inflation

Please refer for Figure 12. The Historical Decomposition of Inflation shows that the UK House Prices do not contribute to the structural accumulated shocks of Inflation. However, we notice that the LHM seems to be contributing by quite a lot to Inflation's Decomposition, especially since 1990. For example, from 2000 to 2010, we can see that the London House Prices contributed by 2% to the structural accumulated shocks of Inflation, while the UKHM shows no contribution at all. This gives weight to our initial findings in Sections 3.3.1.1 and 3.3.1.2,

Figure 12: Inflation's decomposition

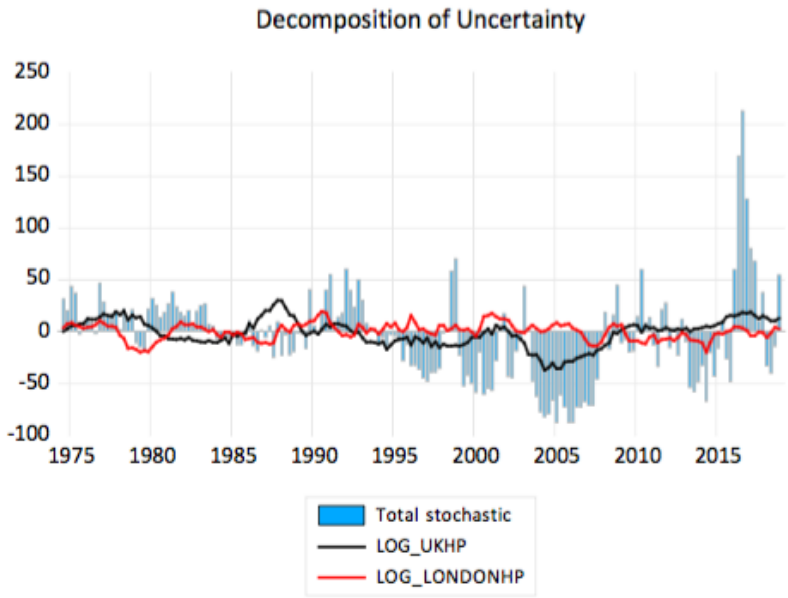


and we can conclude that the London House Prices affect and drive Inflation more than the UK House Prices.

(iii) Uncertainty

From Figure 13, showing the Historical Decomposition of Inflation and the contribution of each Housing Market, we can conclude that we see almost no contribution from the LHM. However, the UKHM seems to contribute more to the structural accumulated shocks of Uncertainty, especially during the 2003-2007 period and since 2015. The contribution, though, is very small. This is in accordance with the result we found in Sections 3.3.1.1 and 3.3.1.2 where the impulse response function showed that a shock in either the LHM or UKHM does not affect Uncertainty negatively.

Figure 13: Uncertainty's decomposition



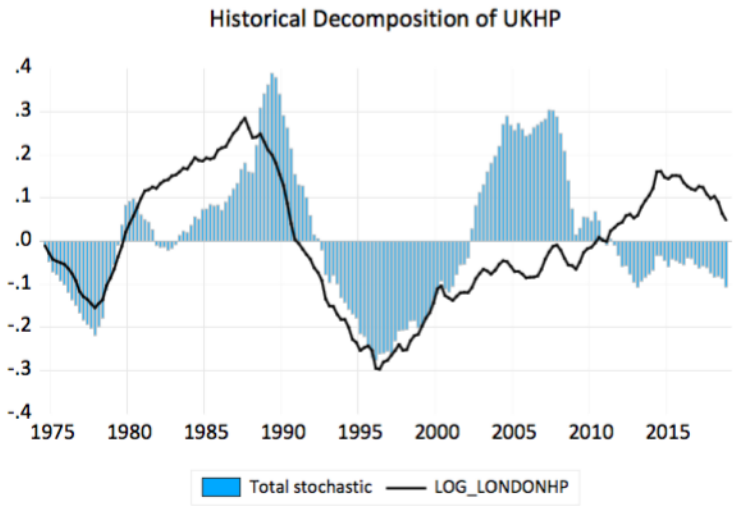
(iv) UK Housing Market

Please refer to Figure 14, which shows the Historical Decomposition of the UKHM, and how in the past the LHM might have contributed to the UK House Prices' structural accumulated shocks. The London House Prices seem to have contributed to structural accumulated shocks in the UK House Prices by quite a lot especially from 1975 to 2000. This gives a lot of emphasis to our previous finding in Sections 3.3.1.1 and 3.3.1.2 in which we suggest that the London House Prices are driving the UK House Prices.

(v) The London Housing Market

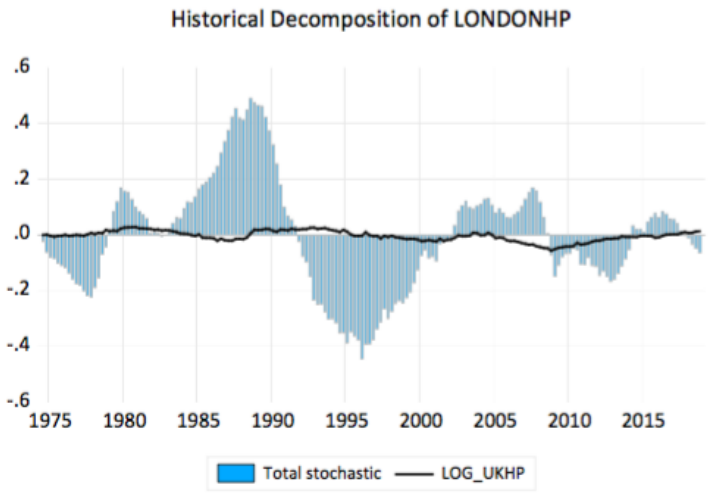
Please refer to Figure 15, which shows the contribution of the UKHM to the structural accumulated shocks of the LHM. We observe absolute no contribution from the UKHM, and

Figure 14: UKHM's decomposition



gives us even more emphasis to our argument that the LHM is driving the UKHM, and not the other way around. The only contribution we see is during the aftermath of the 2007 Financial Crisis, where the UKHM seems to have contributed by 4% to the London House Prices fall in 2009, which makes economic sense considering the state of the economy at that time.

Figure 15: LHM's decomposition



3.3.3 Comparing the London case with the UK case

Comparing the two simulated shocks and their respective responses in our variables as discussed in Section 3.3.1, we notice five main summarising points.

1. The estimated shock in the LHM is larger and more persistent than the one in the UKHM. A shock in the London House Prices reaches 4.8% and last for the 40-quarter period, while, a shock in the UK House Prices is estimated as high as 1.9% and only lasts for 30 quarters.

2. Both shocks are creating a negative response in GDP, however, GDP's reaction seems to be more extreme when the shock is coming from the LHM. A shock in the LHM creates a negative response of 0.4%; while, a shock in the UKHM is estimated to create a negative shock of 0.19%. Furthermore, when the shock is in the LHM, we are certain to see a negative shock in GDP, as showed by the confidence intervals, for a total of 11 quarters, whereas, when the shock is simulated in the UKHM, GDP's response can be positive, negative or unaffected – our confidence intervals are showing that a negative response is not necessarily expected. Lastly, GDP's response to a shock is the UKHM might be more persistent than one in the LHM by only a few quarters, yet from the historical decomposition, we can see that the LHM has been contributing more to the structural accumulated shocks in GDP than the UKHM.

3. The response of Inflation is quite uncertain. It seems that a shock in the LHM is creating a negative response in Inflation for 6 months and could potentially be lasting for a

longer period of time as showed by our confidence intervals. The sign of Inflation's response changes to positive, before turning back to negative. A shock in the UKHM creates a positive response. In both cases our confidence intervals are showing that the response of Inflation might be positive, negative or unaffected, and this period of negative response, probably taking us away from achieving the Bank of England's Inflation target, might be avoided. From the historical decomposition, it seems that the LHM is contributing more to the structural accumulated shocks in Inflation than the UKHM.

4. Our model fails into predicting accurately Uncertainty's reaction to a shock in either the LHM or the UKHM – our results are insignificant for simulations. However, it shows a positive estimate to a shock in both Housing Markets, meaning that following a collapse in either Housing Markets, there will be less uncertainty in the economy. Despite this result not being in accordance with our initial prediction, we could make sense of that result by arguing that Uncertainty was initially creating the shock in the Housing Market, and therefore could not be affected by such a situation. Historical Decomposition is showing that the Housing Markets have not been contributing to the structural accumulated shocks in Uncertainty in the past.

5. London House Prices seem to drive UK House Prices. When looking at the response of the UK House Prices to a shock in the London House Prices, we see quite an important fall. Indeed, it is expected that the UK House Prices would respond negatively for 22 quarters at least, and would fall by 3.4%, with confidence intervals showing the possibility of a negative response as high as 5%. However, when the shock is in the UK House Prices, the London House Prices do not seem to be responding this drastically.

The negative response of the London House Prices is only lasting for 7 quarters and is estimated to be as high as 0.5%, before seeing London House Prices back on positive growth. Confidence intervals are showing that a shock in the UK House Prices creates at most a negative shock in the London House Prices of 1.9%. The Decompositions of both the UK and London House Prices are giving emphasis to this argument – indeed, the UKHM does not seem to contribute to the structural accumulated shocks of the LHM, while the LHM shows quite a strong contribution in the past to the structural accumulated shocks of the UKHM.

3.4 Sensitivity Analysis

In this Section, we have a look at different robustness checks to test the validity of our model, and an updated version of our model to see how monetary policy might have impacted the Housing Markets and their effect on the economy.

3.4.1 Robustness Analysis

We perform different robustness checks aiming to evaluate the strength of our model. We first go through a typical robustness check in which we change the order of our variables, and then through new models where Uncertainty is replaced with other variables. In this section, we aim to answer three main questions: (i) are the sign, significance and size of our responses the same as in our benchmark model? – (ii) is a shock in the LHM still more impactful on the economy? – and (iii) can other variables be affected by a shock in the LHM or UKHM? By answering these questions, we can then evaluate the validity of our model and of our initial findings.

3.4.1.1 Changing the order

We perform robustness checks by changing the order of our variables aiming to see how the reaction of our variables might change, in terms of sign, size and significance. More details on the sensitivity tests discussed in this section can be found in the appendix of the paper. In order to reinforce our results, we re-estimate the model by changing the order of our variables by putting the Housing Markets variables prior to the Macroeconomic variables. The new order is LHM, UKHM, GDP, Inflation and Uncertainty.

Impulse response functions, reported in Figures 1 and 2 in Appendix B, are mildly affected by this change. The shock simulated in the LHM is slightly smaller but the persistence is the same. The responses of GDP and Inflation are slightly less statistically significant. GDP's response is still negative, and its persistence is more important, lasting for the 40 quarters evaluated. Inflation's response is negative for the 10 years evaluated – which is slightly different from the predictions made from our benchmark model. The UKHM is as statistically significant as in our benchmark model, the sign is the same, the size of the response is slightly smaller but the duration of the response is the same. The response of Uncertainty is still insignificant, the sign is the same for the first six quarters, but then the sign turns to negative suggesting that there might be uncertainty in the economy.

The shock computed in the UKHM is smaller and less persistent. The IRFs of GDP and Inflation are much less statistically significant. The sign of GDP's response is positive for the first two quarters, and then negative, but the size of the response is much smaller than the one found in our benchmark model. Inflation's response is negative for 30 quarters – therefore the sign is different from our benchmark model. The LHM shows a negative response for the first

two quarters before being back on positive growth – a shock in the UKHM has almost no impact on the London House Prices. Uncertainty's response – still insignificant and positive – is the same as in our benchmark model.

The new Historical Decompositions, reported in Figure 3 in Appendix B, computed support our results – the LHM contributes more than the UKHM to the past structural accumulated shocks of GDP and Inflation, and the size of the contribution is quite important. In terms of Uncertainty, both Housing Market show no contribute to its structural accumulated shocks. The Historical Decomposition of both the LHM and UKHM give emphasis to our argument that the London House Prices are driving the UK House Prices and vice versa.

The economy seems to be still more affected by a shock in the London Housing Market and that the London House Prices are still driving the UK House Prices. Although the IRFs of GDP and Inflation are statistically less significant, we could argue that this is entirely due to the ordering of our variables. Indeed, this model suggests that following a shock in a Housing Market, GDP and Inflation are affected straight away, when in reality, they take time to adjust to the situation.

3.4.1.2 Replacing Uncertainty with other variables

From Section 3.3, we conclude that our model fails into predicting Uncertainty's response to a shock in either Housing Market as our result is insignificant. We can therefore replace other variables, to see how these ones might react to such a shock, and to check if the results computed by our new models are in line with the ones found through our benchmark model.

Details on the sensitivity tests discussed in this section can be found in Appendix C-G for respectively the Bank Rate, Government Consumption, Investment, Stock Market and Oil Prices. For each model, the IRFs are reported in Figure 1 for a shock in the LHM and in Figure 2 for a shock in the UKHM, and the Decompositions are reported in Figure 3.

(i) Bank Rate

Comparing the model with Bank Rate with our Benchmark model we find that smaller shocks are estimated in both the LHM and UKHM, involving smaller and less persistent responses of GDP. The responses of Inflation to a shock in the LHM and to one in the UKHM are the same as in our benchmark model. The responses of each Housing Market to a shock in the other one is slightly smaller and less persistent for both. It seems, however, that the economy is still more affected by a shock in the London House Prices rather than one in the UK House Prices. The Historical Decomposition emphasises once again this argument showing that the LHM seems to contribute more to the structural accumulated shocks of GDP and Inflation more than the UKHM.

The response of the Bank Rate is insignificant for both shock simulated. The sign of the response in both cases is negative suggesting that following a collapse in one Housing Market, the interest rates would fall. However, interest rates are very close to 0% at the moment and this suggests that we should expect negative interest rates. Our result is statistically insignificant and it means that we should not take it into account. Similarly, as for uncertainty, we can argue that the Bank Rate is driving the Housing Markets and hence why our result might be insignificant. The Historical Decomposition of the Bank Rate shows a greater contribution from the UK Housing Market, which makes economic sense as when adjusting

the interest rates, the Bank of England might be looking at the UK-Wide Housing Market, and not just one city Housing Market such as the London one.

(ii) Government Consumption

This model is very similar to our benchmark model – following a shock in the LHM, GDP and UK's responses are negative as well, but less important in size and duration. Inflation differs by not being affected negatively at the beginning as in our benchmark model, but rather being unaffected, before following the same trend as in our benchmark model. We see a smaller and less persistent shock in the UKHM, which results in a smaller but more tenacious response of GDP, and London House Prices' response is the same as in our benchmark but even less persistent. Inflation is not affected for five quarters before responding negatively. From the Historical Decomposition of GDP, we see that both Housing Markets seem to contribute to the structural accumulated shocks – the UKHM's contribution has increased from our benchmark model finding, however, the LHM still shows the most contribution. In terms of Inflation, similarly as in our benchmark model, the UKHM shows almost no contribution to the structural accumulated shocks of Inflation, while the LHM shows quite a strong contribution especially since the 1990s.

