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2014 Forecast Scenarios for UK Mortgage Arrears and Possessions

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1. Introduction

We have re-estimated our system of equations for rates of 6 and 12 month mortgage arrears and possessions on data up to the first quarter of 2014. The original model had run to the third quarter of 2009 (Aron and Muellbauer, 2010a, 2010b) and the previous update to the third quarter of 2011. Our forecasts of arrears and possessions to 2017 utilise a range of economic forecast scenarios based mainly on underlying forecast data from the *Office for Budget Responsibility (OBR)* but also from *Oxford Economics (OE)* for comparison. This reveals the sensitivity of mortgage possessions and arrears to different economic conditions, highlighting the potential risks faced by the UK and its mortgage lenders. Our models also throw light on the probable impact of policy measures.

There have been a number of data revisions which affect the estimates. The extra ten observations, together with the data revisions again resulted in more precise (and slightly larger) estimates of the effect of the unemployment rate on possessions. These new estimates are even more consistent with our work on regional data for England and Wales on court orders for mortgage possession, Aron and Muellbauer (2011a, 2011b). This slight change in the model means that the forecasts for future possession rates are a little more sensitive than before to differences in assumptions on the unemployment rate. An innovation in the model is to make use of a measure of credit availability in the mortgage market derived from the Bank of England's Bank Lending Survey.

On the base scenario taken from central forecasts made by the *Office for Budget Responsibility* in Spring 2012, the outlook for rates of possessions and arrears looked fairly flat in 2012 and drifted up a little in 2013 and 2014 with a larger rise forecast for 2015. The biggest differences between outcomes and this forecast scenario are that the unemployment rate has fallen faster than almost anyone envisaged; house prices have recovered more strongly than expected; the rise in interest rates pencilled in by most forecasters has been even further postponed into the future, while credit availability and hence refinancing possibilities have improved more than expected. However, the stock of mortgage debt grew far more slowly than forecast by the Office for Budget Responsibility.[1] Thus, outcomes for arrears and possessions since 2011Q3 have been substantially below the base scenario of the time.

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[1] The forecast was based on forecast growth of 8.8% from 2011Q3 to 2014Q1 in the stock of total household debt as the Office for Budget Responsibility did not then publish a separate forecast for the stock of mortgage debt. Actual growth of mortgage debt over the same period was 3.2% according to ONS data while total household debt grew at 2.6%. The Office for Budget Responsibility's forecasting error is doubly surprising since key drivers of mortgage debt - house prices, interest rates and unemployment – all moved in a surprisingly favourable direction for *higher* mortgage debt. Oxford Economics's forecast of 4.6% growth in mortgage debt from 2011Q3 to 2014Q1 proved far less inaccurate.

The Office for Budget Responsibility's forecasts for the mortgage rate assume that the average mortgage rate[2] on outstanding loans reaches a low of 2.9% in the first 9 months of 2015 despite a small rise in base rates around end of 2014/beginning of 2015. Mortgage rates then drift up gradually to 3.7% by the end of 2017. In contrast, the Oxford Economics forecasts see the mortgage rate remaining at a low of 3.2 until 2015Q1, rising to 3.9% in 2016Q1, and 4.7% by the end of 2017. Both forecasters anticipate steady declines in the unemployment rate but the unemployment rate at the end of 2017 is a little higher at 5.9% under the Oxford Economics forecast compared to 5.3% under the Office for Budget Responsibility scenario, while house prices rise more strongly by 22.4 % seen by Office for Budget Responsibility compared to Oxford Economics' 16.4% between 2014Q1 and the end of 2017. But the most dramatic contrast is in the assumed growth of mortgage debt: Office for Budget Responsibility assumes growth of mortgage debt from 2014Q1 to the end of 2017 of 27.6% while Oxford Economics forecasts 8.6%. Some of the differences in scenarios cancel out with debt service ratios and estimates of negative equity by the end of 2017 lower in the Oxford Economics scenario compared to the Office for Budget Responsibility's, but the Oxford Economics's unemployment rate and interest rates a little higher while house prices are lower. The result is that, under the Oxford Economics forecasts, arrears and possessions fall less sharply to 2015 or 2016, and then rise only moderately. Under the Office for Budget Responsibility's forecasts, the possession rate troughs in 2016 and then rises sharply, though still substantially below the 2013 rate and still only half the 2012 rate. Despite the different time profiles, the 2017 forecasts for the possessions and 6 months or over arrears rates for the Office for Budget Responsibility base scenario are a little below the Oxford Economics scenario, and for the 12 months or over arrears rate, a little higher.

The details of the forecast scenarios examined are discussed in section 3, following section 2, where the model revisions due to fine-tuning the model on the additional data are explained. In section 4, the forecast results are discussed, and section 5 concludes.

[2] These figures link Office for Budget Responsibility data with our own 2014Q1 data. In the case of the mortgage rate, we use FCA data on the average rate on outstanding mortgages which differs a little from Office for Budget Responsibility data.

2. Fine-tuning the model

2.1 Formulation of the arrears and possessions equations

The model was described in Aron and Muellbauer (2010 a, 2010b). The model is formulated in logs. There are three economic drivers: the debt-service ratio, the estimated fraction of households with negative equity and the unemployment rate. The estimate of negative equity is derived from a non-linear function of the overall debt-equity ratio, calibrated to fit snapshot estimates of the proportion of mortgages with negative equity. There are also two indicators which use mainly dummy variables to capture shifts in 'loan quality' and in 'forbearance policy'. 'Loan quality' captures hard to measure factors which push arrears and possessions in the same direction. These include quality of lending in previous years, the strength of income support for borrowers with payment difficulties and access to refinancing possibilities. 'Forbearance policy' captures shifts which reduce possessions but raise arrears because higher levels of arrears are tolerated before possession proceedings are carried through. The parameters of the dummy variables are estimated jointly as each indicator enters all three of the equations for arrears and possessions in the model system.

Small changes from the previously estimated equations result from data revisions[3], the addition of ten quarters of data and the use for the first time of data from the Bank Lending Survey to capture changing access to refinancing possibilities. The variables in the model are defined in Table 2, and the parameter estimates from the extended data set are given in Table 3 and Table 4. One result is a small increase in the estimated size and precision of the effect of unemployment on the possessions rate and also on the arrears rates. To compensate, the estimated effects on the rates of possession and arrears of the proportion of households with negative equity fall very slightly, though remaining highly significant.[4]

The estimated long-run contributions of the different variables to the log possession and 6-month arrears rates are shown in the Figures 3-6 in

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[3] One data revision results from a slightly different treatment than previously of the break in the CML data on defaults and on the count of mortgages between 2008Q4 and 2009Q1. From 2009Q1 the CML grossed up data from members to represent the whole first charge mortgage market and also removed 'legacy loans' which were on books of lenders but virtually paid off. The new assumptions slightly raise measured default rates up to 2008Q4 and so slightly lower the implied increase between 2008 and 2009. We have also added several more dummy variables for earlier data outliers to improve the model fit.

[4] The effect on the 6 month arrears rate, previously marginally significant, of the rate of growth of income over the previous two years, is now no longer significant and remains insignificant in the other two equations.

Appendix 1. For example, this makes clear the importance of the rise in the debt service ratio and in the deterioration of lending quality to the initial rise in the possessions rate in 1989-91, and of negative equity in preventing a more rapid fall thereafter. It also illustrates the importance of the fall in interest rates and hence of the debt service ratio in 2008-10 in preventing a more serious rise in mortgage default rates. The more limited rise in negative equity in this period compared with the early 1990s, indirectly due to the cut in interest rates, also contributed to the rise in mortgage defaults in the recent crisis being far less serious than in the early 1990s.

2.2 Changes in the extended loan quality and forbearance policy functions

The most important remaining shifts in the model are changes in the 'loan quality' function.

The 'loan quality' function, as previously discussed, captures hard to measure factors which shift arrears and possessions in the same direction. Most obviously, this would be more risky lending in the previous one to four or so years, which would drive up current rates of arrears and possessions. But the 'loan quality' function also captures two additional effects. The first of these is from another aspect of policy: the improved income support for those with mortgage payment difficulties serves to enhance apparent lending quality, and hence reduce both arrears and possessions below what they would have been. The second effect is through improved refinancing opportunities. These could arise as a matter of policy, for example if banks allow borrowers with payment difficulties to extend their loan terms (rescheduling the debt), or to wrap arrears up in a larger mortgage. This would reduce both possessions and recorded arrears. The Financial Stability Report (December 2011) of the Bank of England gives an estimate, discussed further below, of how much higher arrears might have been without this kind of help for borrowers.

Variations in refinancing opportunities can also arise in the course of market movements in mortgage credit availability. For example, it is likely that the worsening underlying quality of lending in the 2005-2007 period was initially offset or even more than offset by the ease with which borrowers under pressure were able to refinance, to temporarily escape from payment difficulties. As before, we find evidence consistent with this interpretation of a small reduction in arrears in 2005-2007, before the credit crunch beginning in the second half of 2007 reduced these refinancing opportunities.

In the short-term, refinancing appears to improve loan quality – both arrears and possessions fall as a result of rescheduling or absorbing the arrears into a larger mortgage. But borrower risk remains and may be worsened though a larger debt obligation and over a longer period (unless this is countered by concomitant debt forgiveness/write-offs). Thus in the *long-term*, such refinancing could worsen loan quality, and both arrears and possessions might be expected to rise.

In 2007Q2, the Bank of England followed the example of other central banks[5] in introducing a bank lending survey. One of the questions is: "How has the availability of secured credit provided to households changed in the past three months?" Cumulating these changes in mortgage credit availability gives the index of the level of mortgage credit availability shown in Figure 1. This index is strongly significant in the 'loan quality' function. The index shows a collapse in 2007Q4 and beyond. This followed the drying up in August 2007 of bank funding from the money markets and the Northern Rock bank run in September 2007, and credit availability reached its low in 2009Q1 in the depth of the global financial crisis. There is then a sluggish recovery, and from 2012Q3, after the July 2012 announcement of the Funding for Lending Scheme by the Treasury and the Bank of England, a much more rapid recovery.

The rise in the last data point, 2014Q2, probably does not reflect the April 26th Mortgage Market Review by the Financial Conduct Authority which considerably tightened lending criteria on new loans by requiring more careful screening by banks of the ability of households to service debt. And though the June 2014 precautionary measures announced by the Bank of England to reduce risks in the debt and housing markets were modest – welcomed by rises in share prices of the house builders and mortgage lenders- it seems hard to believe that there can be much further near-term upside in mortgage credit availability. We have therefore assumed in our forecast scenarios to 2017 that the 2014Q1 level of the index of mortgage credit availability remains constant.