Government Consumption is insignificant. The sign of the response is very interesting, however. When the shock is coming from the LHM, we see a period of almost two years where Government Consumption respond positively to the shock – meaning that Government Consumption is increasing. However, when the shock is coming from the UKHM, Government Consumption seems to respond negatively. This result, despite being insignificant, tells us that following a collapse in the LHM, the government is more likely to increase its consumption in

order to boost economic activity. When looking at the Historical Decomposition of Government Consumption, we observe that the LHM shows slightly more contribution to the structural accumulated shocks of Government Consumption. Again, a shock in the LHM is more harmful than one in the UKHM.

(iii) Investment

The model with the Investment is very similar to our benchmark model – it differs by estimating a smaller shock in the LHM; and, therefore, the response of GDP is less important in size, but the persistence is the same. Inflation is not affected for the first two quarters, before responding positively and then negatively after 11 quarters; and, the response of the UKHM is mildly smaller than the one in our benchmark model. The estimated shock in the UKHM is slightly higher and results into producing a higher response in GDP, although less persistent, and a higher and more tenacious response of the LHM which seems to last for two and a half years. The Historical Decomposition computed in this model show less contribution from the LHM, and more from the UKHM to both the structural accumulated shocks of GDP and Inflation. Although, it does seem that London House Prices are still contributing a bit more than the UK House Prices for the structural shocks of Inflation; in terms of GDP, it is hard to tell which Housing Market contribute the most as they both show contribution but at different periods of time.

Investment is insignificant in our model. However, the sign of the response is in accordance with economic theory – indeed, considering that we have a recession in the economy, as the response of GDP is suggesting, you would expect a fall in investment in the economy. Here, whether the shock is in the LHM or the UKHM, investment is affected in a negative way, in

line with economic theory. The response of Investment seems to be more persistent when the shock is coming from the LHM as it lasts for the 40 quarters estimated, while it only lasts for 14 quarters when the shock is coming from the UKHM. Both the LHM and UKHM seem to contribute to the structural accumulated shocks in Investment, although not at the same periods of time – for example from 1985 to 2002, London House Prices show more contribution to Investment, however, from 2002 until now, the UK House Prices seem to contribute more.

(iv) Stock Market

The model with the Stock market is very similar to our benchmark model – it differs by giving more emphasis to the responses simulated by a shock in the LHM, and giving less importance to the shock simulated in the UKHM and the respective responses of our variables. Similarly as in our benchmark model, the London House Prices are showing more contribution to the past structural accumulated shocks of both GDP and Inflation.

The response of the Stock Market is insignificant in both simulations, however, the sign of the response is negative for 8 quarters when the shock is coming from the LHM, but alternating between positive and unaffected when the shock is simulated in the UKHM. The Historical Decomposition shows that the London House Prices seem to have contributed to the past structural accumulated shocks by a lot more than the UK House Prices. This is a very interesting finding suggesting that London is the most important and looked at part of the UK economy.

(v) Oil Prices

The model with Oil Prices is quite different from our benchmark model. It gives more emphasis to a shock simulated in the UKHM and to the respective responses of our variables, and seems to suggest that the London House Prices are no longer driving the UK House Prices. A much smaller shock in the LHM is simulated and we see smaller negative and less persistent responses in both GDP and the UKHM. However, a more significant shock is simulated in the UKHM, with larger and more tenacious responses in GDP, Inflation and the LHM. The shock simulated in the LHM and its respective responses are still slightly more prominent than the ones with a shock simulated in the UKHM. The Historical Decomposition computed in this model show less contribution from the LHM, and more contribution from the UKHM to both the structural accumulated shocks of GDP and Inflation. Although, it does seem that London House Prices are still contributing more than the UK House Prices.

The response of Oil Prices is insignificant for both shock simulated. However, when the shock is coming from the LHM, it seems that Oil Prices take time to adjust and respond negatively only after 5 quarters, whereas when the shock is simulated in the UKHM, we see a negative response straight away. The Historical Decomposition supports our findings through the Impulse Response Function by showing that from the past structural accumulated shocks of Oil Prices, most of the contribution is coming from the UKHM, and the LHM does not seem to contribute.

3.4.2 Dividing our sample in 2

In this Section, we evaluate an updated version of our Benchmark Model. We divide our sample in 2, to see how the housing markets evolved through time into affecting the economy. We choose to divide our sample at 1992, as this is where monetary policy started to change. Subsample 1 is from 1973 to 1991Q4, and subsample 2 is from 1992Q1 to 2018Q4. We keep the same lag length to not "distort" our results.

Please refer to the Appendix H for subsample 1 and to Appendix I for subsample 2. The IRFs are reported in Figure 1 for a shock in the LHM and in Figure 2 for a shock in the UKHM, and the Decompositions are reported in Figure 3, for each subsample.

3.4.2.1 Results prior to 1992

The simulated shock of the LHM is larger than the one simulated in the UKHM. GDP's response is negative for seven quarters following a shock in the London House Prices, however, it is positive after a shock in the UK House Prices i.e. GDP is only affected by a shock in the LHM, although not by a lot considering the size of response, and not by one in the UKHM. Inflation's response to a shock in the LHM is negative for the entire 10-year period, whereas, following a shock in the UKHM, Inflation takes four quarters to adjust and respond negatively. Uncertainty is still insignificant in both case and suggests a positive response. The LHM is not affected at all by a shock in the UKHM, while the UKHM responds negatively for 16 quarters, suggesting once again that the London House Prices are driving the UK House Prices. From the Historical Decomposition, we find that both Housing Markets contribute to the structural accumulated shocks of GDP, Inflation and Uncertainty, and it seems that towards the end of

the sample, starting 1988, the UKHM shows more contribution to their decomposition. The UKHM is showing very little contribution to the structural accumulated shocks in the LHM, whereas the LHM is showing quite an important contribution to the decomposition of the UK House Prices.

3.4.2.2 Results following 1992

The shock simulated in the LHM is larger than the one simulated in the UKHM. The responses of GDP are of the same sign and size. However, it seems that following a shock in the UKHM, GDP's response is more persistent, and lasts for the 40 quarters estimated. This involves that a collapse in either Housing Market would affect GDP growth and for a minimum of 8 years. Inflation's response to a shock in the LHM is positive, whereas, in the case of a shock in the UKHM, Inflation seems to respond negatively for 2 quarters, then positively for 3 quarters, and then negatively again for the rest of the estimated period. This means that Inflation might not be affected negatively by a collapse in the LHM, but one in the UKHM might have a more negative impact. Uncertainty is still insignificant – the sign of the response is positive following a shock in the UKHM, and negative for 10 quarters after a 6-month period of adjustment. This suggests that a collapse in the LHM would potentially create uncertainty in the economy, whereas a shock in the UKHM would not, however, similarly as in our benchmark model, this result is not statistically significant. It seems that a collapse in either Housing Markets results in a negative response for a duration of 10 years in the other Housing Market – London House Prices seem to be affected negatively for 40 quarters by a shock in the UKHM. Though, the response of the UKHM to a shock in the LHM is still more significant and important in size. From the Historical Decomposition, we find that both Housing Markets are contributing to the accumulated structural shocks of GDP. However, the LHM is still contributing more to the

decomposition of Inflation, although much less significantly than in our benchmark model, and the UK seems to be contributing more to the decomposition of Uncertainty. The LHM is still contributing quite importantly to the Decomposition of the UKHM, and it seems that, starting 2003, the UKHM contributes to some extent to the decomposition of the LHM.

3.4.2.3 Comparing our two subsamples results

The results of our two subsamples are quite different. Indeed, subsample 2 suggests that a collapse in either Housing Market has a much more consequential impact on the economy, than one simulated in subsample 1, especially for GDP growth. This is a very interesting and important result. Prior to 1992, the UK had higher interest rates and was following much more conventional monetary policy. After 1992, we saw in the economy Financial Liberalisation – low interest rates, and post 2009, unconventional monetary policy methods were adopted such as Quantitative Easing. The low interest rates allowed the House Prices, both in the UK and London, to rise at a considerable speed; and because of that, the Housing Markets might have taken too much importance in the economy, which results in them having a negative impact in case of burst.

3.4 Critics and limitations of our model

Our model is far from being perfect and could be improved for further research. There are five critics and limitations of our model that needs to be pointed out.

1. In this paper, we only go through the IRFs of shocks simulated in the LHM and UKHM. We are not doing any forecasting but just looking at the expected dynamic consequences of our variables. This is important to note because the shock simulated is

much smaller than the one predicted by Marc Carney in August 2018. Therefore, to some extent, this research might be not sufficient enough to be taken into account, as no "real" economic predictions are made, but only supposition.

2. The statistical significance of our IRFs is not reviewed by accurate tests such as the delta method, or the Bootstrap and Monte Carlo methods. This could imply that some of our results that are considered statistically significant, might actually not be.
3. A VAR model can only take into account a very small amount of variables, otherwise it would affect the significance of our results, and hence why in this paper, we only have 5. This is a limitation as there are obviously other factors affecting the economy, but there might be as well other variables that could be affected by such a shock.
4. As mentioned above, there are other factors affecting the economy that are not taken into account in this paper. The IRFs calculated are showing the expected dynamic consequences of our variables, holding everything else constant. This means that there is a possibility that the economy will not be affected by such a situation arising, as there might be positive factors occurring at the same time, and outweighing the negative impacts of shocks in the Housing Markets.
5. The results of our benchmark model, and the one obtained from subsample 2, are different. Indeed, subsample 2 results are no longer suggesting that the LHM has a much more consequential impact on the economy – now both shocks simulated have roughly the same impact. Furthermore, the LHM is no longer driving the UKHM – a shock in the LHM will still have a considerable impact on the UKHM, but the persistence of the response is much smaller; and, a shock in the UKHM creates a more serious response – in terms of size and persistence – in the LHM.

3.5 Conclusion

We used a VAR Model to estimate how a shock in the LHM and UKHM would affect the economy, and specifically the Impulse Response Functions and Historical Decomposition to evaluate how GDP, Inflation and Uncertainty might react in case of such a situation arising.

Our results suggest that the economy is affected by both a collapse in the London and UK Housing Markets, but more particularly by one in the London Housing Market.

GDP is more affected by a shock in the LHM rather than one in the UKHM. The sign of the response is negative in both cases and the persistence of it is slightly larger when the shock is simulated in the UKHM. Looking at the size of the response, we see that a collapse in London House Prices has a much more damaging impact on GDP growth. In both cases, from the sign, size and significance of our response, it is fair to assume that we will see a recession in the UK. Obviously, there are other factors affecting the economy, and they might outweigh the negative effects of a housing market collapse, however, it is important to notice that the shock simulated in this paper is much smaller than the one predicted by Marc Carney. Considering the difference in size of the shock simulated and the one predicted, we should expect GDP's response to be much more negative and destructive.

Inflation seems to be affected negatively for a very short period of time for a shock in the LHM, but is assumed to respond positively for a shock in the UKHM. Throughout the period estimated, the sign of Inflation's response changes, making it slightly unclear on what to really expect. The confidence intervals in both cases are showing the possibility of both a positive or negative response. In case of the negative response, the Inflation rate should not be affected

too much, however, it will draw us away from the Bank of England's Inflation target of 2%, considering that the Inflation Rate as of October 2018 was at 2.4%, and if the response is as high as the confidence interval, we might even see deflation in the economy, which, will cause an even deeper and more severe crisis in the UK economy. We, therefore, hope that in case of a burst in one of the Housing Market, Inflation's response will not be worse than the one predicted.

The London House Prices appear to be driving the UK House Prices – from the IRFs obtained, the UKHM is responding in a much more negative and persistent way to a shock in the LHM, whereas, the LHM insinuates a very small decline for only a few months.

The IRF of uncertainty is statistically insignificant and implies less uncertainty in the economy following a shock in either Housing Market – we therefore replace it with other variables to check the validity of our model but also to see how these new variables might be affected by such a situation.

The Historical Decomposition, which is looking at the empirical data and how the LHM and UKMH contributed to the past structural accumulated shocks in our variables, are in accordance with our IRFs findings, suggesting that we can trust our estimates.

The results obtained from the new models computed are extremely similar to the results of our benchmark model. Even if the IRFs of our new variables are statistically insignificant, it appears that the Bank Rate, Investment and Oil Prices would be affected in a negative way for both simulated shocks. However, we see a positive response of Government Consumption for a shock in the LHM, and a negative response for a shock in the UKHM. The Stock Market

responds negatively to a shock in the LHM, but positively to a shock in the UKHM. The Decompositions of our variables are supporting our IRFs' findings. From these results, we maintain our initial hypothesis that a shock in the LHM has much more serious consequences on the economy.

The additional robustness check conducted by changing the order of our variables is suggesting that once again a shock in the LHM has damaging consequences on the economy – however, the IRFs of GDP and Inflation became much less statistically significant. This could be explained that these variables cannot possibly be affected straight away by a shock in either Housing Market, as economic intuition suggests.

Finally, the experiment of dividing our sample in two, highlights that Financial Liberalisation has perhaps given too prominent a place to the Housing Markets in the economy, leading them to have a harmful impact on economic growth, inflation and other important components of the economy, in case of a burst.

A few limitations of our model have been mentioned, suggesting that further research needs to be done such as checking the statistical significance of our IRFs, doing some forecasting and actual economic predictions with Marc Carney's estimated shock including some other factors affecting the economy to see the real consequences of LHM and UKHM shocks.

The main important thing to remember is that whether the shock is coming from the LHM or the UKHM, the economy seems to be affected and we need to prepared for such a situation arising.

4 Conclusion

From the literature, it was suggested that a collapse in the London Housing Market was very much possible and even imminent, especially in case of a "no-deal Brexit". Marc Carney predicted a worse-case scenario of a 35% crash in London House Prices, which could then lead to a recession as bad as the 2008 Financial Crisis. It was also implied that the London House Prices might be driving the UK House Prices. Since 2018, the London Housing Market has seen a drop-in house prices of 3.8%, which has already been affecting the England Housing Market, and might be disturbing the UK Housing Market as a whole as well.

We used an econometrics model called Vector Autoregressive, which enabled us to look at the dynamic consequences of a shock in a Housing Market on of the economy through the Impulse Response Functions. The Historical Decomposition was also used to understand how the Housing Markets contributed in the past structural accumulated shocks of our variables of interest.

From our analysis, we analysed (i) the impact of a collapse in the London Housing Market on GDP, Inflation, the UK Housing Market and Uncertainty; (ii) we compared these results with the impact of a collapse in the UK Housing Market on the same variables and the London Housing Market. Our benchmark model suggested that GDP and Inflation would be much more affected by a shock in the London Housing Market rather than by one in the UK Housing Market. Considering the duration of GDP's response, it is fair to assume that there will be a recession in the UK following such a situation. Furthermore, the negative response of Inflation indicates that we might pull the Inflation rate back from the Bank of England's Inflation target. The London House Prices seem to be driving the UK House Prices, as a shock in the London Housing Market creates a much more significant response in the UK Housing Market, than

vice versa. Our model fails into predicting the response of Uncertainty to shocks in either Housing Market, as our result is not statistically significant. The Historical Decompositions are in accordance with our findings through the Impulse Response Functions, and show that the London Housing Market is contributing more to the structural accumulated shocks of GDP and Inflation. No contribution from either Housing Market in Uncertainty is perceived.