With this new variable, the estimated 'loan quality' function remains very similar to that previously estimated up to 2011Q3. However, the subsequent rise in credit availability results in a substantial improvement (fall) in the estimated 'loan quality' function, compared to the base scenario which we assumed in early 2012 at the time of the last update. Figure 2 plots the estimated 'loan quality' and 'forbearance policy' functions.

The 'forbearance policy' function changes very little on the revised and extended data. As noted above, the forbearance policy function captures shifts in policy which reduce possessions but increase arrears. Most dramatically, such a shift in policy occurred at the end of 1991, with effect from 1992Q1, and in 2008Q4. Increased forbearance after the end of 1991 was reversed over two years in 1997 and 1998, following evidence of reduced public concern seen in the tighter Income Support for Mortgage Interest (ISMI) conditions imposed from 1995. In 2005-6, possessions rose while arrears fell in this period in a way that cannot be explained in conventional economic terms. This apparently reduced forbearance is consistent with a higher proportion of loans accounted for by a tough new type of lender, more willing

[5] The US Federal Reserve introduced its survey in 1966, including the mortgage market from 1990; and the ECB in 2002.

to take on riskier borrowers, but quicker to resort to the law when payment problems arose.[6]

2.2.1 Interpreting the estimated loan quality function

The first sign of deteriorating lending quality in the latter 1980s was apparent in a rise in the LQ function in 1986-7, exacerbated in 1989, and peaking in 1990Q4, as revealed in Figure 2. It seems likely that easy credit in 1986-7 may have initially masked a decline in underlying loan quality, and that the peak in LQ from 1990Q4 is also reflecting reduced access to credit. By 1994-6, the higher lending standards resulting from more cautious behaviour by lenders following the mortgage default crisis result in lower default rates and a decline in the LQ function. In 1997-8, the LQ function rises again, which we interpret as due to the tightening of rules on ISMI announced in 1995 (reduced state support). There is then a period of stability in the LQ function. Stability does not necessarily mean that the quality of lending, strictly conceived, was constant. Stability can also result if increased access to refinancing opportunities roughly balances a deterioration in underlying lending quality. The LQ function exhibits a small fall in 2005-6 suggesting that, at that time, easier refinancing opportunities more than offset a deterioration in underlying lending quality. A pronounced increase in defaults from 2007Q3, reflects both the earlier lax lending standards, the sharp reduction of refinancing opportunities and perhaps worsened longer-term risk through the spate of past refinancing. The LQ function then worsens sharply to a peak in 2009Q1, reflecting both the riskiness of many mortgage loans granted in previous years and the short-term evaporation of refinancing opportunities in the credit crunch.

However, from 2009Q2 it appears that the improvement in government income support had a dramatic effect on both arrears and possessions: LQ falls sharply. In 2009Q4 and 2010Q3 there appear to be small reversals. The 2010Q3 rise probably reflects the reduction (announced in June 2010) in the standard rate of interest used to calculate the SMI payments.

From 2010Q4 to 2012Q3 there is a slight drift down in LQ as mortgage credit availability slowly increases and after 2012Q3 a much sharper fall after the Funding for Lending Scheme improves credit availability, see Figure 2.

2.2.2 Interpreting the estimated forbearance policy shift function

A sharp change in policy in December 1991 is seen in the pronounced fall in the PS function in 1992Q1, reflecting greater forbearance. In 1997-8, the withdrawal of this forbearance and resumption of 'normal' practice is confirmed by the data. The PS function rises in 2005-6, which we interpret in

[6] The freely estimated size of this effect is a little larger than the corresponding shift in 1997-8. We can accept the hypothesis that the effect has the same magnitude as the 1997-8 shift and prefer to impose this restriction.

terms of a shift in the composition of mortgage lending at this time; evidence suggests there was an increase in the proportion of lenders ("centralised mortgage lenders") extending riskier loans but quicker to resort to the courts when default problems arose. In 2008Q4, the PS function again fell sharply, representing newly-reinforced forbearance, mainly through the Mortgage Pre-Action Protocol which came into force in November 2008, see Atkinson (2009) and Stephens (2009). Some of the shift in 2008 would have been temporary in nature since the revised mortgage code of practice delayed some possessions actions. Experimentation with lags in the 2008Q4 step dummy, suggests the PS function is then flat for a few quarters, presumably because the increased application of the protocol roughly balanced the partial reversal to be expected as previously delayed possessions proceedings were enacted.

In 2009Q3 and in 2010Q2, the PS function rises as more of the delayed possessions proceedings came through. In 2010Q4, however, there is a renewed fall in the PS function and increased forbearance, which we associate with new FSA rules on mortgage providers. Again, one should expect a partial reversal, since part of the effect of new rules is to delay default proceedings, and in 2011Q1, there is indeed such a partial reversal. There is no evidence of significant changes in the PS function beyond this point so the estimated PS function in Figure 2 is flat from this point onwards..

It is important to note that the 'forbearance policy shift' indicator in our model measures forbearance which reduces possessions by tolerating higher levels of arrears. It is identified by its negative effect on the possessions rate simultaneously with its positive effect on arrears rates. As previously mentioned, another kind of forbearance involves a longer lasting refinancing, where, for example, existing arrears are rolled up in additional debt and/or the term for repayment is extended, so reducing monthly payments. However, this type of forbearance is similar to the refinancing of debt when mortgage credit is easily available, and when borrowers can raise cash to overcome current payment difficulties by taking on further debt. This reduces both possessions and arrears in the short run, but probably worsens both in the long run, and so is covered by our 'loan quality' indicator, see discussion above. The Financial Stability Report of the Bank of England in December 2011suggests that the magnitude of this type of forbearance is substantial:

"The FSA forbearance review carried out for the FPC covered three quarters of UK mortgages. It suggests that 5–8 percent of mortgages are subject to forbearance, depending on the definition applied. FSA estimates indicate that around 5 percent of these households would have been in arrears of six or more months if they had not received forbearance. That suggests that, in the absence of forbearance, the mortgage arrears rate might have been 0.5 percentage points higher at 1.7 percent, even at near-zero official interest rates".

This review appears to refer to early 2011. If these estimates are correct, the arrears rate would be almost 30 percent lower (i.e. 0.5 percent divided by 1.7 percent) than it otherwise would have been.

It is possible to make an estimate of the impact on possessions of this type of forbearance. We use the above assumption of the 30 percent counterfactual fall in the arrears rate, and apply the coefficients on the LQ function in our model. In our model, the impact of the LQ function on the 6-month arrears rate is 1.30 of the size of its impact on the rate of possessions. This implies that the possessions rate would then have been about 23 percent lower (1/1.30 multiplied by 30 percent) than it would have been otherwise.[7] If this were counted as a benefit of policy, as opposed to something mortgage lenders would anyway have done, the total effects of policy intervention on possessions would necessarily be substantially in excess of 23 percent since the benefits of more generous SMI rules as well as of the Mortgage Pre-Action Protocol would have to be included to measure the total impact of policy shifts on possessions rates. However, it does seem plausible that some of the forbearance on refinancing estimated by the FSA would have been instituted by lenders even in the absence of government suasion.

It is not possible to make a strict calculation of the total impact of policy from our estimates. This is because, as emphasised above, our 'loan quality' indicator includes some of the effects of government policy in supporting borrowers in difficulties (e.g. the effects of improvements in SMI and forbearance in the form of recapitalisation). It also includes the effect of the Funding for Lending Scheme on credit availability which affects the 'loan quality' indicator. Our 'forbearance policy' indicator is for a narrower definition of forbearance that excludes the consequences of refinancing and recapitalisation. Nevertheless, some insights are suggested into the impact of policy. Data on mortgage possessions rates by vintage of origination would be needed to separate strict loan quality from the above policy factors encapsulated in the LQ function.

Our model suggests that between 2008Q3 (i.e. before forbearance policy shifted, see Table 1) and 2011Q2, our 'forbearance policy shift' indicator fell by 14 percent[8]. This implies a lowering of the possessions rate by around 14 percent (since the coefficient is normalised at 1 in the possessions equation). The corresponding rise implied in the 6-month arrears rate over the same period is 24 percent (the coefficient of the PS function in the arrears equations is about 1.70). Taking 2009Q1, as a benchmark (i.e. just before loan quality improved, see Table 1), our 'loan quality' function, implies a lowering of the possessions rate of 18 percent and of the 6-month arrears rate by 23 percent (18 percent times the coefficient of 1.3 of LQ in the arrears equation) by 2010Q3 because it falls ('loan quality' improves) by 18 percent over this period. Measured from 2009Q1 to 2012Q2, just before the Funding for

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[7] In our discussion of 'percentage effects' we assume that a change of x in the log possessions or log arrears rate is a 100x percentage change. This is a good approximation for small changes but less good for larger changes. For example, a 0.3 change in the log possessions rate actually corresponds to a percentage change of 35%.

[8] This revises up our previous estimate of 11%, mainly due to the revised treatment of the break in CML data in 2009Q1.

Lending Scheme began, the LQ function fell by 0.22, implying a 22 percent fall in the possessions rate and a 25 percent fall in the 6-month arrears rate.

The fall of 14 percent in the LQ indicator between 2009Q1 and 2010Q3 probably understates the effects of policy action in the form of income support and refinancing since it is likely that without such action the LQ indicator would have continued to deteriorate in 2009. In other words, the fall of 14 percent in the LQ indicator between 2009Q1 and 2011Q3 reflects the net effect of a deterioration due, for example, to tighter credit conditions and risky lending in previous years, and an improvement due to policy interventions. This suggests that the total impact of policy – not including the cuts in the base rate- on the possessions rate, including the 14 percent fall implied by our forbearance function, is likely to have exceeded 32 percent (14 percent plus *at least* 18 percent). This conclusion is reinforced by the subsequent decline in the LQ function, which owes much to the policy intervention in the form of the Funding for Lending Scheme.

We can be fairly confident that a medium term reduction of 14 percent in possessions accompanied by a 22 percent rise in 6+month arrears is the best estimate of the medium term effect of the Mortgage Pre-Action Protocol (and possibly of associated greater forbearance exercised by partly state-owned banks). This 14 percent figure is after the temporary reductions in possessions and increases in arrears caused by the slow-down in court procedures associated with the protocol have passed. The different type of forbearance discussed by the FSA is of the kind which reduces measured arrears (and possessions) by refinancing mortgage debt (or conceivably by writing off part of debt). As noted above, this is harder to disentangle from other causes such as income support for mortgage borrowers and possible changes in mortgage credit availability, which affect refinancing voluntarily offered by mortgage lenders.