Different robustness checks have been conducted in order to check the validity of our model. We first changed the order of our variables, putting the House Prices variables first, which resulted in emphasising the much more detrimental impact that the London Housing Market collapse on the economy, and once again showing that a collapse in the UK Housing Market is less worrying. However, the statistical significance of our variables is not as strong as in our benchmark model.

Due to the statistical insignificance of our Uncertainty variable, we replaced it with other variables to see how these might be affected in such a situation. Our models are very similar to our benchmark model, suggesting the accuracy of our initial findings. The Bank Rate, Investment and Oil Prices would be affected in a negative way for both simulated shocks, and Government Consumption shows a positive response for a shock in the London Housing Market, but a negative response for a shock in the UK Housing Market. The Stock Market is responding negatively for a shock in the London Housing Market but positively for shock in the UK Housing Market. These results suggest once again that the economy is more affected in case of a burst in the London Housing Market.

Lastly, we divided our sample in two, to see how financial liberalisation, and particularly low interest rates, impacted the relationship between the economy and the housing markets.

Subsample 1, which simulated shocks before 1992, is almost not affected by either shocks and the statistical significance of our variables of interest is not as meaningful as in our benchmark model. However, for shocks simulated after 1992, we see that both the London and UK Housing Markets have detrimental effects on the economy. This experiment has given weight to the hazardousness of the low interest rates.

Being very critical of our model, we found a few limitations and critics that can be highlighted so that further research on this topic can be done. For example, the statistical significances of the Impulse Response Functions have not been verified by econometrics testing. In addition, we only looked at the expected dynamic consequences of a collapse in the London or UK Housing Market, and therefore, actual forecasting could be more useful.

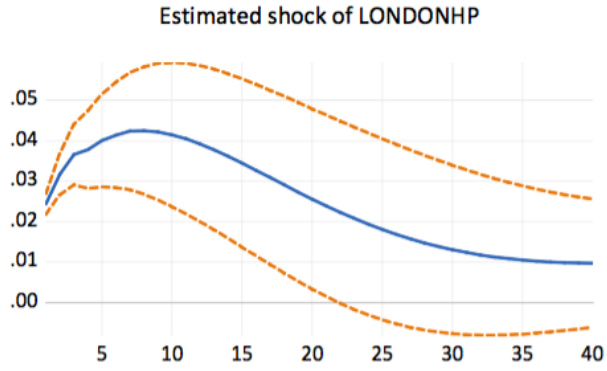
The prediction of Marc Carney is much higher than the shock simulated in our model, which means that we can expect even more destructive effects on the economy. It seems that the London Housing Market is contributing more to the economy in general, but that a collapse in the UK Housing Market has also some negative consequences. A recession might be coming our way, but perhaps it is needed in order to bring the prices of the UK Housing Market as a whole to their actual value.

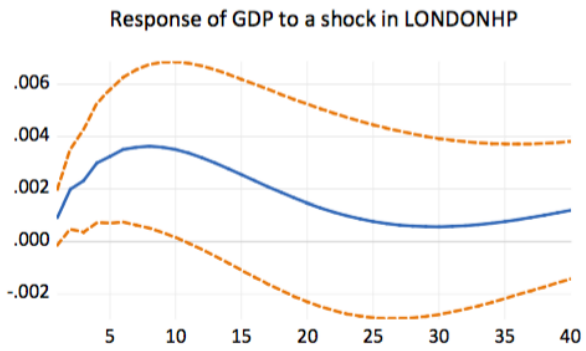
Appendix A – Data Description

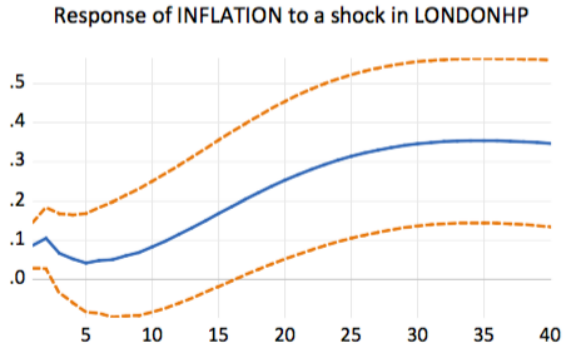
Variable	*Data obtained*	*Description*	*Date*	*Transformation*
GDP	ONS database Source dataset: UK Economic Accounts Time Series (UKEA)	Gross Domestic Product – chained volume measures – seasonally adjusted £m – quarterly data	1955Q1 – 2018Q4	Natural logarithm
Inflation	Fred Economic Database	Consumer Price Index of all Items in the United Kingdom – Not seasonally adjusted – Quarterly data	1955Q1 – 2018Q4	No transformation
London House Prices	Nationwide website Source dataset: Regional Quarterly Indices (Post 73)	London Quarterly House Prices in £	1973Q3 – 2019Q1	Natural logarithm
UK House Prices	Nationwide website Source dataset: Regional Quarterly Indices (Post 73)	UK Quarterly House Prices in £	1973Q3 – 2019Q1	Natural logarithm
Uncertainty	Economic Policy Uncertainty website Source dataset: "Measuring Policy Uncertainty" by Scott Baker, Nicholas Bloom and Steven J. Davis, Quarterly Journal of Economics	Monthly data – Policy-related economic uncertainty in the UK through an index based on newspapers articles regarding policy uncertainty	Historical UK EPU Index: 1955 M1 – 1997 M12 UK Monthly EPU Index: 1998 M1 – 2019 M3	Data transformed quarterly
Bank Rate	Bank of England database	Official Bank Rate	1975 – 2019	Data transformed quarterly Natural logarithm
Government Spending	ONS database Source dataset: UK Economic Account Time Series (UKEA)	Final Consumption expenditure by general government deflator – SA Quarterly data	1955Q1 – 2018Q4	Natural logarithm
Investment	Bank of England database Source dataset: "A millennium of Macroeconomic Data"	Gross Fixed Capital Formation – Chained volume measure – £m – 2013 reference prices	1955Q1 – 2016Q4	Natural logarithm
Stock Market	Bank of England database Source dataset: "A millennium of Macroeconomic Data" (Financial Times)	FTSE All-share Index 10th April 1962=100	1962Q2 – 2017Q2	No transformation
Oil Prices	ONS database Source dataset: Consumer Price inflation time series (MM23)	RPI: Petrol and Oil (including Fuel Oil) Jan 1987=100 (base year) Quarterly data	1987Q1 – 2019Q1	No transformation

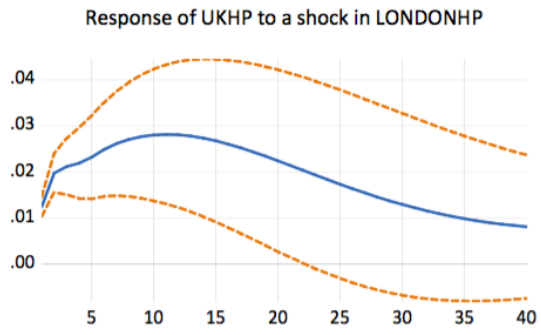
Appendix B – Order Changed

Figure 1: Shock in the London Housing Market and estimated response of GDP, Inflation, UK Housing Market and Bank Rate – New order: LHM, UKHM, GDP, Inflation, Uncertainty









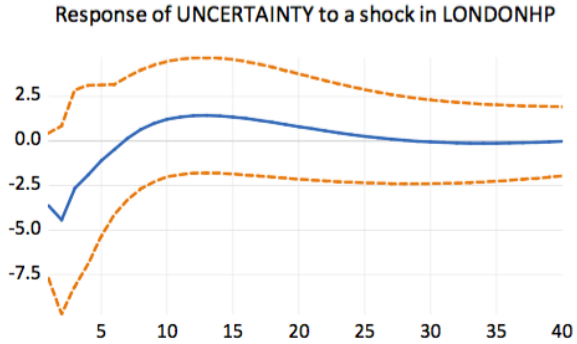
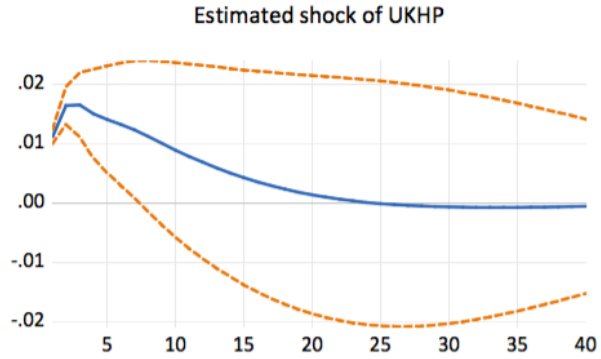
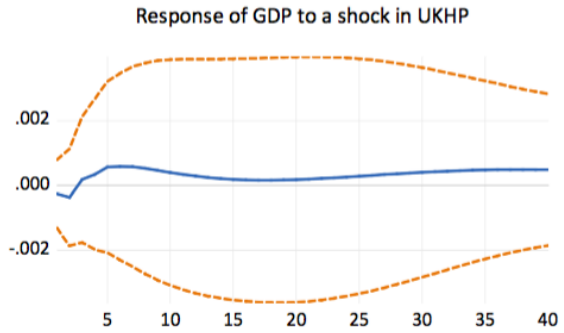
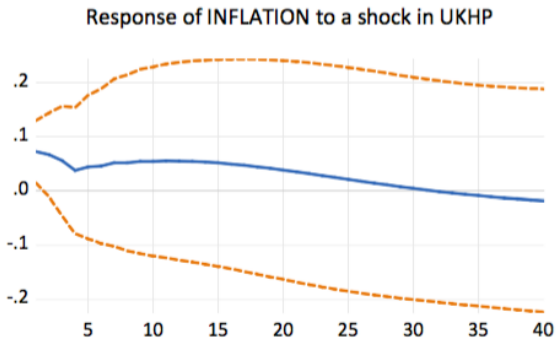
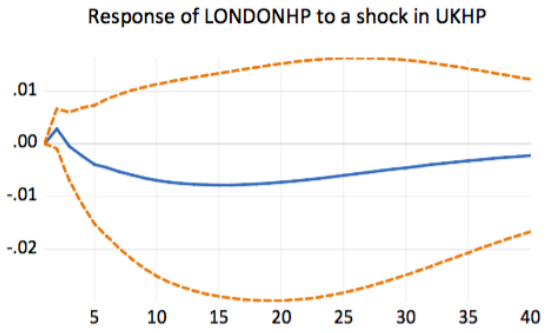


Figure 2: Shock in the UK Housing Market and estimated response of GDP, Inflation, London Housing Market and Bank Rate – New order: LHM, UKHM, GDP, Inflation, Uncertainty









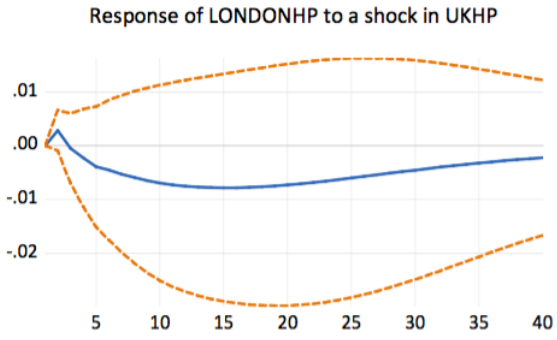
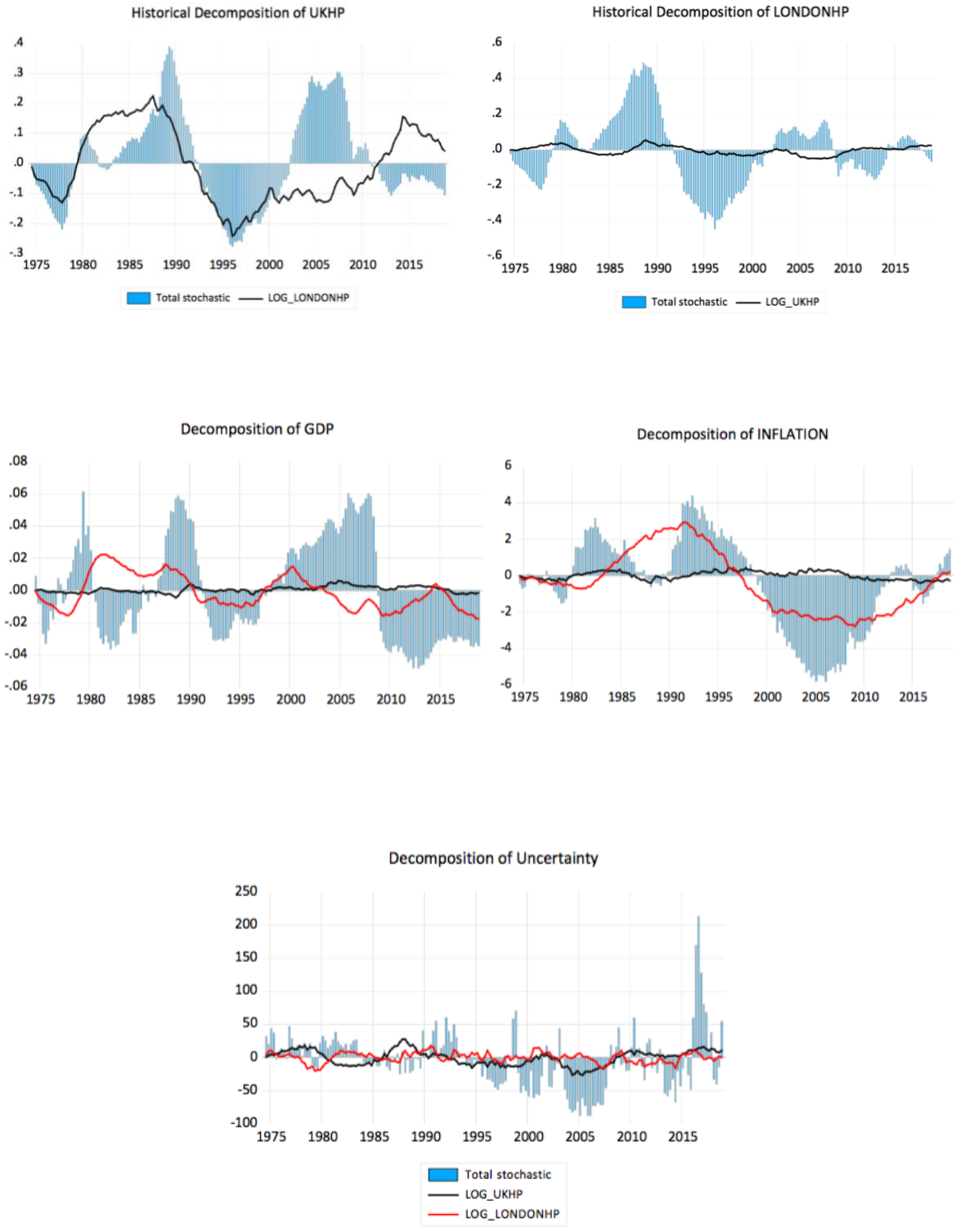
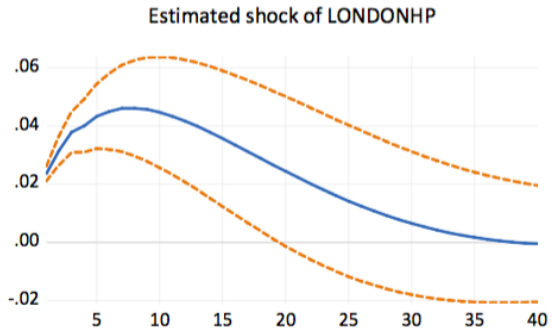