Given the substantial impact of policy interventions, it follows that withdrawal of such policy support would cause a serious deterioration in mortgage defaults unless offset by remarkably benign economic circumstances. Below we discuss forecasts in several hypothetical economic scenarios.

3. The forecast scenarios

Forecasts are given for 2014Q2 to 2017Q4 of total and voluntary mortgage possessions, arrears (≥6 months) and arrears (≥12 months), based on different economic scenarios. These forecasts were generated using the model described in Aron and Muellbauer (2010a, 2010b), with changes as discussed above. The data and assumptions underlying the forecasts are explained in section 3.1, with reference to Appendix 2.

Five contrasting scenarios are described in section 3.2. The first is of the scenario implied by the Oxford Economics forecasts of underlying variables including interest rates, unemployment rates, inflation, house prices, disposable income, and the mortgage stock made in Spring 2014. The second is the Office for Budget Responsibility base scenario and the last three are variations the Office for Budget Responsibility base forecasts. The varying scenarios illustrate possible risk factors in the outlook for arrears and possessions.

3.1 Forecast data

Assumptions are given for the variables taken as exogenous: unemployment rates, mortgage debt, interest rates (and hence debt service ratios), house prices (and hence debt to equity ratios), and household income. The forecast data underlying the exogenous variables are taken from two sources: *Oxford Economics* and the *Office for Budget Responsibility*. For the former, the data for 2014Q1 to 2017Q4 are given in Table A, Appendix 2. For the latter[9], see Table B, Appendix 2. Growth rates from the forecast data are constructed for population, house prices, income, and household mortgage debt and applied to the 2014Q1 levels of these variables in our model to construct the future paths. For the unemployment rate and the mortgage rate, quarterly changes from the forecast data are constructed and applied to the 2004Q1 levels in our data base.[10] The contribution of the forecast exogenous variables to the log possessions and 6-month arrears rates are graphed in Appendix 1.

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[9] The website is: http://budgetresponsibility.independent.gov.uk/category/publications/

[10] The reason for this procedure is that there can be slight differences between the 2014Q1 values in our data base and values in the Oxford Economics and Office for Budget Responsibility data bases. For example, our mortgage interest rate, taken from FCA data differs very slightly from Oxford Economics and Office for Budget Responsibility data sources.

3.2 Assumptions underlying the five scenarios

Scenario 1 and *Scenario 2* are the base scenarios using Oxford Economics and Office for Budget Responsibility assumptions, respectively. *Scenarios 3* to *5* are variations around the base Office for Budget Responsibility scenario. *Scenario 3* is a variant with higher growth and higher interest rates. Here the unemployment rate falls relative to base, reaching 0.5% lower by 2017Q1, but mortgage rates begin to rise more quickly than base reaching a level that is 1.8% higher than base by 2016Q2 and remaining there. Quarterly income growth is 0.5% higher than base, so 2% per annum higher per annum. House price growth is initially 0.5% per quarter higher but in 2015 this fades to 0.25% under the impact of higher interest rates, falling to zero in 2017. The growth rate of mortgage debt is 0.5% lower per quarter throughout than the Office for Budget Responsibility base scenario, whose debt projections look very high and whose debt forecasting record in 2012 was not good as noted above.

Scenario 4 is a variant with lower growth and higher interest rates, perhaps the result of a change in the international interest rate environment or because of higher domestic inflation. Here the unemployment rate rises relative to base and ends 1.2% higher than base from 2016Q4, though still slightly below the 2014Q1 rate at the end of 2017. The mortgage interest rate starts rising in 2014Q3 and is 1 percentage point higher than the base forecast by 2015Q2and 1.8 percentage points higher from 2015Q2. Income growth is 0.2% per quarter lower from 2014Q3 to 2016Q2 and subsequently 0.3% lower, and house price growth 0.75% per quarter lower than base, while the growth of the mortgage stock is 1.25% per quarter below base. On these assumptions, there is growth of only 0.8% of real per capita income between 2015Q2 and 2016Q4.

Scenario 5 is a variant with lower growth and lower interest rates, with the mortgage rate 0.5% below base by 2017Q4. However, as the Office for Budget Responsibility base scenario sees the mortgage rate declining from the 2014Q1 level to a low in 2015Q1 and remaining at this low for all of 2015, it seems hard to believe that the mortgage rate could go lower still in this period. We therefore assume that the mortgage rate is the same as in the base scenario until 2016Q1 and then rises less than under the base scenario. In this scenario, the unemployment rate is 0.6% higher than base by 2017Q1. Income growth is initially 0.1% per quarter lower than base and 0.2% per quarter lower from 2016Q2. These assumptions mean that annual real per capita income growth still remains positive throughout. With the same interest rates as base until 2016Q1 but weaker growth, we assume that house price growth is modestly lower than base by 0.25% per quarter until 2016Q1, is then the same as base until 2017Q1 and then is higher than base by 0.25% per quarter under the impact of lower interest rates. The growth in the mortgage stock growth is assumed to be modestly lower than under the Office for Budget Responsibility base scenario from 2014Q3 by 0.25% per quarter.

4. Forecast results

Graphical forecasts of the logs of rates of possessions, arrears (≥6 months) and arrears (≥12 months), for each of five scenarios, for 2014Q2 to 2017Q4, are shown in Appendix 3. The forecasts of the numbers of properties taken into possession in the period, and of the numbers of household with loans in arrears (≥12 months and ≥6 months) are given in Appendix 4. Appendix 5 provides annual summaries of the data from Appendix 4.

In *Scenario 1*, the base scenario form Oxford Economics, the mortgage rate troughs at 3.3% (on the FCA measure) between 2014Q2 and 2015Q1. It then rises gradually to reach 4.8% at the end of 2017. Nominal income growth averages at an annual rate of 4.7%, around 3.9% on a per capita basis while the unemployment rate declines to 5.9% by 2017Q4. House prices rise by 16.4% from 2014Q1 to 2017Q4 while the mortgage stock rises 8.6% over the same period. Under these assumptions, the number of quarterly possessions cases continues to fall quite sharply from 6400 in 2014Q1 to 4800 in 2015Q1, just before the election, to 4200 in 2016Q1 and rises gently from 2016Q2 to 2017Q4 to 4500. The number of cases 12 months or more in arrears continues to fall quite strongly from 38,800 in 2014Q1 to 26,000 in 2015Q1 and troughs at 19,800 in 2016Q1, rising gently to 21,300 in 2017Q2 to 2017Q4. The number of cases 6 months or more in arrears, also continues a rapid fall from 95,200 in 2014Q1 to 74,500 in 2015Q1, troughs at 62,300 in 2016Q1, and then rises to 69,800 in 2017Q4.

In *Scenario 2*, the Office for Budget Responsibility base scenario, the mortgage rate troughs at 2.9% (on the FCA measure) between 2015Q1 and 2015Q3. It then rises gradually to reach 3.7% at the end of 2017. Nominal income growth averages at an annual rate of 4.3%, around 3.5% on a per capita basis. House prices rise by 22.4% from 2014Q1 to 2017Q4 while the mortgage stock rises 27.6% over the same period. Under these assumptions, the number of quarterly possessions cases continues to fall quite sharply from 6400 in 2014Q1 to 3400 in 2015Q4, bottoming later and lower than under the Oxford Economics forecast. It then rises to 4700 by 2017Q4, a higher level than the 4500 cases under the Oxford Economics base scenario. The number of cases 12 months or more in arrears continues to fall quite strongly from 38,800 in 2014Q1 to 26,200 in 2015Q1 and troughs at 19,000 in 2016Q2, below the level under the Oxford Economics base scenario. It then rises more strongly to 22,400 in 2017Q4 compared with 21,300 under the Oxford Economics base scenario. The number of cases 6 months or more in arrears, also continues a rapid fall from 95,200 in 2014Q1 to 73,500 in 2015Q1, troughs at 55,800, lower than under the Oxford Economics base forecast, in 2016Q2, and then rises to 63,300 in 2017Q4. This is lower than the 69,800 forecast under the Oxford Economics base scenario, but on course to overtake the Oxford Economics projected figure in the second quarter of 2018.

The reason for these contrasts between outcomes under the Oxford Economics and Office for Budget Responsibility base scenarios is that initially, higher house price growth, lower mortgage rates and larger falls in unemployment under the Office for Budget Responsibility scenario overwhelm the more rapid growth of mortgage debt. Eventually, however, even with a lower mortgage interest rate, the dramatically higher level of mortgage debt implies a greater debt service ratio and ultimately higher levels of negative equity. These drive the more rapid rise in mortgage defaults from lower lows than under the Oxford Economics base scenario, to ultimately higher levels.

Scenario 3 is a higher growth, higher interest rate variant of the Office for Budget Responsibility base projections. The number of possessions cases begins to exceed those in the base scenario in 2014Q4. By 2016Q1, the number of possessions is 4800 compared to 3700 under the Office for Budget Responsibility base, and by 2017Q4 is 5500 compared to 4700 under the Office for Budget Responsibility base. This illustrates the sensitivity of possessions to higher interest rates despite somewhat lower unemployment, substantially higher income growth, somewhat higher house prices and lower mortgage debt, and hence lower negative equity.

The count of arrears case of 12 months or more is initially below that in the Office for Budget Responsibility base scenario, but begins to exceed the base by 2015Q4, but eventually drawing roughly level in 2017Q4. For arrears cases of 6 months or more, the count exceeds the base from 2015Q2, ending in 2017Q4 at 74,200 compared with 63,300 under the Office for Budget Responsibility base projection, though for both measures of arrears, the 2017Q4 figures are still substantially below the 2014Q1 levels.

Scenario 4 is one in which growth is lower and interest rates higher. From 2014Q3 onwards, the possessions count, not surprisingly, is higher than under the base, reaching 7400 per quarter in 2017Q4 compared with 4700 under the Office for Budget Responsibility base projection and exceeding the 2014Q1 level. The same is true of both arrears counts: the 12-month arrears count reaches 31,100 by 2017Q4 compared with 22,400 under the Office for Budget Responsibility base projection, though still lower than the 2014Q1 level; the 6-month arrears count reaches 98,100 in 2017Q4 compared with 63,300 under the Office for Budget Responsibility base, and then exceeds the 2014Q1 level. With weaker house prices and income growth, and higher unemployment and interest rates, only the weaker growth of mortgage debt prevents possessions and arrears counts going even higher.

Scenario 5 is a combination of lower growth and lower interest rates than the Office for Budget Responsibility base, though interest rate are assumed to deviate below the Office for Budget Responsibility forecasts only from June 2016. Lower house price and mortgage debt growth roughly offset each other, though higher unemployment and lower income growth cause arrears counts to rise relative to base from 2015Q1. However, by 2017, the impact of lower interest rates brings the possessions and both arrears counts below the levels implied by the Office for Budget Responsibility base scenario.

The annual summary of the possessions counts added up over each calendar year and the end of year arrears levels shown in Appendix 5 provide a convenient overview of the comparisons between the five scenarios.

5. Evaluation of past forecasting performance

We noted in the introduction that forecasts made with the previous version of this model estimated up to 2011Q3 proved too pessimistic, even with the less inaccurate forecasts of fundamentals from the Oxford Economics central scenario of spring 2012. In principle, this could be due to forecast errors in the economic fundamentals, data revisions, model mis-specification and parameter estimation errors. A detailed investigation suggested that 90 percent or more of the overshoot in defaults forecast in 2012Q1 up to 2014Q1, using the model estimated up to 2011Q3, was due to forecast errors in the economic fundamentals. We also carried out a replication of what forecasts made at the end of 2012 and of 2013 would have suggested for the period up to 2014Q1. The forecast errors, not surprisingly, rise with a longer forecast horizon: forecast possessions are around 16% higher than actuals in 2014Q1; 12-month arrears are around 18% higher and 6-month arrears around 14% higher. Once again, most of the forecast errors are the result of too pessimistic forecasts of the economic fundamentals

6. Conclusions

We have re-estimated our system of equations for rates of 6 and 12 month mortgage arrears and possessions on data up to the first quarter of 2014, and forecast to the end of 2017. The structure and the parameter estimates of our system of equations remain much as before, though the impact of unemployment on the possessions rate is slightly higher and more precisely estimated for the revised and updated data. As discussed above, the opportunity was taken to improve the estimates of the 'loan quality' indicator by introducing a measure of mortgage credit availability from the Bank of England's Bank Lending Survey.

It is not possible to identify completely the impact of the mix of policies applied to reducing mortgage defaults given that the previously lax lending standards and the tightening of credit have also affected outcomes. Nevertheless, it is likely that the combined impact of policy-forbearance through the Mortgage Pre-Action Protocol and increased generosity of SMI, but excluding the effects of lower interest rates- reduced the possessions rate by *at least* 32 percent by 2011Q3 compared to what it otherwise would have been (details in section 2.2). As before, the different scenarios and the decomposition of possessions and arrears rates into the main economic drivers, highlight the importance of the debt service ratio and of negative equity for default outcomes, with the unemployment rate playing a significant but still less quantitatively important role than the other two drivers.

As far as the short-term outlook from 2014Q1 for possessions is concerned, both base scenarios – from Oxford Economics and the Office for Budget Responsibility- suggest a continuation of the rapid fall in numbers of possessions. The model implies that there are significant lags in the transmission of falling unemployment, rising house prices, a slightly lower mortgage rate and increased mortgage credit availability into possessions and arrears counts. Both Oxford Economics and Office for Budget Responsibility take the view that rises in the Bank of England base rate will be only slowly and not fully translated into higher mortgage rates. This is partly due to the fact that many recent mortgages are at short-term fixed rates and also the view that mortgage lenders will tolerate smaller spreads between funding costs and mortgage rates given their more confident market outlook. This is key to the bullish nature of the forecasts, which see considerable delay before mortgage defaults start rising again under the impact of higher interest rates and higher debt. Under both base scenarios, mortgage defaults will still be considerably lower than the 2014Q1 levels by the end of 2017.

The Office for Budget Responsibility forecast of a rise in the mortgage stock of 27.6% from 2014Q1 to 2017Q4 is scarcely credible. Previous research on the determination of the UK mortgage stock, see Fernandez-Corugedo and Muellbauer (2006) confirmed earlier findings of a quarterly speed of adjustment of the order of 6%. This makes sense given the 25-year or longer horizons of most mortgage contracts and means that even large

improvements in the fundamentals would take considerable time to feed through into the stock. Secondly, the forecast rise in the mortgage rate is a negative for the long-run mortgage stock with an elasticity of around -0.4. This means that a rise in the mortgage interest rate from 3 to 4 percent would *reduce* the long-run mortgage stock by around 13 percent, other things being equal. Thirdly, another negative is unfavourable demography with the fall in the proportion of under 40s in the population. On the positive side, rising income, falling unemployment, increased credit availability and the rise in the housing wealth to income ratio provide some uplift. According to the estimate in Fernandez-Corugedo and Muellbauer (2006), the elasticity of the mortgage stock to the housing wealth to income ratio is of the order of 0.3. This implies an only moderate transmission of higher house prices into a higher mortgage stock. Back of the envelope calculations suggest that the Oxford Economics forecast of a rise in the mortgage stock of 8.6% to 2017Q4 is rather more credible than the Office for Budget Responsibility's 27.6%. This suggests that the relatively rapid rise, from low levels, in mortgage defaults in 2016 implied by the Office for Budget Responsibility base scenario is rather unlikely.

Our analysis is based on a macro view and does not take full account of the more granular structure of outstanding mortgages where payment problems are most likely to arise. The Resolution Foundation report, Whittaker (2014), tries to take account of the proportions of fixed and variable rate mortgages, of interest only mortgages and of self-certified mortgages, often held by the self-employed and of the income distribution associated with mortgage payment problems. It suggests that around 10 percent of mortgages face serious affordability problems, lack of access to re-mortgaging and are on standard variable rate mortgages and therefore immediately subject to increases in mortgage interest rates. On the other hand, many households have had considerable time to consider options such as to work more and/or save more. In some cases they have been able to take advantage of mortgage products offered by lenders such as Nationwide and Lloyds TSB which give households in negative equity the ability to move house, for example, to take advantage of employment opportunities elsewhere. The recorded decline in the incidence of mortgage defaults since 2009 gives one confidence that the scale of defaults over the next three years will be on a moderate scale.

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Technical information

Table 1: Priors on lending standards and policy shifts for past changes

Date	*Shift*	*Arrears Impact*	*Possessions Impact*
1986-1989, peak in 1990q4	Poor quality lending, reduced credit access at end.	Arrears up	Possessions up
End 1991	Policy shift (increased forbearance) to reduce possessions	Arrears up	Possessions down
1994/5-6	Better lending quality	Arrears down	Possessions up
1997-8	Policy reversal (back to normal) and SMI rules tightened affecting lending quality		Possessions up
1999-2005	Good lending quality and/or easy credit access	Arrears down	Possessions down
2005-6	Change in the composition of the mortgage market toward riskier lenders; easy refinance overwhelms poor quality lending	Arrears down	Possessions up
2007-2009	Poor quality lending; reduced access to credit	Arrears up	Possessions up
2008Q4	Policy shift (Mortgage Pre-action Plan increases forbearance) to reduce possessions	Arrears up	Possessions down
2008-9	Income support (ISMI/SMI) made more generous; refinancing of mortgages	Arrears down	Possessions down
2010Q3	Fall in standard rate of interest paid under SMI	Arrears up	Possessions up
2010Q4	New FSA rules promote increased forbearance	Arrears up	Possessions down
2012Q3	Funding for Lending Scheme begins gradually increasing refinancing possibilities	Arrears down	Possessions down

Notes: Financial Services Authority (FSA); Income Support for Mortgage Interest (ISMI)/ Support for Mortgage Interest (SMI).

Table 2: Definitions of variables used in the regressions

Symbol	*Definition*	*Means*	*Source*
$\log poss_t$	Log of the ratio of possessions to number of mortgages outstanding	-7.30	CML
$\log arr6_t$	Log of the ratio of arrears (greater than or equal to months) to number of mortgages outstanding	-4.62	CML
$\log arr12_t$	Log of the ratio of arrears (greater than or equal to 12 months) to number of mortgages outstanding	-5.82	CML
$\log ur_t$	Log of unemployment rate (Labour Force Survey measure)	2.00	ONS: code MGSX
$\log dsr_t$	Log of cost of loan relative to income, the latter ratio measured as: $((arbm/100)(avmort(-1))/(avpdi)$ arbm=average mortgage interest rate, r bm[1], adjusted for tax before 2000; avmort=amwt/mortno; amwt=mortgage lending, stock, personal sector (£mn), from Financial Statistics; mortno=mortgages outstanding from CML; avpdi= annualised quarterly personal disposable income[2], current prices (£mn)/popw; popw=population of working age, 15 to 59 for women, 15 to 64 for men ('000s), quarterly interpolation.	-7.19	mortno: CML popw: ONS amwt: ONS rbm: ONS pdi: ONS
$\log negeq_t$	Log of the debt equity ratio, measured to proxy average mortgage to house prices. Implied proportion of negative equity (*normalised*) (see Aron and Muellbauer (2010a), equation (4), section 2.1): $negeq = ([1/(1+\exp(-\lambda * (\log(avdebt/equity) - \lambda_{0t}))])$ Then adjust $negeq$ by subtracting the cumulated number of possessions cases over the previous 2 years, scaled by no. of mortgages outstanding. (average debt)/((average equity)=avmort(-1)/(ph); ph converted from quarterly index to an average quarterly house price. ph=2nd-hand mix-adjusted house prices[3] (2002Q1=100), *normalized.* λ=7, λ_0 = - 0.001*(t - 40) + 0.04.	-3.22	ph: DCLG
$\log ry_t$	log real income/working age pop, where real income is avpdi/price deflator	1.62	ONS

$sd2008q4_t$	Example of Step Dummy: Step Dummy =1 from 2008Q4, and 0 otherwise	-	Constructed
$sdmmxx_t$	Double moving average of Step Dummies, with a smooth increasing transition from zero to one over 8 quarters, from zero in the last quarter of year xx-1, to one in the last quarter of year xx+1	-	Constructed
$d84q3_t$	Example of Impulse Dummy for 1984Q3 for an outlier in 12month+arrears.	-	Constructed

Notes: The sample is the longest available for both arrears and repossessions, 1983Q2 to 2014Q1. Interpolated quarterly CML data are used before 1999, see Aron and Muellbauer (2010c).