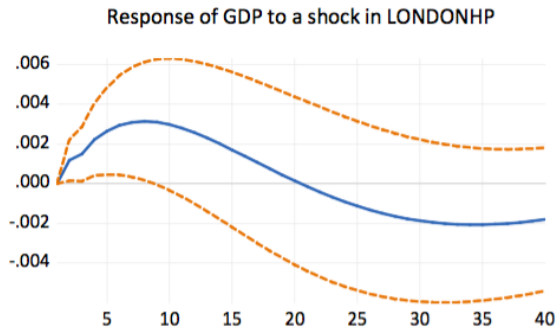
Figure 3: Historical Decompositions of GDP, Inflation, London Housing Market, UK Housing Market, and Uncertainty

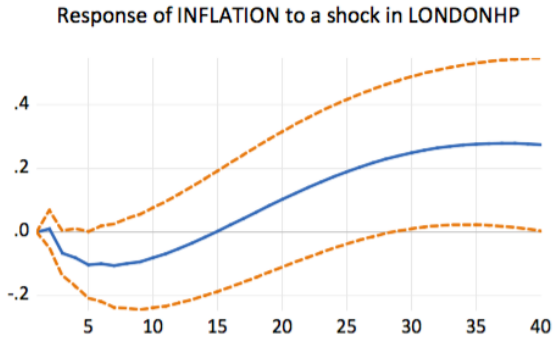


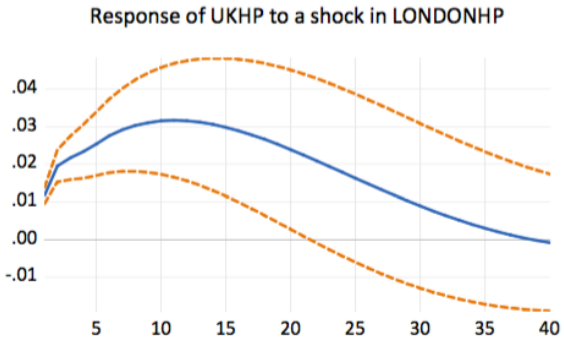
Appendix C – Model with Bank Rate

Figure 1: Shock in the London Housing Market and estimated response of GDP, Inflation, UK Housing Market and Bank Rate









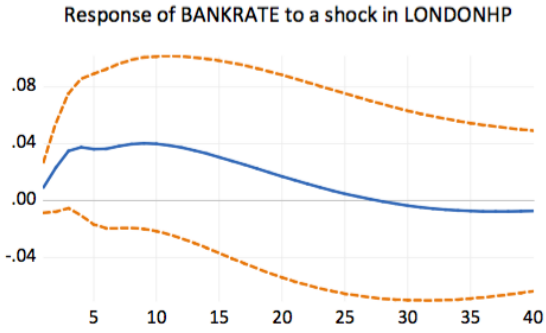


Figure 2: Shock in the UK Housing Market and estimated response of GDP, Inflation, London Housing Market and Bank Rate

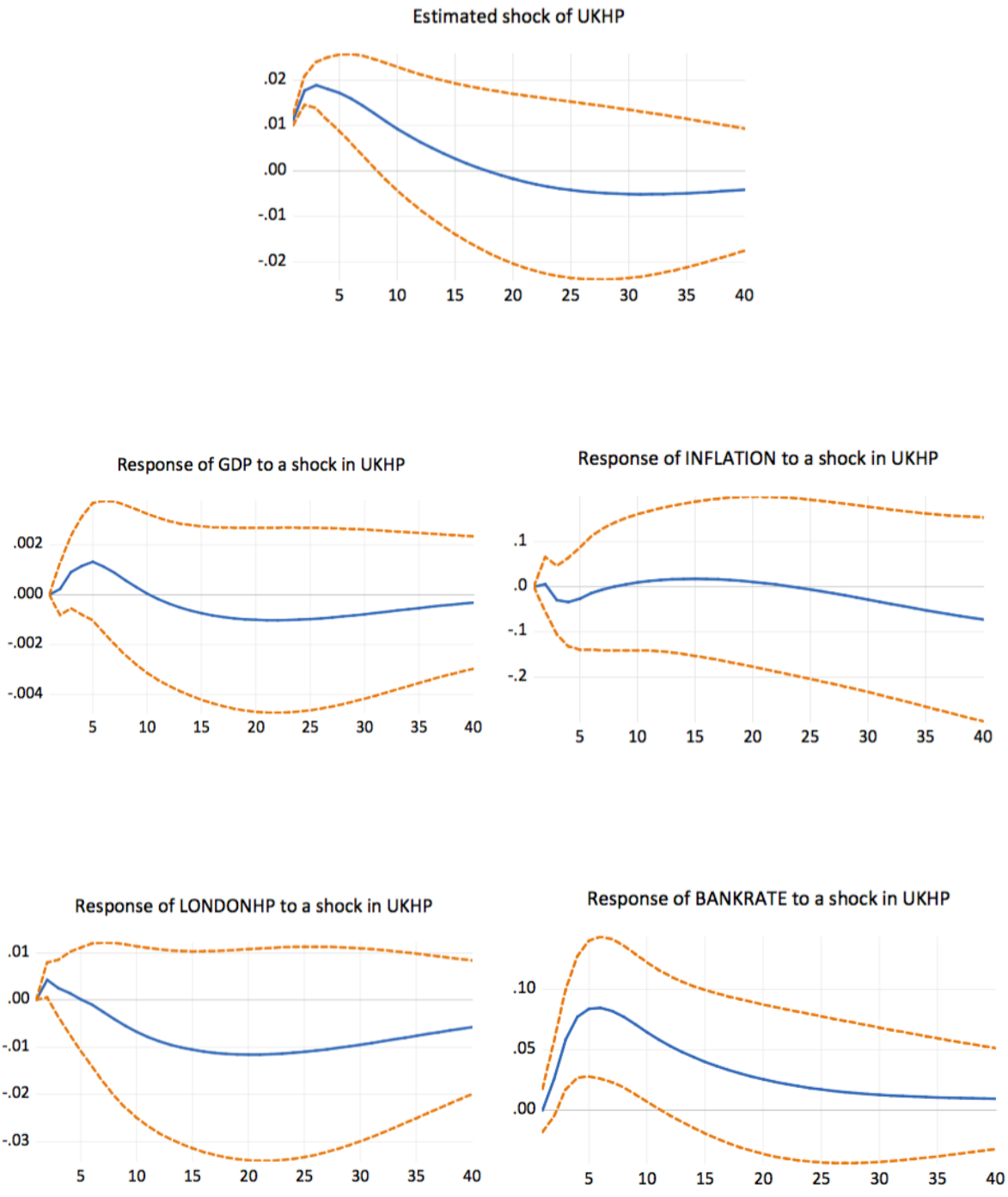
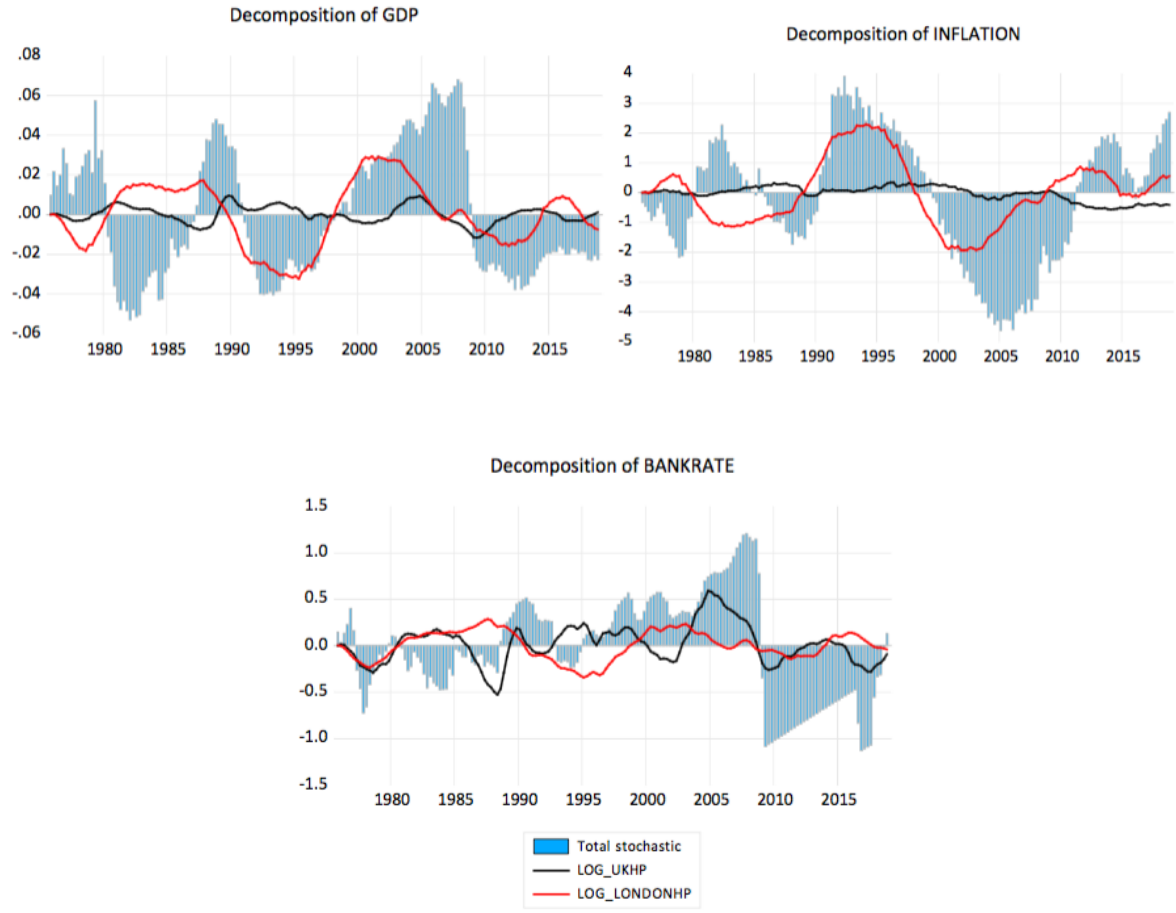
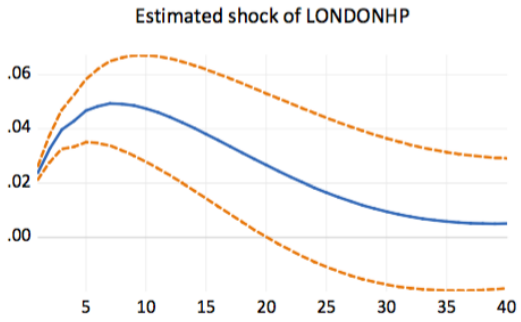


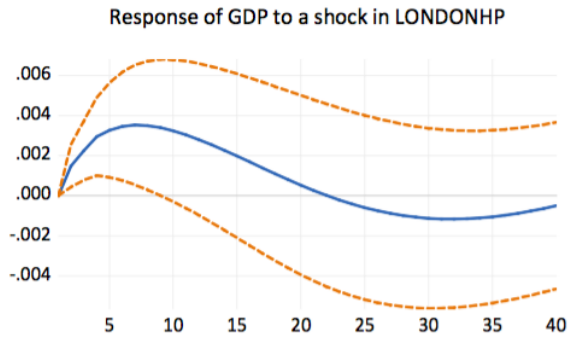
Figure 3: Historical Decomposition of GDP, Inflation and the Bank Rate

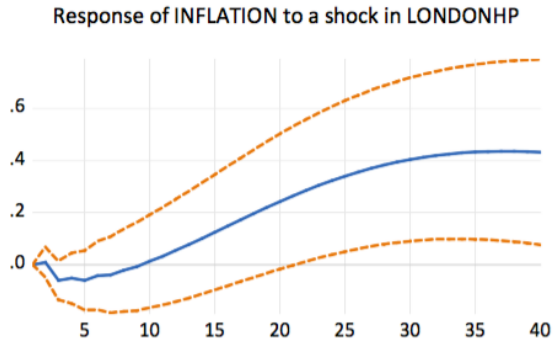


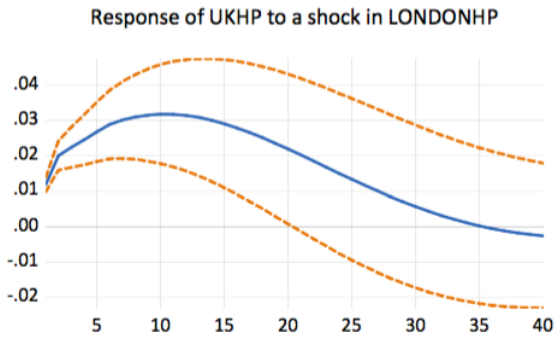
Appendix D – Model with Government Consumption

Figure 1: Shock in the London Housing Market and estimated response of GDP, Inflation, UK Housing Market and Government Consumption









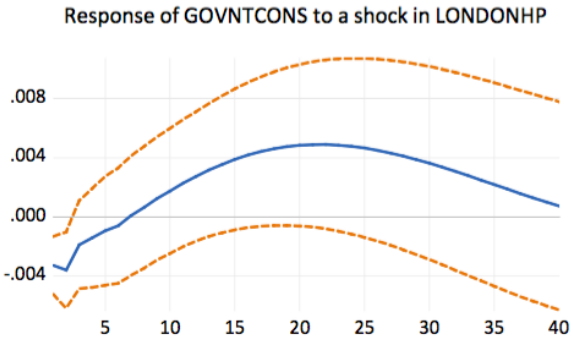
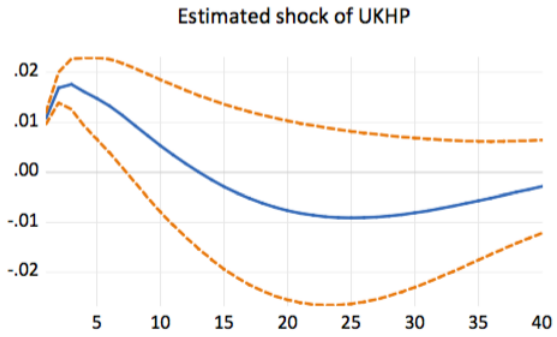
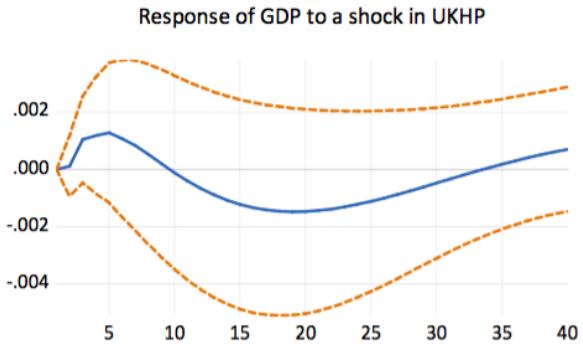
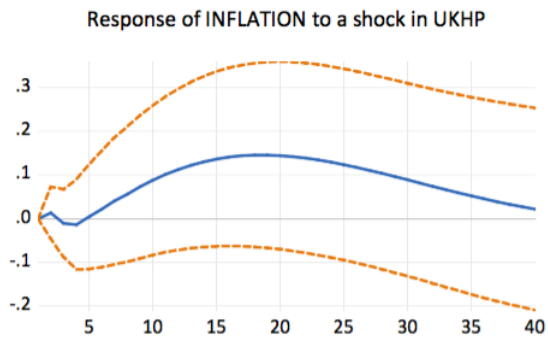
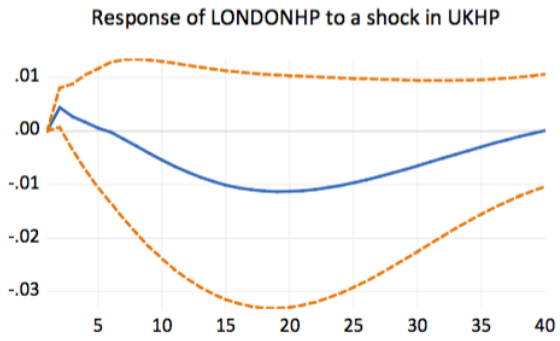