1. Mortgage rate: from FCA MLAR, Table 1.22 - Residential loans to individuals: Interest rate analysis. Overall weighted average interest rate on balances outstanding, all loans. From 2000 to 2006, linked to average of mortgage rate on balances outstanding for banks and building societies, previously reported in Financial Statistics. Before 2000, linked to average mortgage rate on balances outstanding for building societies, previously reported in Financial Statistics, code AJNL.

2. Nominal household disposable income = real household disposable income x consumer expenditure deflator, where the latter = current price measure of consumer expenditure/chained volume index of consumer expenditure from Consumer Trends, both seasonally adjusted. Real household disposable income SA from UK Economic accounts, code NRJR.

Table 3: Estimation results for arrears and possessions equations, 1983 Q2 - 2014 Q1

Variable	***Symbol***	***Possessions equation:*** **Δlog poss**	***Robust std. errors***	***Symbol***	***Arrears equation:*** **Δlog ass12**	***Robust std. errors***	***Symbol***	***Arrears equation:*** **Δlog arr6**	***Robust std. errors***
Constant	a0	5.77**	0.78	b0	3.82**	1.05	c0	4.30**	0.87
log dsrma(-1)	a1	1.73**	0.09	b1	1.69**	0.13	c1	1.51**	0.096
log negeqma(-1)	a2	0.634**	0.035	-			-		
log negeqma(-2)	-			b2	0.568**	0.039	c2	0.407**	0.027
log ur(-4)	a3	0.46**	0.13	-			-		
log ur(-5)	-			b3	0.70**	0.19	c3	0.70**	0.14
Speed of adjustment	a4	0.383**	0.041	b4	0.481**	0.034	c4	0.408**	0.036
LQ (loan quality)	a5	1		b5	1.83**	0.16	c5	1.30**	0.123
PS (forbearance policy shift)	a6	-1		b6	0.675	0.39	c6	1.70**	0.43
Correction factor	-			θ12	-0.354**	0.068	θ6	-0.191**	0.038
$\Delta_2$log negeq	a7	0.129**	0.023	b7	0.063**	0.016	c7	0.041**	0.013
$\Delta_8$log negeq (-1)	a8	0.182**	0.050	-			-		

Variable	*Symbol*	*Possessions equation:* ∆log poss	*Robust std. errors*	*Symbol*	*Arrears equation:* ∆log ass12	*Robust std. errors*	*Symbol*	*Arrears equation:* ∆log arr6	*Robust std. errors*
∆log poss(-2)	a9	-0.035**	0.009	-			-		
dynamic shift adjustment	a10	0.12**	0.044	b10	0.27**	0.099	c10	0.455**	0.098
∆dsr(-1)	a11	0.20*	0.08	-			c11	0.09	0.049
$\Delta_4$log ur	-			-			c12	0.208**	0.048
$\Delta_4$log ur(-1)	-			b12	0.11	0.07	-		
Q1seasonal	a13	0.106**	0.015	-			-		
Pre-99-Q1seasonal	a14	-0.064**	0.018	-			-		
D84Q3	-			-			c13	0.118	0.011
D87Q1	-			b14	0.140**	0.016	c14	0.072**	0.014
D89Q3	a15	-0.166**	0.025	-			-		
D02Q4	a16	-0.199**	0.015	-			-		
D04Q1	a17	-0.205**	0.019	-			-		
D05Q4	a18	-0.171**	0.018	-			-		
Diagnostics									
Eq. standard error		0.0475			0.0381			0.0224	
R squared		0.993			0.998			0.999	

Variable	*Symbol*	*Possessions equation:* **Δlog poss**	*Robust std. errors*	*Symbol*	*Arrears equation:* **Δlog ass12**	*Robust std. errors*	*Symbol*	*Arrears equation:* **Δlog arr6**	*Robust std. errors*
LM Het test P-val		0.025			0.071			0.212	
Durbin-Watson		1.75			1.75			2.39	

Notes:

1. Estimates are reported to three significant figures. See the equations that generated these results below; variables are defined in Table 2.
2. ** indicates significant at the 1 percent level; * indicates significant at the 5 percent level.
3. The forbearance policy shift function enters as (kappa*PS+(1-kappa)*PS(-1)), with kappa fixed at 0.5.
4. The dynamic shift adjustments are for the possessions rate, for the 12-month and for the 6-month arrears rates, respectively: $(1-sd1999_t)*(\Delta_2 \log poss_{t-1})$ $(1-sd1999_t)*(\Delta \log arr12_{t-1} - \theta_{12}\Delta \log dsr_{t-1})$ and $(1-sd1999_t)*(\Delta \log arr6_{t-1} - \theta_{6}\Delta \log dsr_{t-1})$ where *sd1999* is a step dummy beginning in 1999 when data frequency shifted to quarterly.
5. The selected equations:

The selected possessions equation:

$$\begin{aligned}\Delta \log poss_t = {} & a_4(a_0 + a_5 LQ_t + a_6 PS_t + a_1 \log dsrma_{t-1} + a_2 \log negeqma_{t-1} \\ & + a_3 \log ur_{t-4} - \log poss_{t-1}) + (PS_t - PS_{t-1}) + a_7 \Delta_2 \log negeq_t \\ & + a_8 \Delta_8 \log negeq_{t-1} + a_9 \Delta \log poss_{t-2} \\ & + a_{10}(1-sd1999_t)*(\Delta_2 \log poss_{t-1}) \\ & + a_{11} dsr_{t-1} + a_{13} seasQ1_t + a_{14}(1-sd1999_t) seasQ1_t + a_{15} D89Q3_t \\ & + a_{16} D02Q4_t + a_{17} D04Q1_t + a_{18} D05Q4_t\end{aligned}$$

$$a_5 = 1,\ a_6 = 1$$

The selected arrears equations:

The two arrears equations have a similar structure; the three main drivers are the log debt service ratio, the log imputed proportion in negative equity and the log unemployment rate.

Arrears > 12 months:

$$\begin{aligned}\Delta \log arr12_t &= b_4(b_0 + b_1 \log dsrma_{t-1} + b_2 \log negeqma_{t-1} + b_3 \log ur_{t-5} \\ &+ b_5 LQ_t \text{-} b_6(\kappa \mathrm{PS}_t + (1\text{-}\kappa)\mathrm{PS}_{t-1}) - (\log arr12_{t-1} - \theta_{12} \log dsr_{t-1})) \\ &+ \theta_{12} \Delta \log dsr_t - 0.8\, poss_t / arr12_{t-1} + b_7 \Delta_2 \log negeq_t \\ &+ b_{10}(1 - sd1999_t)(\Delta \log arr12_{t-1} - \theta_{12} \log \Delta dsr_{t-1}) \\ &+ b_{12} \Delta_4 \log ur_{t-1} + b_{13} D87Q1_t\end{aligned}$$

Arrears > 6 months:

$$\begin{aligned}\Delta \log arr6_t &= c_4(c_0 + c_1 \log dsrma_{t-1} + c_2 \log negeqma_{t-1} + c_3 \log ur_{t-5} \\ &+ c_5 LQ_t \text{-} c_6(\kappa \mathrm{PS}_t + (1\text{-}\kappa)\mathrm{PS}_{t-1}) - (\log arr6_{t-1} - \theta_6 \log dsr_{t-1})) \\ &+ \theta_6 \Delta \log dsr_t - poss_t / arr6_{t-1} + c_7 \Delta_2 \log negeq_t \\ &+ c_{10}(1 - sd1999_t)(\Delta \log arr6_{t-1} - \theta_6 \log \Delta dsr_{t-1}) \\ &+ c_{11} \log \Delta dsr_{t-1} + c_{12} \Delta_4 \log ur_t + c_{13} D84Q3_t + c_{14} D87Q1_t\end{aligned}$$

Table 4: Estimation results for forbearance policy shift and lending quality equations, 1983 Q2 - 2014 Q1

Variable	***Parameter***	***Estimate***	***Robust std. errors***
Forbearance policy shift function			
(*sd*1991(-4) - *sdmm*97-sdmm05)	P91	-.146**	0.031
*sd*2008Q4	P08Q4	-.234**	0.040
*sd*2009Q3	P09Q3	.076*	0.029
*sd*2010Q2	P10Q2	.062**	0.017
*sd*2010Q4	P10Q4	-.067**	0.013
*sd*2011Q2	P11Q1	.022**	0.012
Loan quality function			
*sdmm*86	L86	.076*	0.038
*sdmm*89	L89	.602**	0.060
*sdmm*94	L94	-.178**	0.033
*sdmm*95	L95	-.139**	0.035
*sdmm*97	L97	.094**	0.0331
*sdmm*05(-2)	L05	-0.056	0.029
*sdmm*07(-2)	L07a	.218**	0.061
*sd*2009Q2	L09Q2	-.277**	0.051
*sd*2009Q4	L09Q4	.043	0.023
*sd*2010Q3	L10Q3	.047*	0.023
Credavail/100	Lcred	-0.13	0.019

1. ***The selected forbearance policy shift equation***:

$$PS_t = p91 \times (sd91_{t-4} - sdmm97_t - sdmm05_t) + p08Q4 \times sd08Q4_t + p09Q3 \times sd09Q3_t + p10Q2 \times sd10Q2_t + p10Q4 \times sd10Q4_t + p11Q1 \times sd11Q1_t$$

where *sd91* is a step dummy beginning in 1991.