Figure 2: Shock in the UK Housing Market and estimated response of GDP, Inflation, London Housing Market and Government Consumption









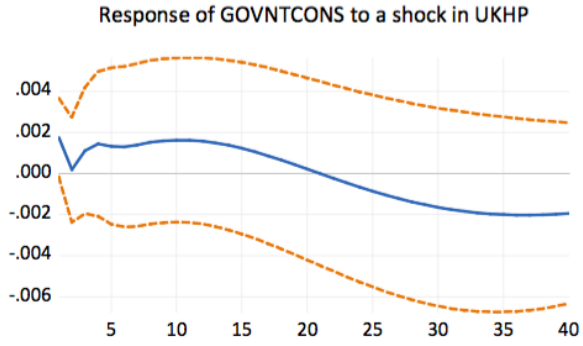
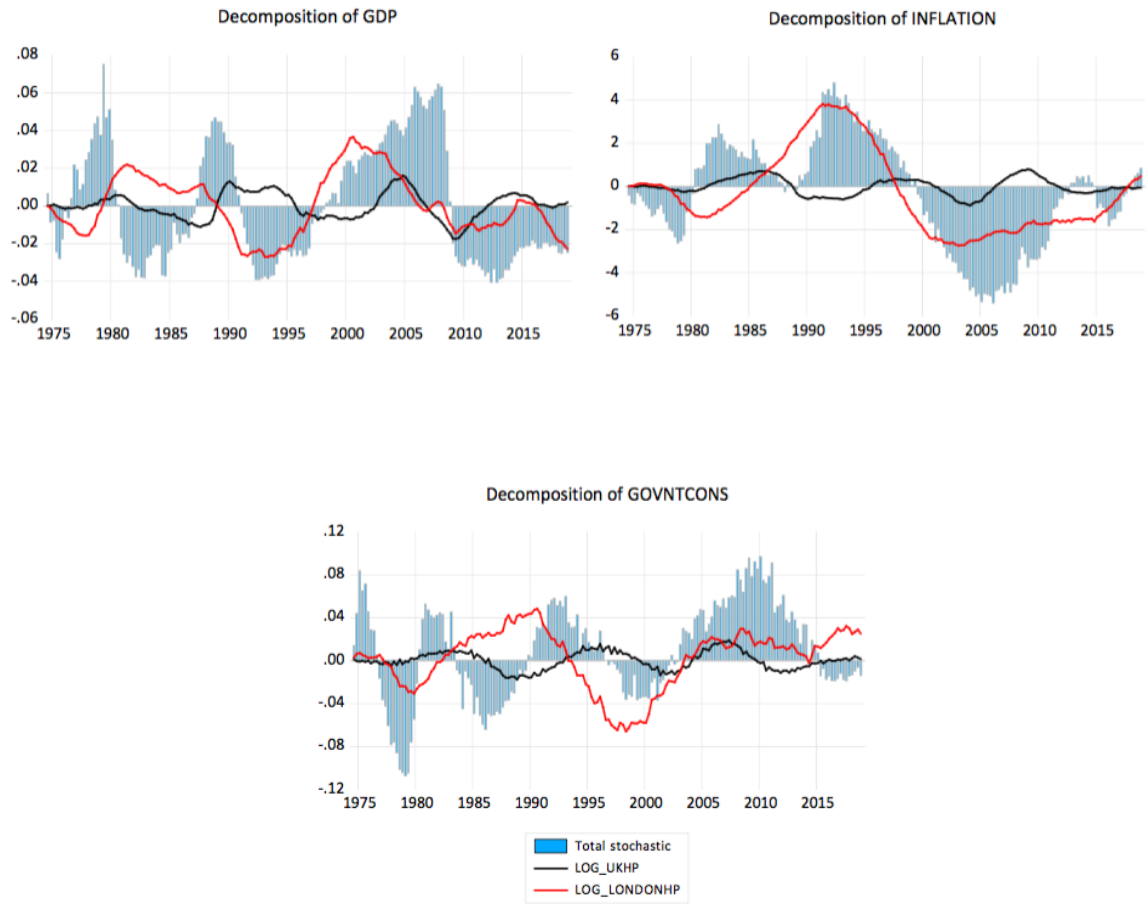


Figure 3: Historical Decomposition of GDP, Inflation and Government Consumption



Appendix E – Model with Investment

Figure 1: Shock in the London Housing Market and estimated response of GDP, Inflation, UK Housing Market and Investment

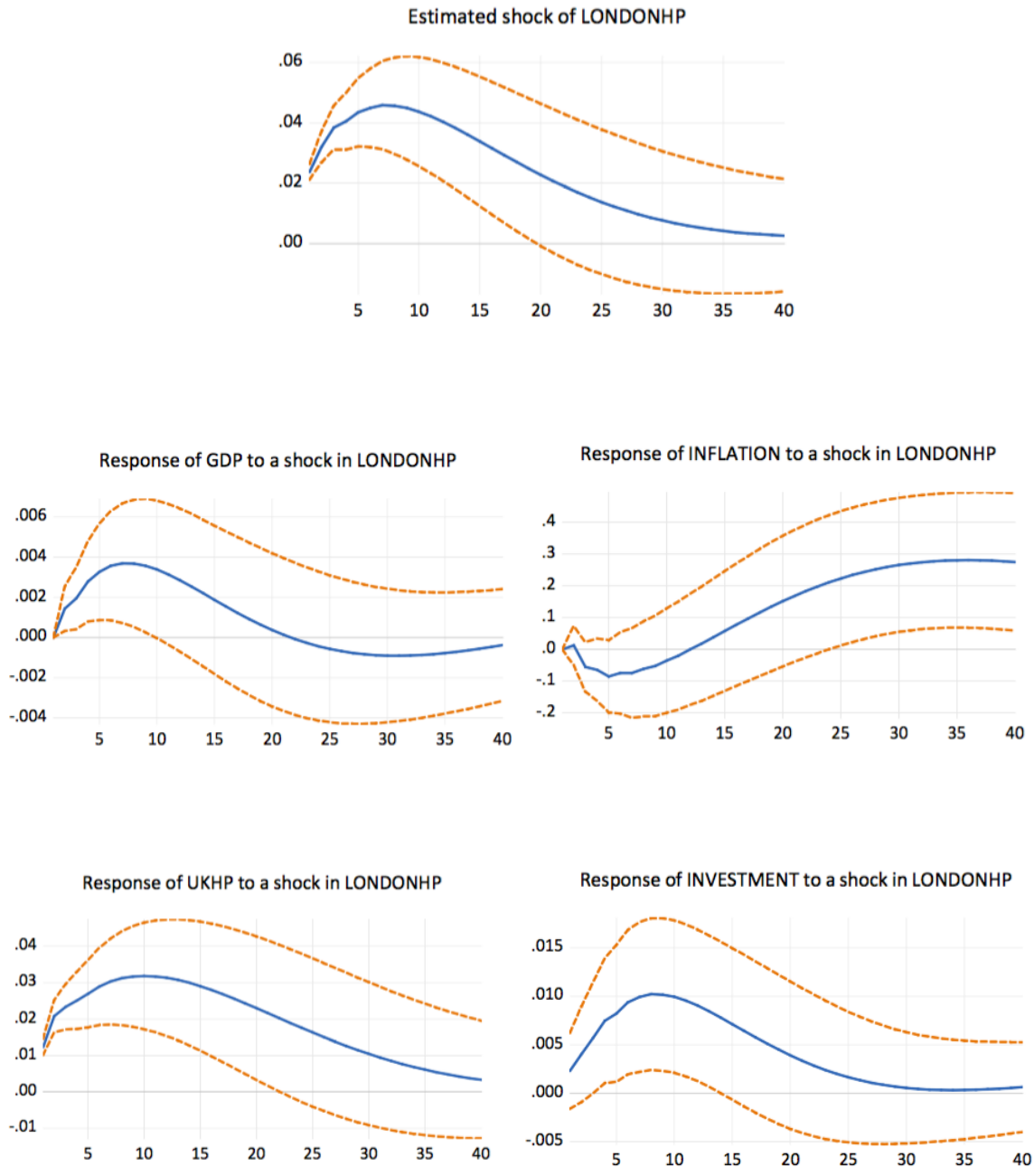


Figure 2: Shock in the UK Housing Market and estimated responses of GDP, Inflation, London Housing Market and Investment

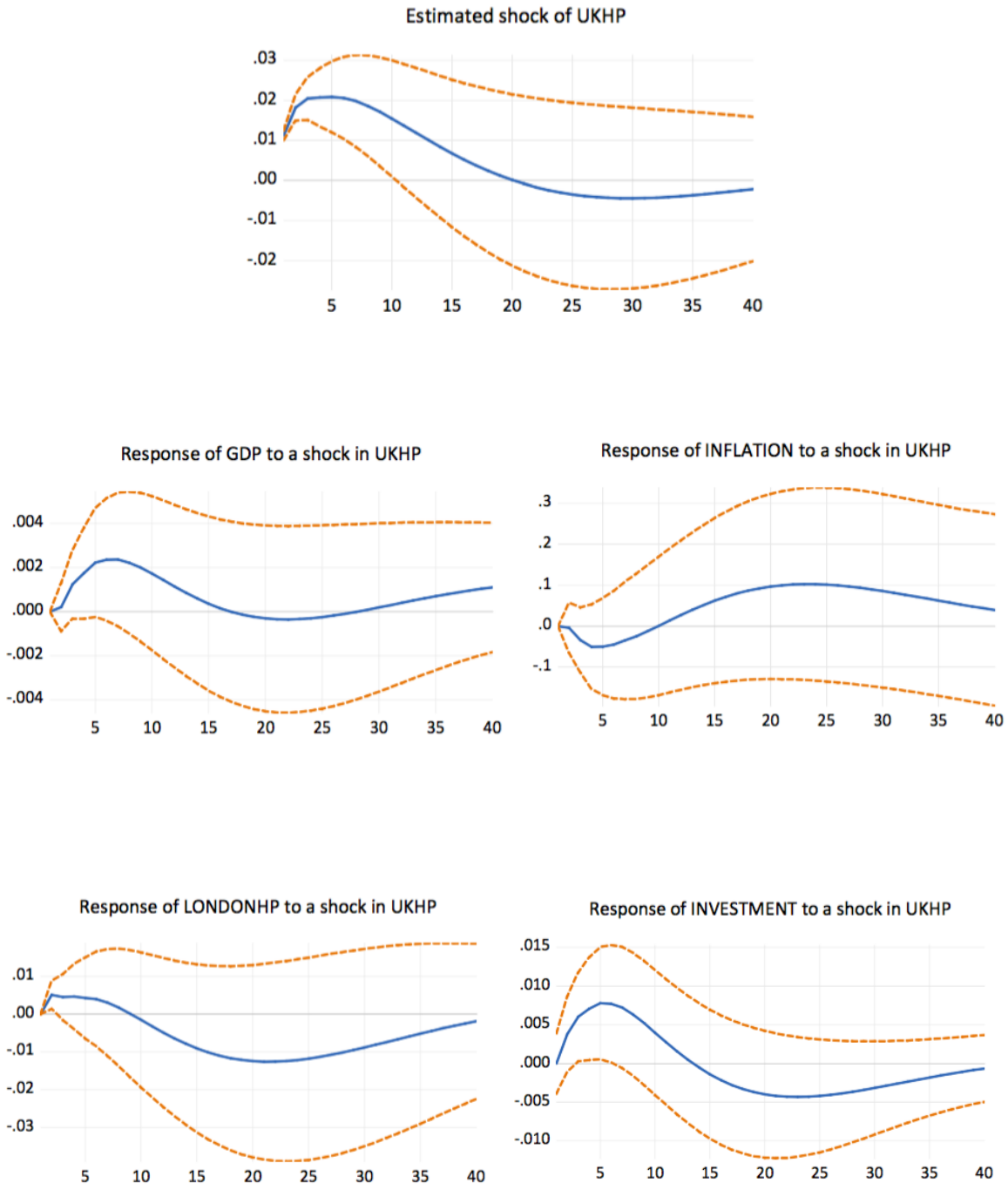
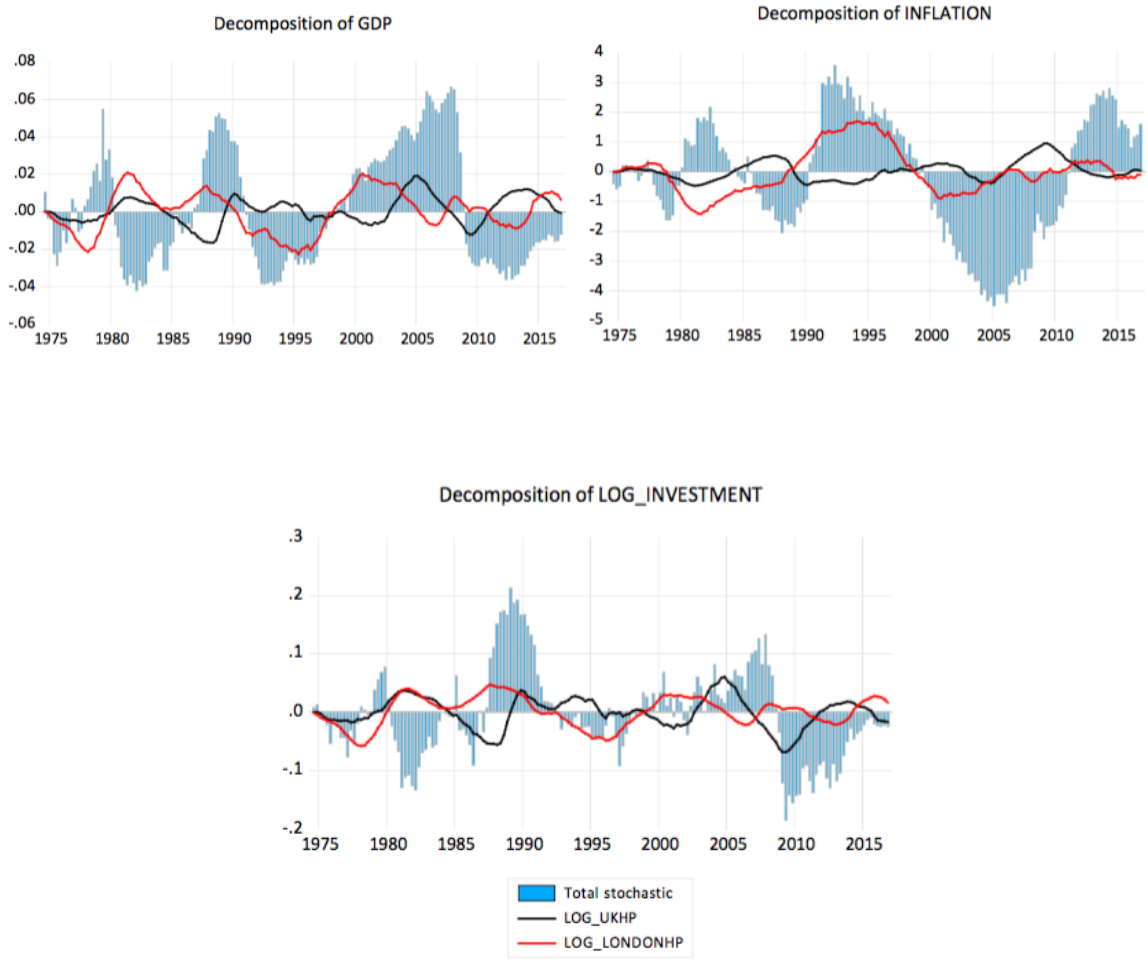
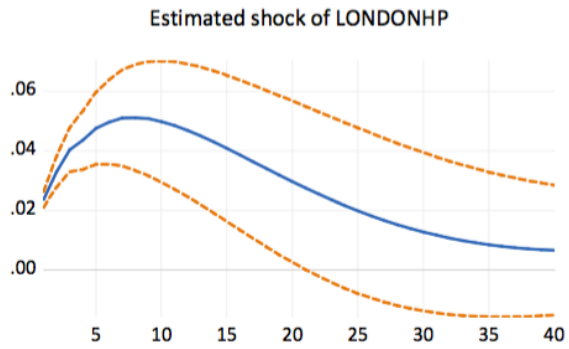