2. ***The selected 'loan quality' equation***:

$$LQ_t = l86 \times sdmm86_t + l89 \times sdmm89_t + l94 \times sdmm94_t$$
$$+ l95 \times sdmm95_t + l97 \times sdmm97_t + l05 \times sdmm05_{t-2} + l07a \times sdmm07_{t-2}$$
$$+ l09Q2 \times sd09Q2_t + l09Q4 \times sd09Q4_t + l10Q3 \times sd10Q3_t$$
$$+ lcred \times credavail_{t-1}$$

Figure 1: Index of mortgage credit availability (Bank of England Bank Lending Survey)

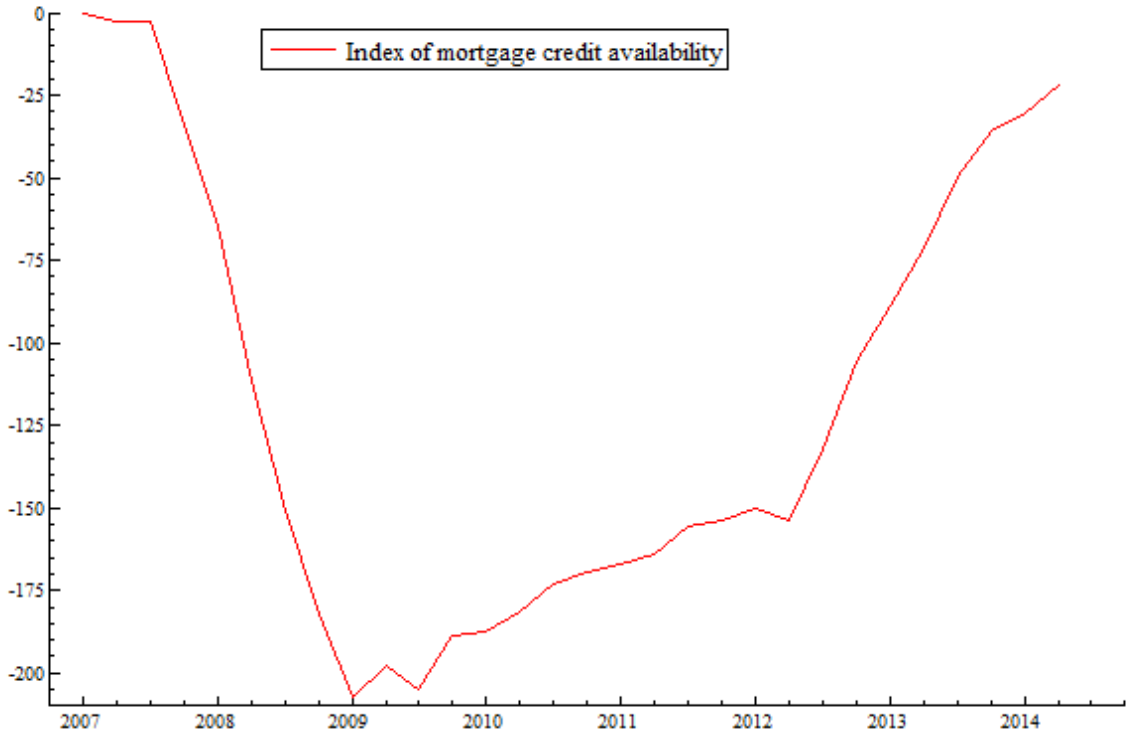
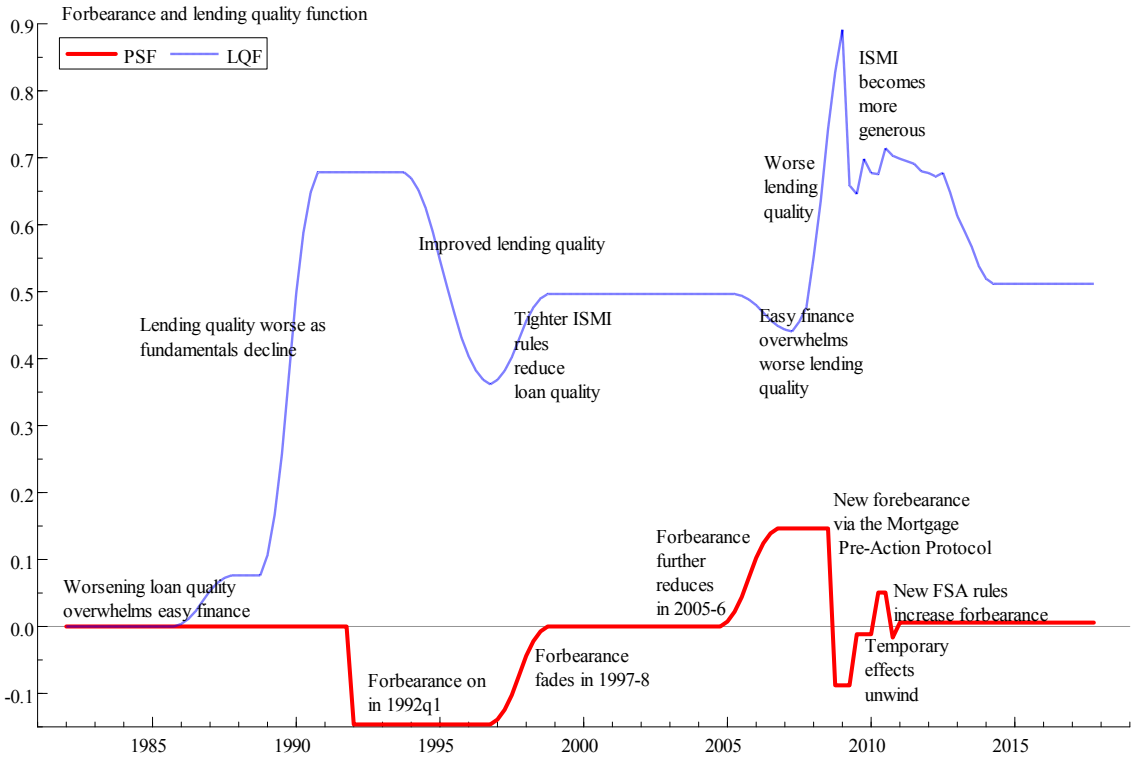


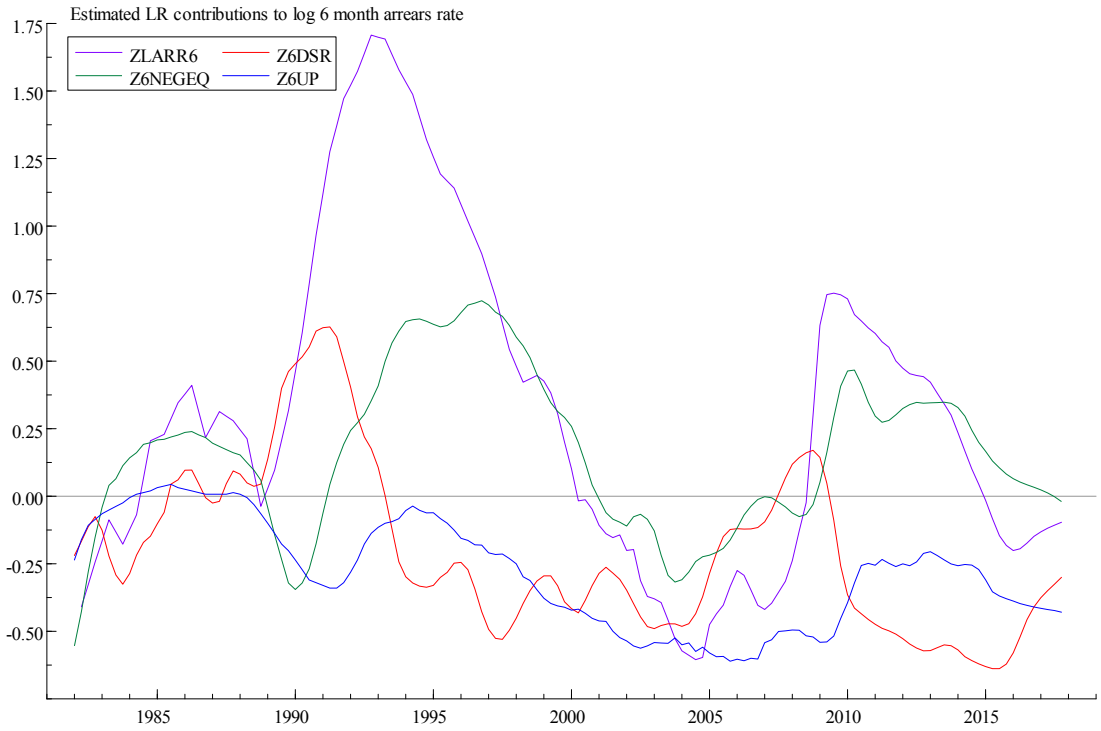
Figure 2: Forbearance and lending quality



KEY: Order of coloured lines: highest to lowest: **LQF** (lending quality function) and **PSF** (forebearance policy shift function). Financial Services Authority (**FSA**); Income Support for Mortgage Interest (**ISMI**).

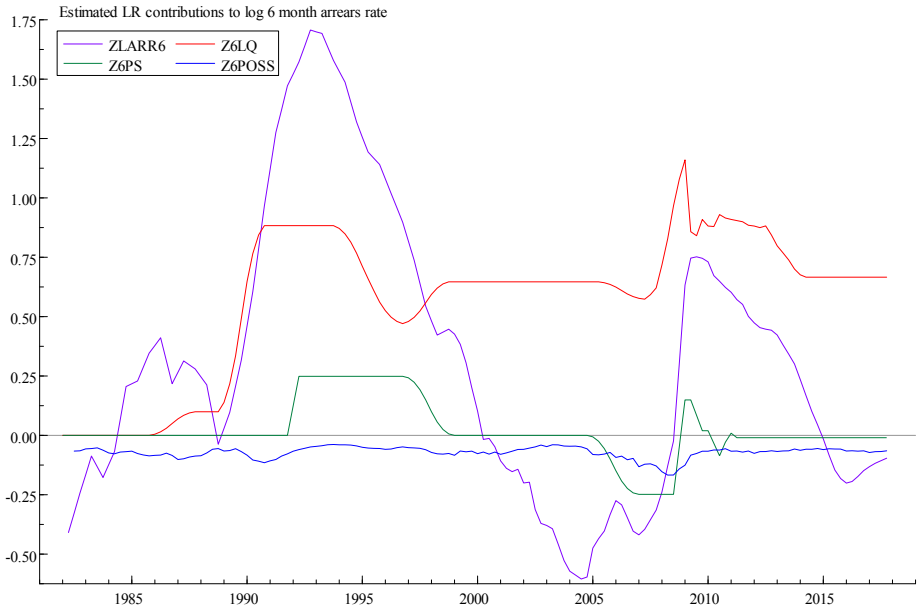
Appendix 1: Explanatory variables for log arrears and log possessions (OE base scenario)

Figure 3: Estimated long-run contributions of key explanatory variables to the log arrears rate.



KEY: ZLARR6=log 6 month arrears rate; **ZLDSR=** debt service ratio; **Z6NEGEQ=** proportion in negative equity; **Z6UP**=unemployment.