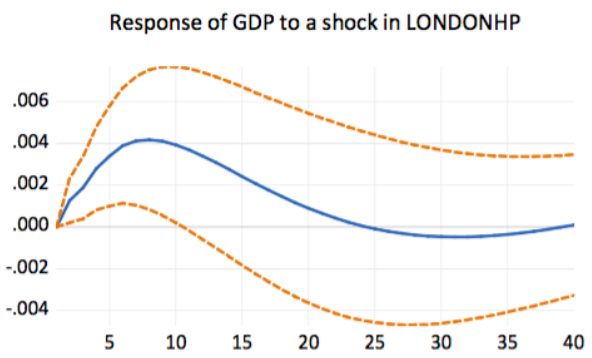
Figure 3: Historical Decompositions of GDP, Inflation and Investment

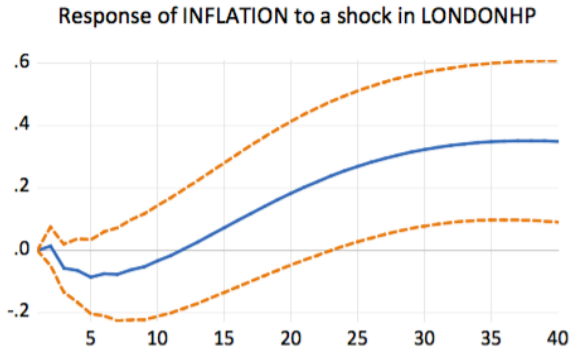


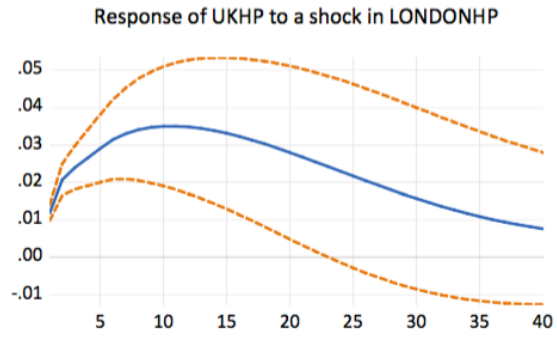
Appendix F – Model with Stock Market

Figure 1: Shock in the London Housing Market and estimated responses of GDP, Inflation, UK Housing Market and Stock Market









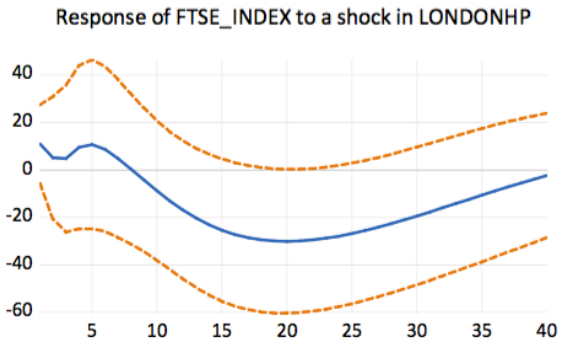
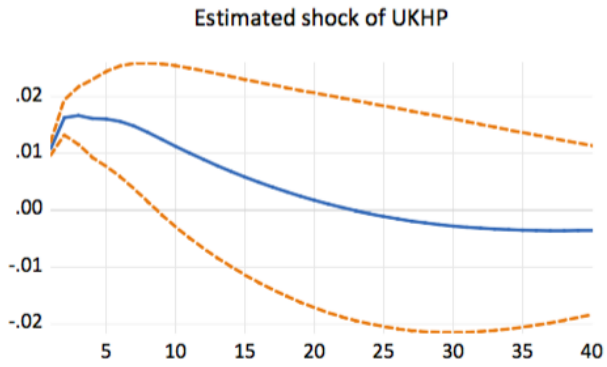
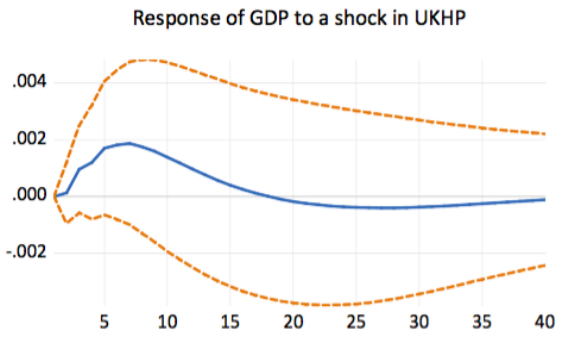
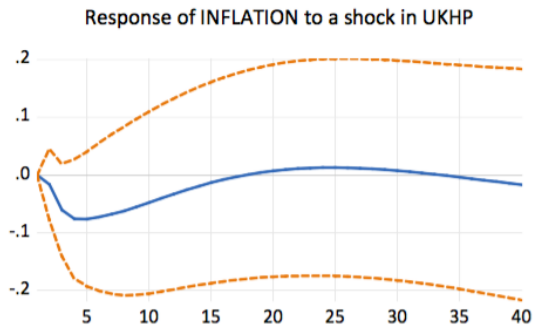
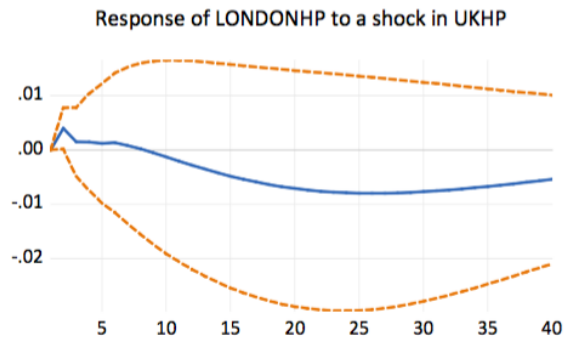


Figure 2: Shock in the UK Housing Market and estimated responses of GDP, Inflation, London Housing Market and Stock Market









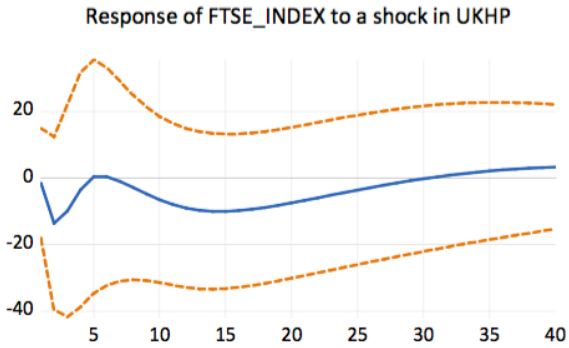
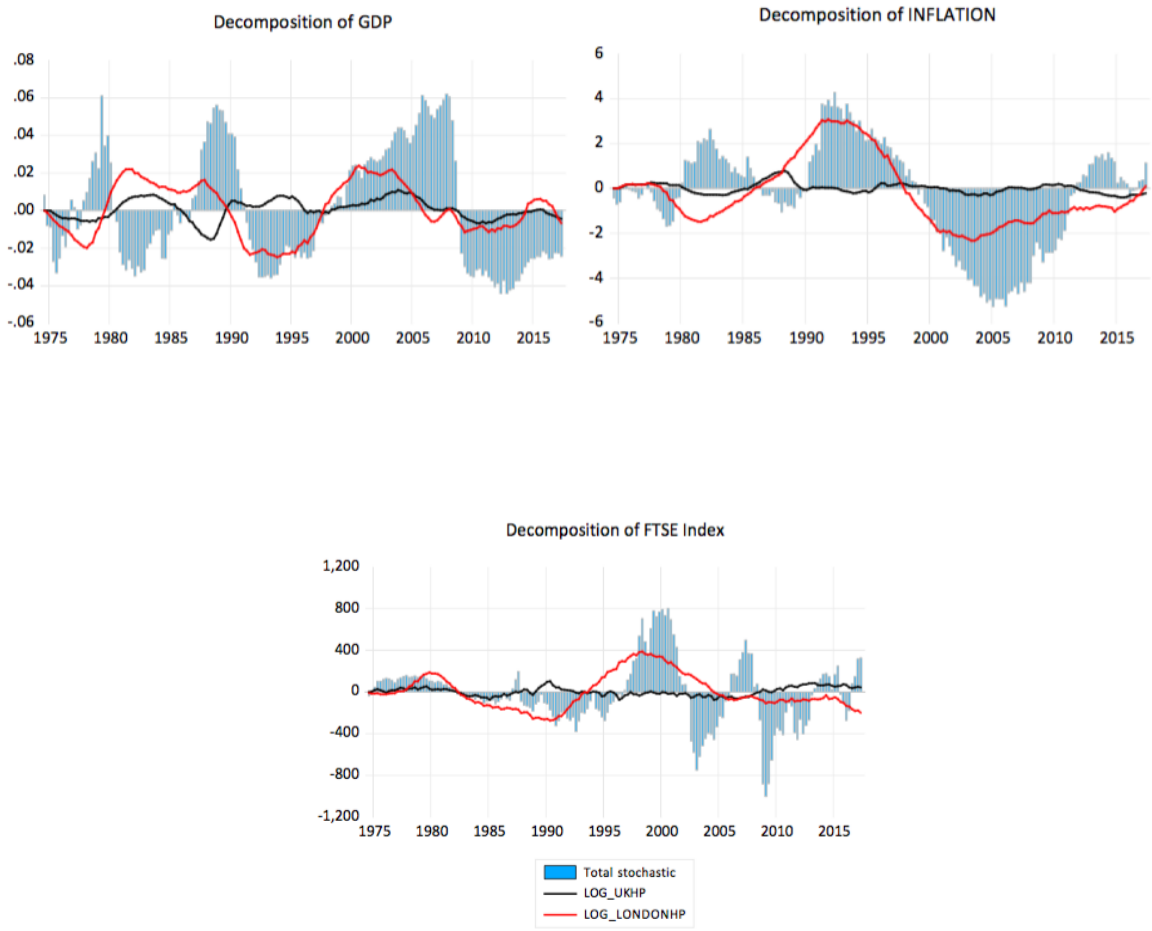


Figure 3: Historical Decompositions of GDP, Inflation and the Stock Market



Appendix G – Model with Oil Prices

Figure 1: Shock in the London Housing Market and estimated responses of GDP, Inflation, UK Housing Market and Oil Prices

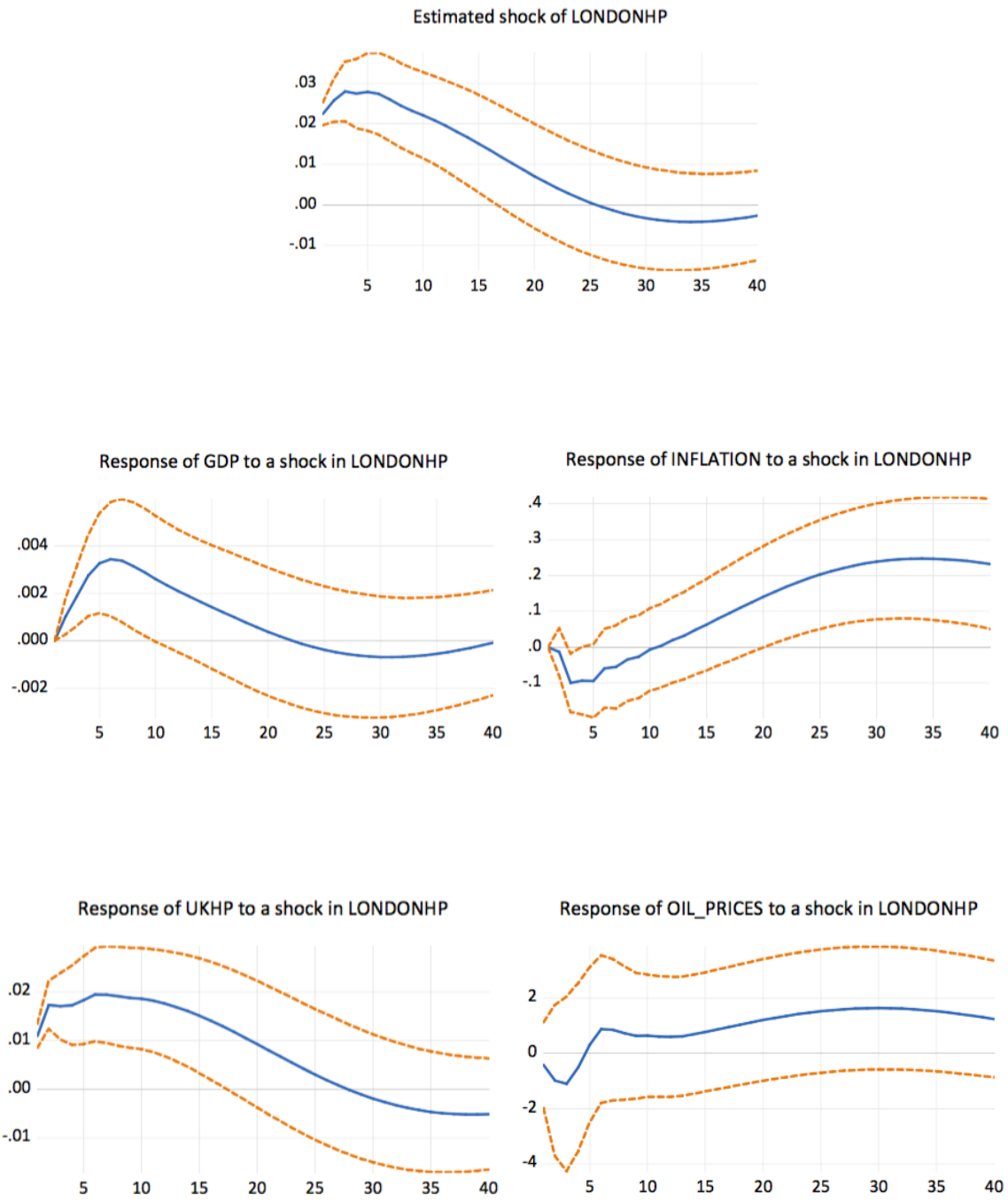


Figure 2: Shock in the UK Housing Market and estimated responses of GDP, Inflation, London Housing Market and Oil Prices

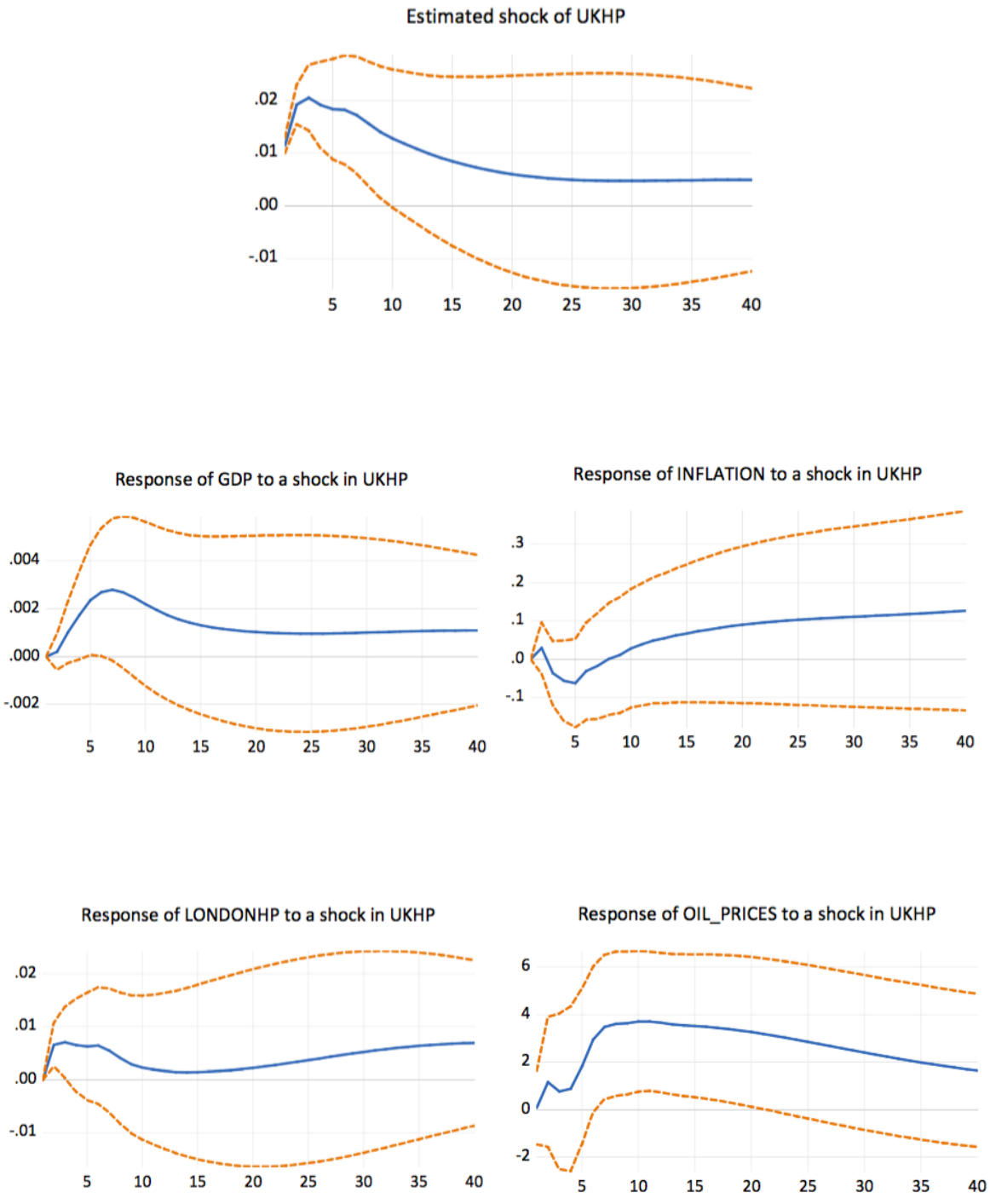
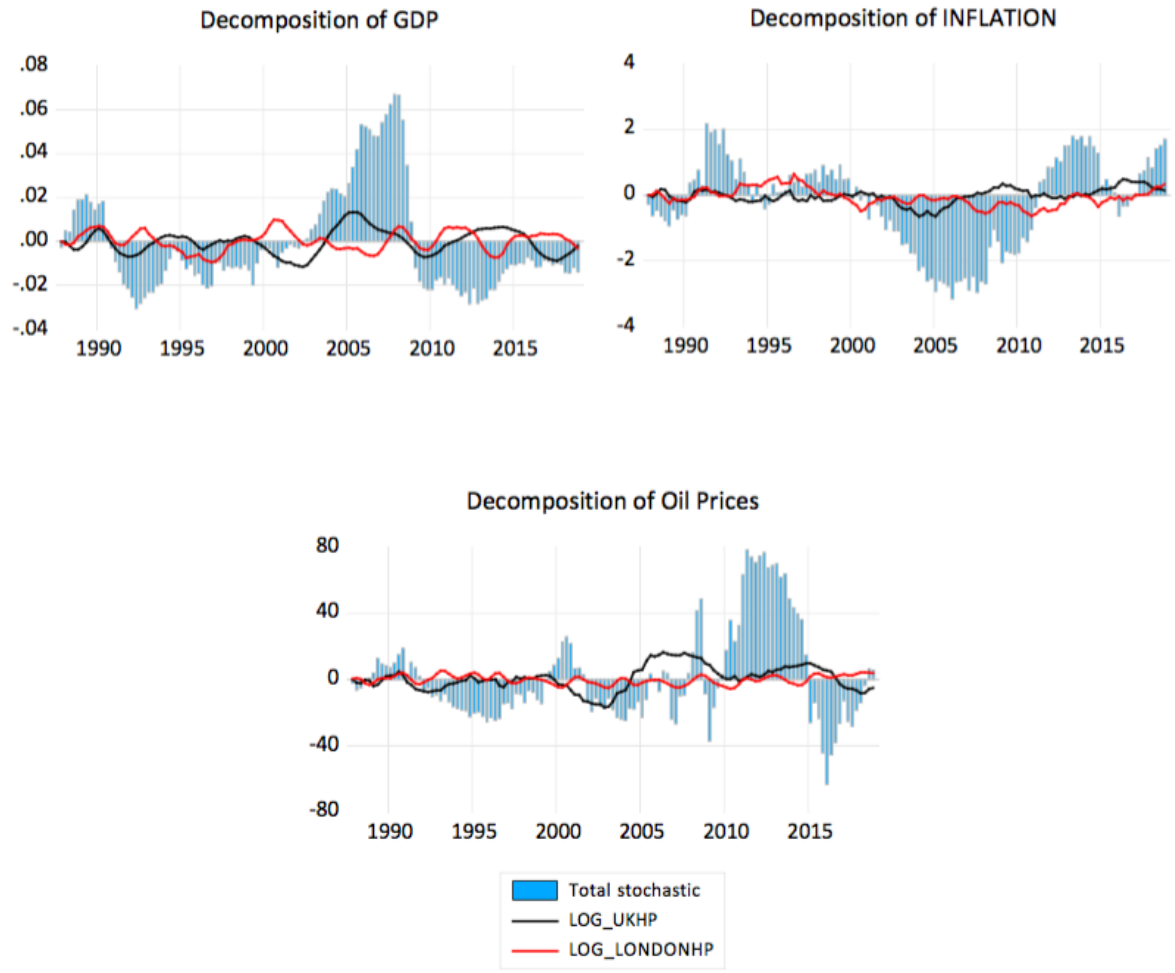
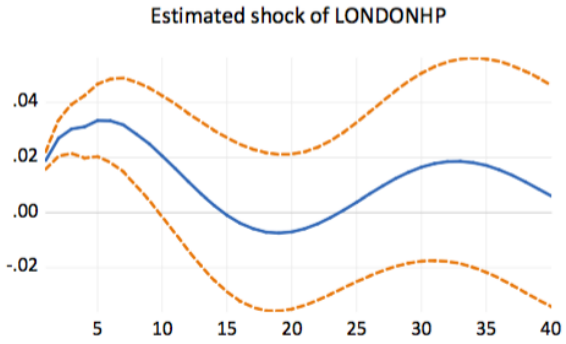


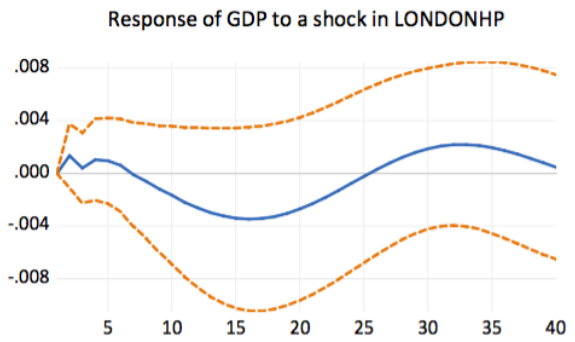
Figure 3: Historical Decompositions of GDP, Inflation and Oil Prices

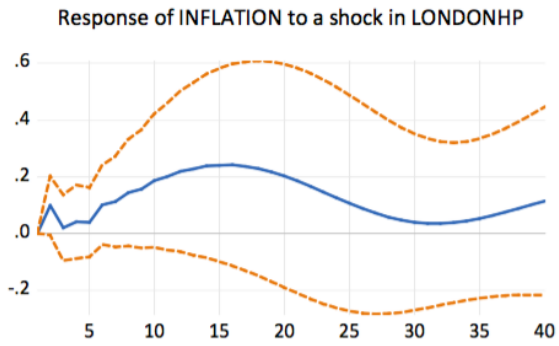


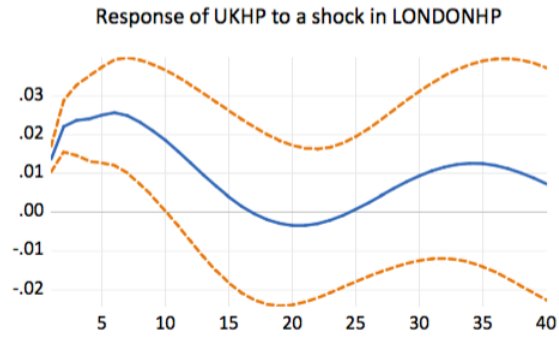
Appendix H – Subsample 1

Figure 1: Shock in the London Housing Market and estimated responses of GDP, Inflation, UK Housing Market and Uncertainty









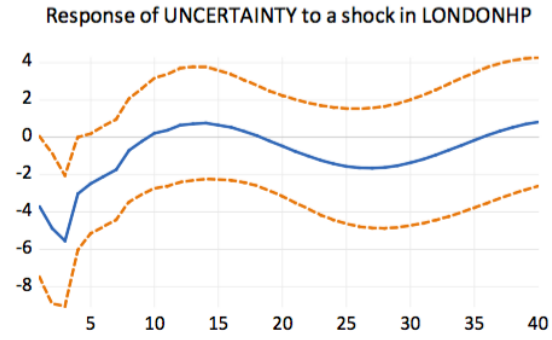
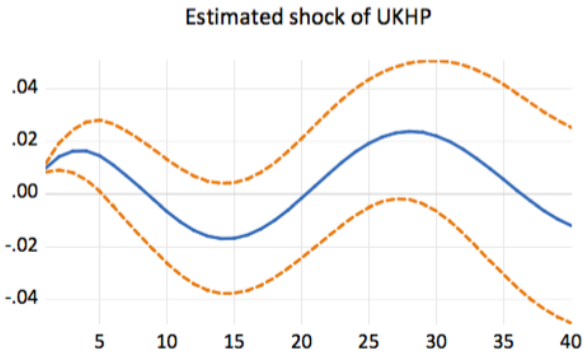
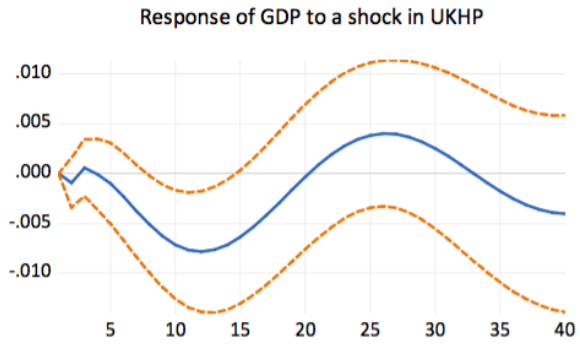
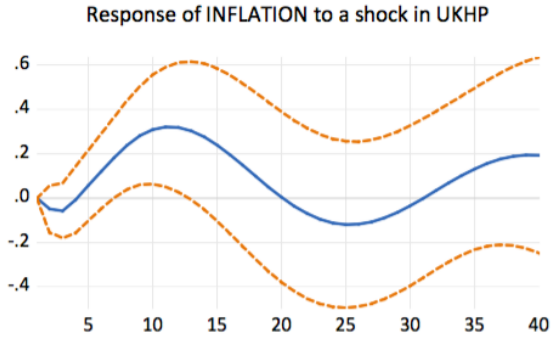
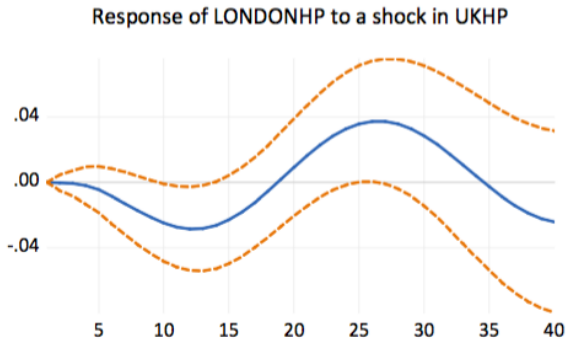


Figure 2: Shock in the UK Housing Market and estimated responses of GDP, Inflation, London Housing Market and Uncertainty