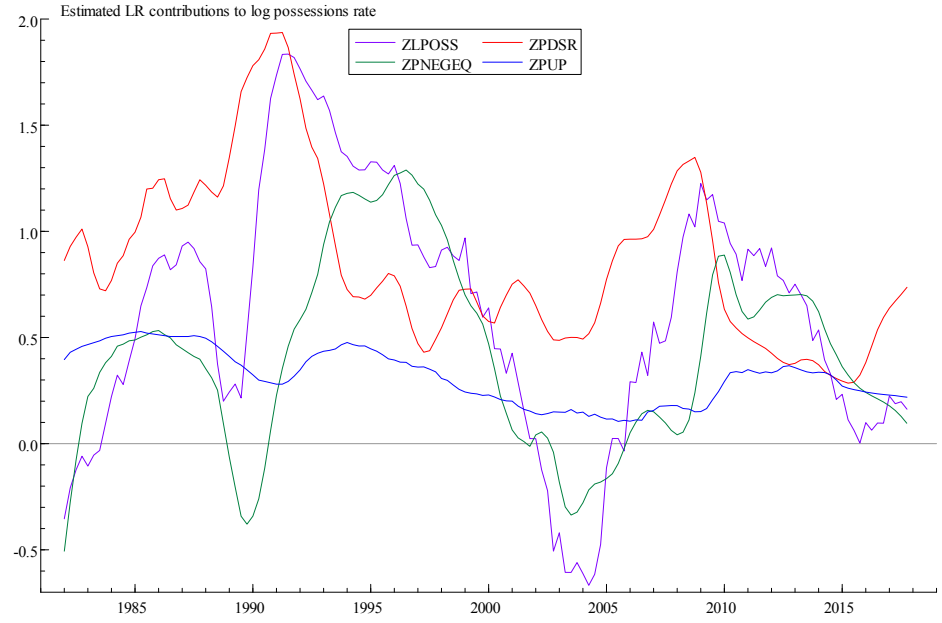
Figure 4: Estimated long-run contribution of lending standards and policy shift proxies to the log arrears rate.



KEY: ZLARR6=log 6 month arrears rate; **Z6PS**= forbearance policy shift function; **Z6LQ**= lending conditions; **Z6POSS**= measurement factor.

Note 1: Variables are level-adjusted for visual purposes.

Figure 5: Estimated long-run contributions of key explanatory variables to the log possessions rate



KEY: ZLPOSS=log possessions rate; **ZPDSR**= debt service ratio; **ZPNEGEQ**= proportion in negative equity; **ZPUP**=unemployment.

Note 1: Variables are level-adjusted for visual purposes.

Figure 6: Estimated long-run contribution of lending standards and policy shift proxies to the log possessions rate

KEY: ZLPOSS=log possessions rate; **ZPPS**= policy function; **ZPLQ**= lending conditions

Appendix 2: Forecast assumptions 2014 Q1 – 2017 Q4

A. Underlying Oxford Economics numbers from their May 2014 forecasts

	Unemp. Rate	*Mort Rate*	*Nominal Income*	*House Prices*	*Mortgage Stock*	*Est. Prop. In Negative Equity*
Mar-14	6.77	3.34	281496	192.7	1277166	3.81
Jun-14	6.62	3.31	284318	195.2	1281469	3.60
Sep-14	6.53	3.31	286470	197.8	1286304	3.31
Dec-14	6.45	3.31	288862	200.0	1292208	3.10
Mar-15	6.36	3.31	291455	201.9	1298828	2.97
Jun-15	6.30	3.39	294639	203.7	1306246	2.87
Sep-15	6.25	3.64	297630	205.3	1313614	2.80
Dec-15	6.20	3.86	300940	206.9	1320834	2.74
Mar-16	6.16	4.02	304486	208.4	1327854	2.68
Jun-16	6.13	4.14	308078	210.0	1334992	2.62
Sep-16	6.08	4.24	311453	211.6	1342392	2.55
Dec-16	6.03	4.35	314921	213.6	1350232	2.45
Mar-17	5.99	4.43	318508	215.8	1358721	2.34
Jun-17	5.94	4.54	322191	218.4	1367849	2.20
Sep-17	5.90	4.66	325721	221.2	1377539	2.06
Dec-17	5.88	4.78	329314	224.3	1387677	1.92

B. Underlying Office for Budget Responsibility numbers from their March 2014 forecasts

	Unemp. Rate	*Mort Rate*	*Nominal Income*	*House Prices*	*Mortgage Stock*	*Est. Prop. In Negative Equity*
Mar-14	6.77	3.34	281496	192.7	1277166	3.81
Jun-14	6.57	3.24	287363	195.9	1297699	3.50
Sep-14	6.57	3.14	290195	200.4	1322339	3.29
Dec-14	6.47	3.04	293229	204.7	1345952	3.21
Mar-15	6.37	2.94	295556	208.5	1367512	3.18
Jun-15	6.37	2.94	298691	212.4	1395232	3.10
Sep-15	6.27	2.94	300714	216.1	1425005	3.15
Dec-15	6.17	3.04	303951	219.2	1450672	3.30
Mar-16	6.07	3.04	306277	221.5	1471205	3.46
Jun-16	5.97	3.14	309615	223.8	1497898	3.53
Sep-16	5.87	3.24	312650	225.8	1524591	3.73
Dec-16	5.77	3.24	316190	227.5	1546151	3.97
Mar-17	5.57	3.34	319528	229.7	1562578	4.05
Jun-17	5.47	3.44	323675	232.1	1586191	4.00
Sep-17	5.37	3.64	327215	234.1	1609804	4.12
Dec-17	5.27	3.74	331059	235.9	1631364	4.27

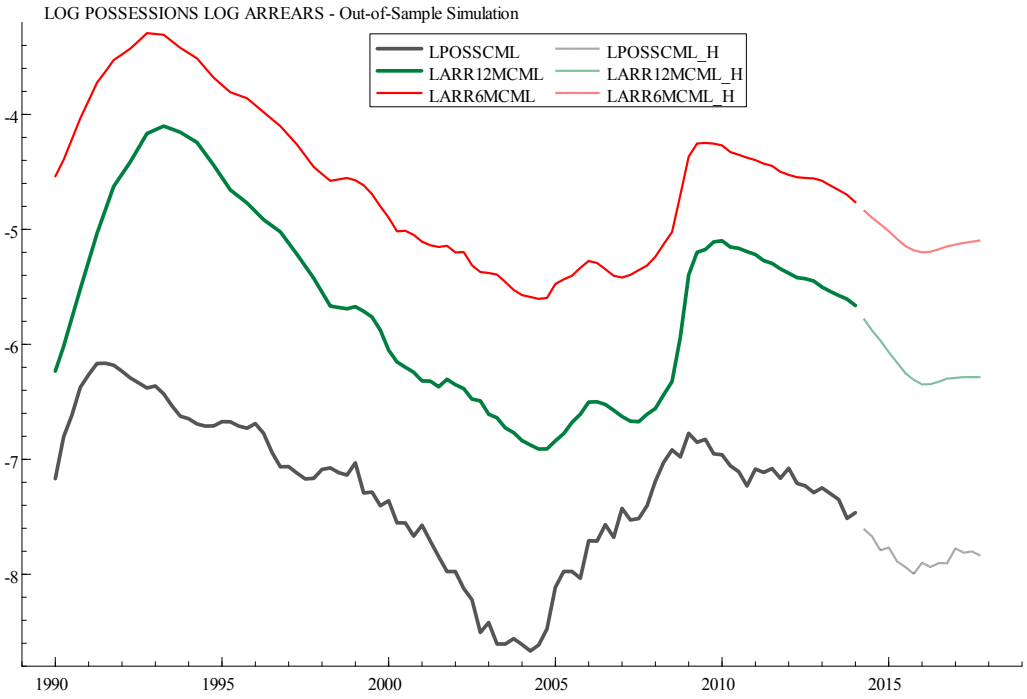
C. Increments relative to Office for Budget Responsibility base for the higher growth, higher mortgage rate (HGHR), the lower growth, higher mortgage rate (LGHR) and lower growth, lower mortgage rate (LGLR) scenarios

	HGHR UP	***LGHR UP***	***LGLR UP***	***HRMR***	***LRMR***	***HGHRINC***	***LGHRINC***	***LGLRINC***	***HGHR HP***	***LGHR HP***	***LGLR HP***	***HGHR DB***	***LGHR DB***	***LGLR DB***
Jun-14	-0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Sep-14	-0.1	0.2	0	0.004	0	0.005	-0.002	-0.001	0.005	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Dec-14	-0.2	0.3	0	0.006	0	0.005	-0.002	-0.001	0.005	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Mar-15	-0.3	0.5	0.2	0.008	0	0.005	-0.002	-0.001	0.0025	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Jun-15	-0.4	0.6	0.2	0.01	0	0.005	-0.002	-0.001	0.0025	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Sep-15	-0.5	0.7	0.3	0.012	0	0.005	-0.002	-0.001	0.0025	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Dec-15	-0.5	0.8	0.3	0.014	0	0.005	-0.002	-0.001	0.0025	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Mar-16	-0.5	0.9	0.4	0.016	0	0.005	-0.002	-0.001	0.0025	-0.0075	-0.0025	-0.005	-0.0125	-0.0025
Jun-16	-0.5	1	0.4	0.018	-0.001	0.005	-0.002	-0.002	0.0025	-0.0075	0	-0.0125	-0.0125	-0.0025
Sep-16	-0.5	1.1	0.4	0.018	-0.001	0.005	-0.003	-0.002	0.0025	-0.0075	0	-0.005	-0.0125	-0.0025
Dec-16	-0.5	1.2	0.4	0.018	-0.001	0.005	-0.003	-0.002	0.0025	-0.0075	0	-0.005	-0.0125	-0.0025
Mar-17	-0.5	1.2	0.6	0.018	-0.002	0.005	-0.003	-0.002	0	-0.0075	0	-0.005	-0.0125	-0.0025
Jun-17	-0.5	1.2	0.6	0.018	-0.003	0.005	-0.003	-0.002	0	-0.0075	0.0025	-0.005	-0.0125	-0.0025
Sep-17	-0.5	1.2	0.6	0.018	-0.004	0.005	-0.003	-0.002	0	-0.0075	0.0025	-0.005	-0.0125	-0.0025
Dec-17	-0.5	1.2	0.6	0.018	-0.005	0.005	-0.003	-0.002	0	-0.0075	0.0025	-0.005	-0.0125	-0.0025

KEY:
UP is the unemployment rate **HP** is house prices
MR is the mortgage rate **DB** is mortgage debt
INC is nominal income

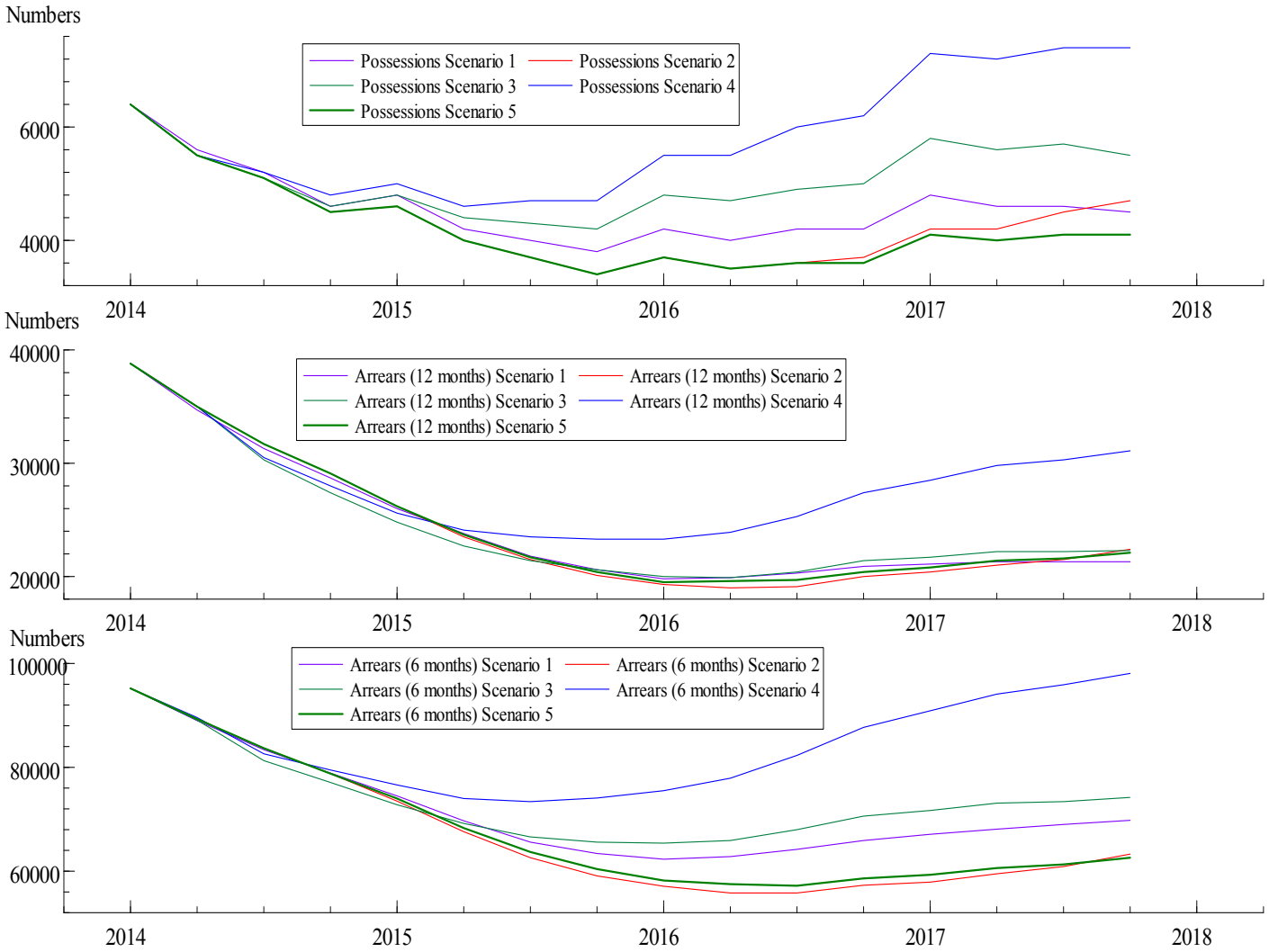
Appendix 3: Pictures of forecast scenarios

Scenario 1: Base scenario Oxford Economics for 2014 Q1 data



KEY: Order of coloured lines: highest to lowest: **LARR6MCML**, **LARR12MCML**, **LPOSSCML** of dotted lines: highest to lowest: **LARR6MCML_H**, **LARR12MCML_H**, **LPOSSCML_H**

Scenarios 1-5: Possessions and arrears (6 and 12 months)



Appendix 4: Forecast results for arrears and possessions 2014 Q1 – 2017 Q4

SCENARIO 1 ***OE Base*** ***Forecast quarter***	***Properties taken into possession in period/no.***	***Loans in arrears ≥12 months/no.***	***Loans in arrears ≥6 months/no.***
	(rounded to nearest 100)		
Mar-14	6,400	38,800	95,200
Jun-14	5,600	34,700	89,000
Sep-14	5,200	31,300	83,400
Dec-14	4,600	28,700	78,900
Mar-15	4,800	26,000	74,500
Jun-15	4,200	23,800	69,700
Sep-15	4,000	21,800	65,600
Dec-15	3,800	20,600	63,400
Mar-16	4,200	19,800	62,300
Jun-16	4,000	19,900	62,800
Sep-16	4,200	20,300	64,200
Dec-16	4,200	20,900	65,900
Mar-17	4,800	21,100	67,100
Jun-17	4,600	21,300	68,100
Sep-17	4,600	21,300	69,000
Dec-17	4,500	21,300	69,800

SCENARIO 2 ***OBR Base*** ***Forecast quarter***	***Properties taken into possession in period/no.***	***Loans in arrears ≥12 months/no.***	***Loans in arrears ≥6 months/no.***
	(rounded to nearest 100)		
Mar-14	6,400	38,800	95,200
Jun-14	5,500	35,000	89,300
Sep-14	5,100	31,700	83,700
Dec-14	4,500	29,100	78,800
Mar-15	4,600	26,200	73,500

Jun-15	4,000	23,500	67,600
Sep-15	3,700	21,500	62,600
Dec-15	3,400	20,100	59,100
Mar-16	3,700	19,300	57,100
Jun-16	3,500	19,000	55,800
Sep-16	3,600	19,100	55,800
Dec-16	3,700	20,000	57,300
Mar-17	4,200	20,400	57,900
Jun-17	4,200	21,000	59,500
Sep-17	4,500	21,500	60,900
Dec-17	4,700	22,400	63,300

Scenario 3: OBR HG, HR Forecast quarter	***Properties taken into possession in period/no.***	***Loans in arrears ≥12 months/no.***	***Loans in arrears ≥6 months/no.***
	(rounded to nearest 100)		
Mar-14	6,400	38,800	95,200
Jun-14	5,500	35,000	89,100
Sep-14	5,100	30,300	81,300
Dec-14	4,600	27,400	77,100
Mar-15	4,800	24,800	72,800
Jun-15	4,400	22,700	69,200
Sep-15	4,300	21,400	66,600
Dec-15	4,200	20,600	65,600
Mar-16	4,800	20,000	65,400
Jun-16	4,700	19,900	65,900
Sep-16	4,900	20,400	68,000
Dec-16	5,000	21,400	70,600
Mar-17	5,800	21,700	71,700
Jun-17	5,600	22,200	73,100
Sep-17	5,700	22,200	73,400
Dec-17	5,500	22,300	74,200

Scenario 4: OBR LG, HR Forecast quarter	***Properties taken into possession in period/no.***	***Loans in arrears ≥12 months/no.***	***Loans in arrears ≥6 months/no.***
	(rounded to nearest 100)		
Mar-14	6,400	38,800	95,200
Jun-14	5,500	35,000	89,600
Sep-14	5,200	30,500	82,600
Dec-14	4,800	28,000	79,500
Mar-15	5,000	25,600	76,600
Jun-15	4,600	24,100	74,000
Sep-15	4,700	23,500	73,400
Dec-15	4,700	23,300	74,100
Mar-16	5,500	23,300	75,500
Jun-16	5,500	23,900	77,900
Sep-16	6,000	25,300	82,300
Dec-16	6,200	27,400	87,700
Mar-17	7,300	28,500	90,900
Jun-17	7,200	29,800	94,100
Sep-17	7,400	30,300	95,900
Dec-17	7,400	31,100	98,100

Scenario 5: OBR LG, LR Forecast quarter	***Properties taken into possession in period/no.***	***Loans in arrears ≥12 months/no.***	***Loans in arrears ≥6 months/no.***
	(rounded to nearest 100)		
Mar-14	6,400	38,800	95,200
Jun-14	5,500	35,000	89,300
Sep-14	5,100	31,700	83,700
Dec-14	4,500	29,100	78,800
Mar-15	4,600	26,200	74,000
Jun-15	4,000	23,700	68,300
Sep-15	3,700	21,700	63,700
Dec-15	3,400	20,400	60,400
Mar-16	3,700	19,500	58,200
Jun-16	3,500	19,600	57,500

Sep-16	3,600	19,700	57,200
Dec-16	3,600	20,400	58,600
Mar-17	4,100	20,800	59,300
Jun-17	4,000	21,400	60,600
Sep-17	4,100	21,600	61,300
Dec-17	4,100	22,100	62,600

Appendix 5: Annualised results 2013 - 2017

Forecast year	***Possess-ions***	***Arrears 12 months***	***Arrears 6 months***	***Possess-ions***	***Arrears 12 months***	***Arrears 6 months***	***Possess-ions***	***Arrears 12 months***	***Arrears 6 months***
	Scenario 1: OE Base			*Scenario 2: OBR BASE*			*Scenario 3: OBR HG, HR*		
2013	28,900	41,100	101,800	28,900	41,100	101,800	28,900	41,100	101,800
2014	21,800	28,700	78,900	21,600	29,100	78,800	21,700	27,400	77,100
2015	16,800	20,600	63,400	15,600	20,100	59,100	17,600	20,600	65,600
2016	16,600	20,900	65,900	14,400	20,000	57,300	19,400	21,400	70,600
2017	18,500	21,300	69,800	17,600	22,400	63,300	22,600	22,300	74,200

Forecast year	***Possess-ions***	***Arrears 12 months***	***Arrears 6 months***	***Possess-ions***	***Arrears 12 months***	***Arrears 6 months***
	Scenario 4: OBR LG, HR			*Scenario 5: OBR LG, LR*		
2013	28,900	41,100	101,800	28,900	41,100	101,800
2014	21,900	28,000	79,500	21,600	29,100	78,800
2015	18,900	23,300	74,100	15,600	20,400	60,400
2016	23,200	27,400	87,700	14,400	20,400	58,600
2017	29,300	31,100	98,100	16,300	22,100	62,600