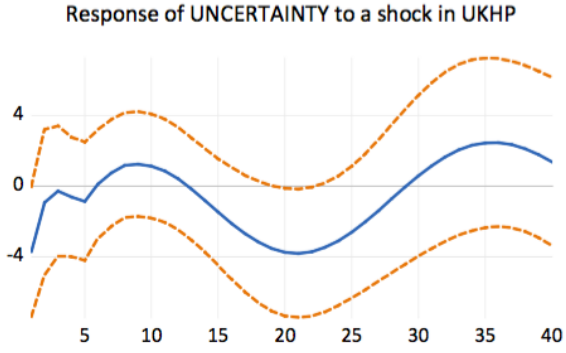
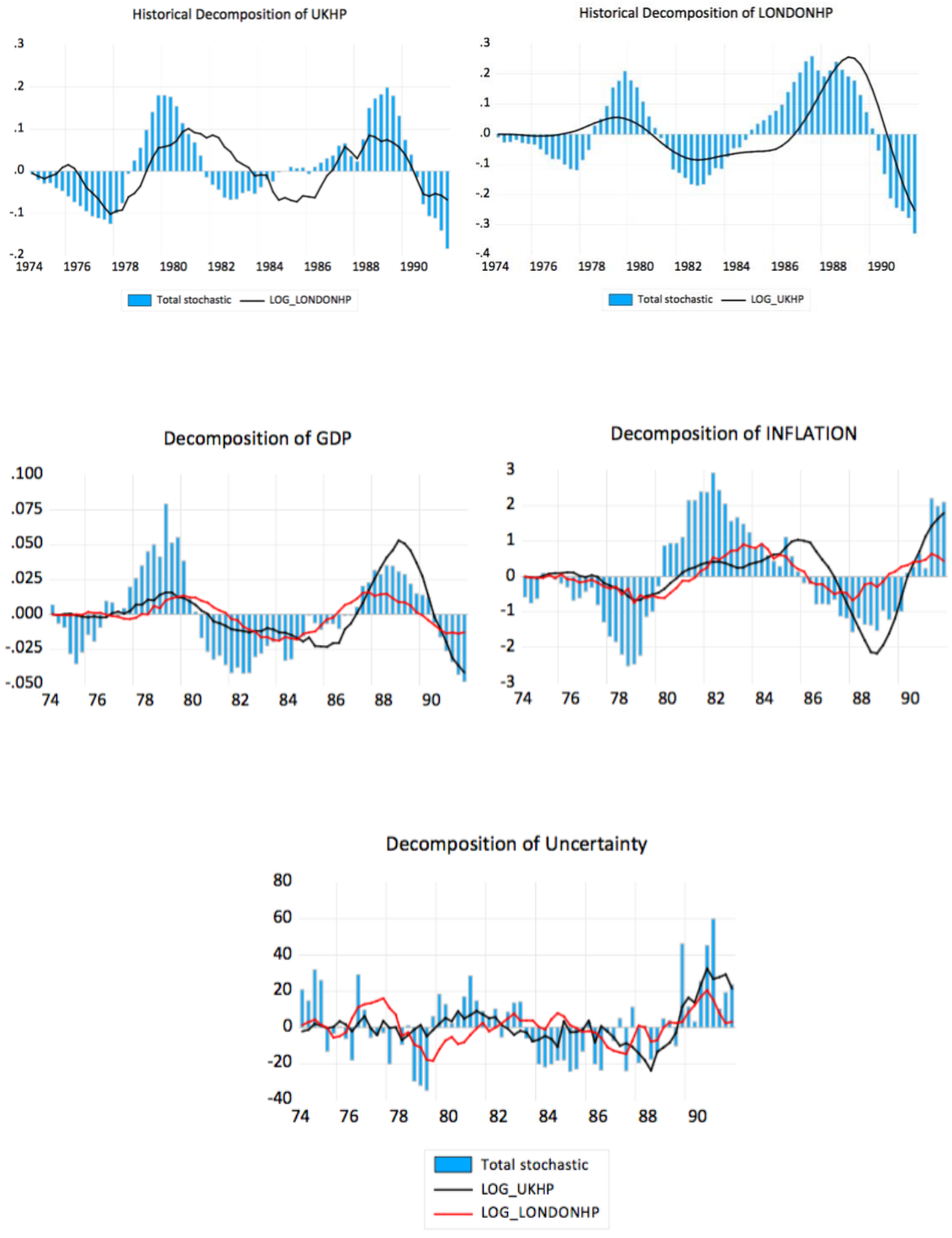
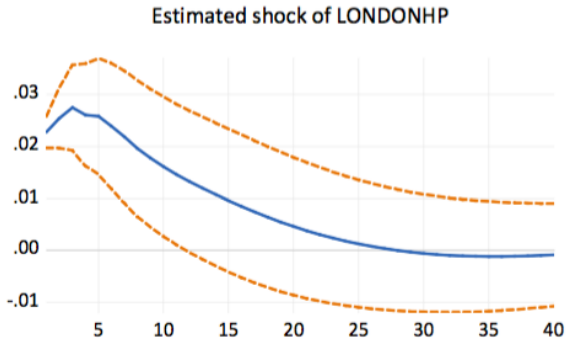


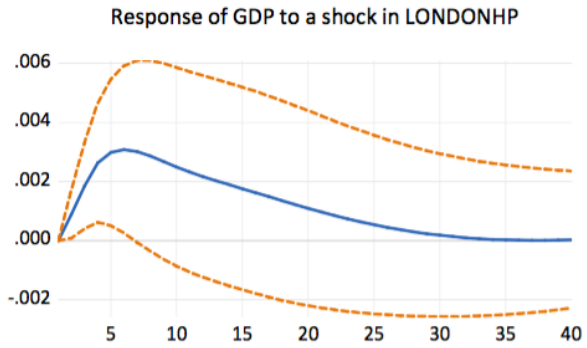
Figure 3: Historical Decompositions of GDP, Inflation, Uncertainty, London Housing Market, and UK Housing

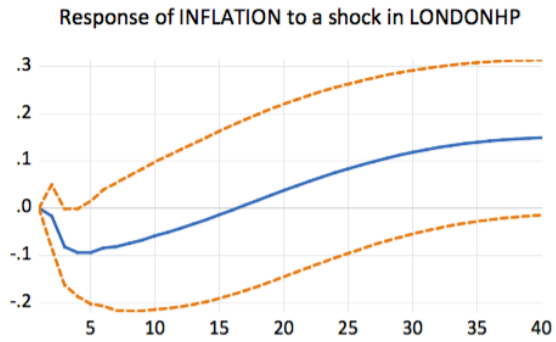


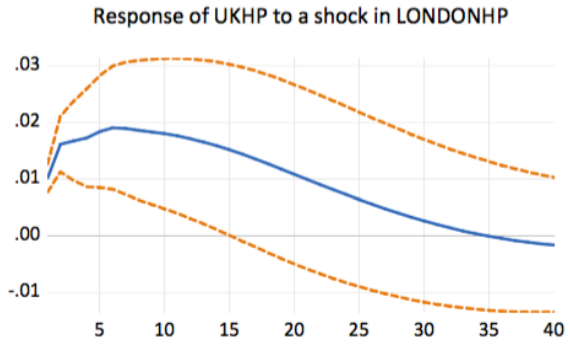
Appendix I – Subsample 2

Figure 1: Shock in the London Housing Market and estimated responses of GDP, Inflation, UK Housing Market and Uncertainty









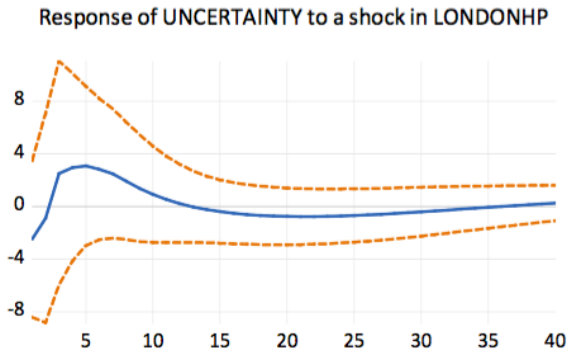
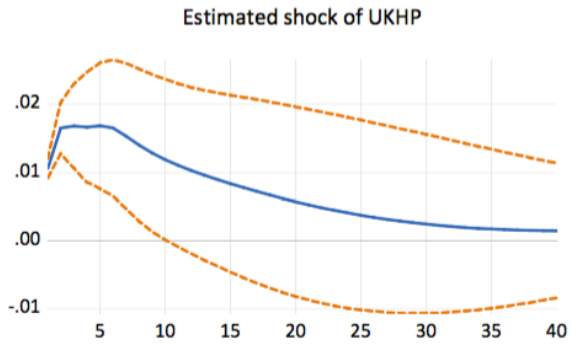
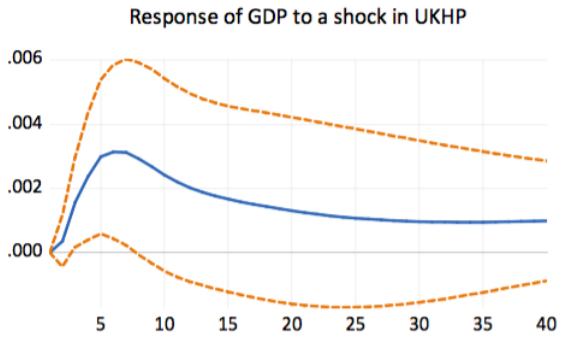
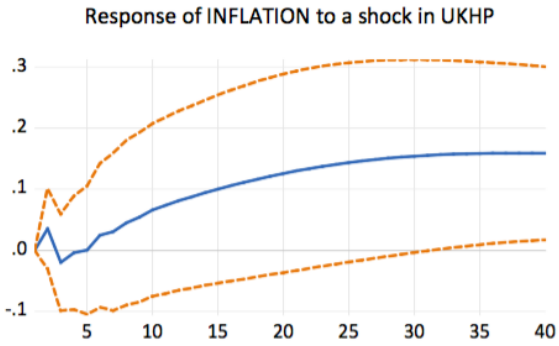
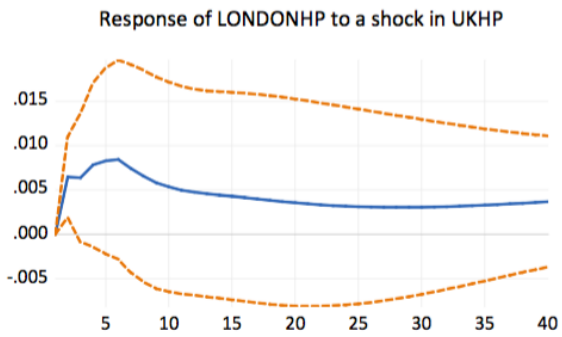


Figure 2: Shock in the UK Housing Market and estimated responses of GDP, Inflation, London Housing Market and Uncertainty









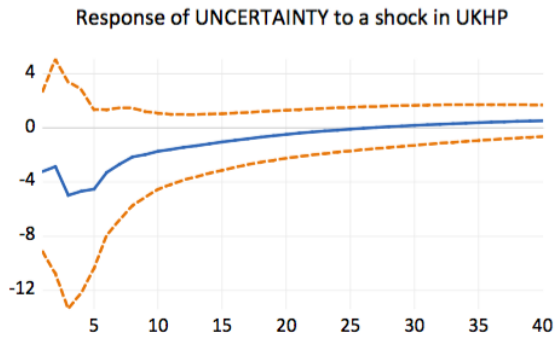
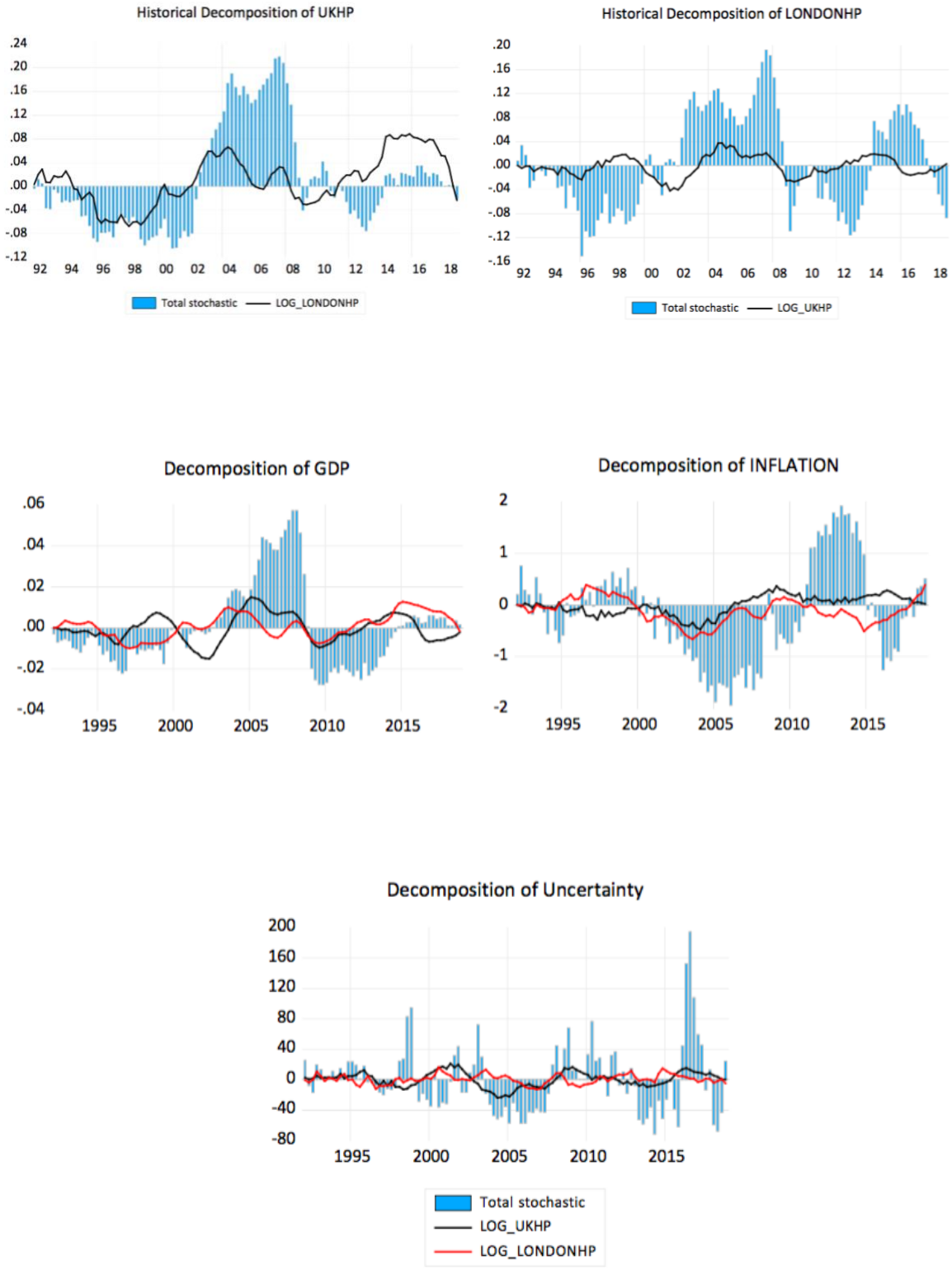


Figure 3: Historical Decompositions of GDP, Inflation, Uncertainty, London Housing Market, and UK Housing



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