MODELLING HOUSE PRICES AND HOME OWNERSHIP

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NIESR - 1 June 2018

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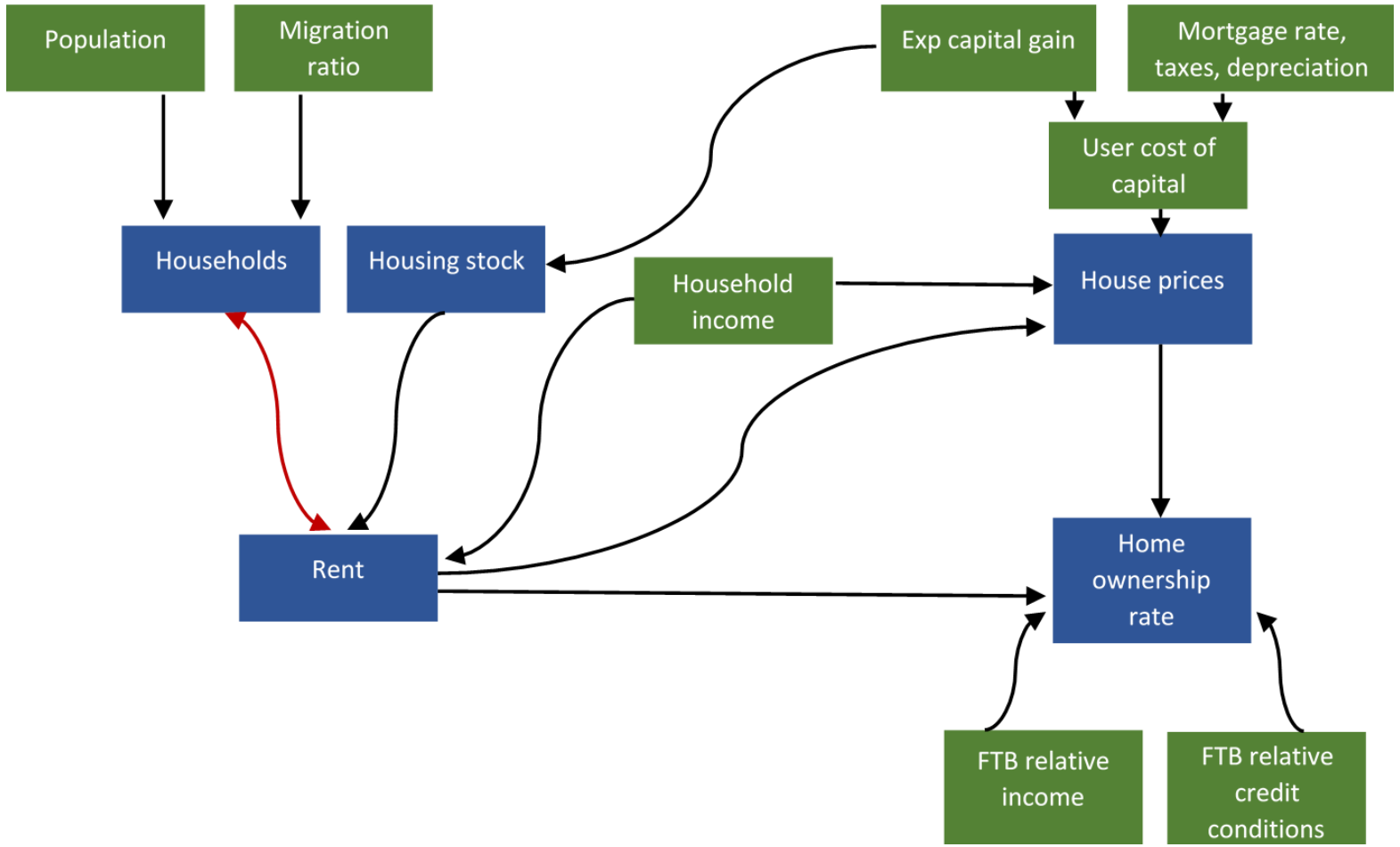
OBJECTIVES

- Explain the drivers of house prices and home ownership in the UK.
- Use the model to explain the contribution of various determinants in driving major recent changes in house prices and home ownership.
- We use a new econometric technique – Structural Equation Modelling (SEM) – to account for the complex interaction of various parameters in the housing market.

MODEL STRUCTURE

Overview



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MODEL STRUCTURE

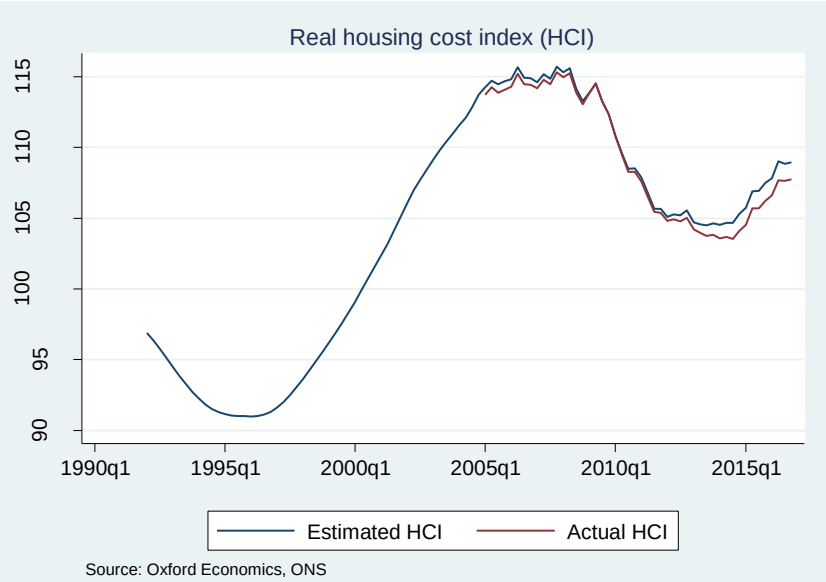
Overview

- Model consists of four equations estimated simultaneously:
  1. Rent
  2. Household formation
  3. House prices
  4. Home ownership
- Model allows us to estimate both direct and indirect effects on each outcome.
- Allows us to account for potential endogeneity from two-way causality.

MODEL STRUCTURE

Rent equation

$$rRent_t = HSHH_t + rIncome_t$$



Why construct a housing cost index?

- IPHRP is an index of rented properties, while OOH(RE) is for owner-occupied properties. These diverge mainly because of tenure mix in different regions.
- We needed an index for the rental (equivalent) of the entire housing stock.
- Used OOH and PRS weights in CPIH to combine OOH(RE) and IPHRP into a 'housing cost index' (HCI)

Estimating HCI before 2005

- Use regional data for IPHRP across UK nations and regions from 2005Q1 to create a panel model of rent.
- Use model to backcast HCI data to 1992.
- Good fit between HCI and predicted values

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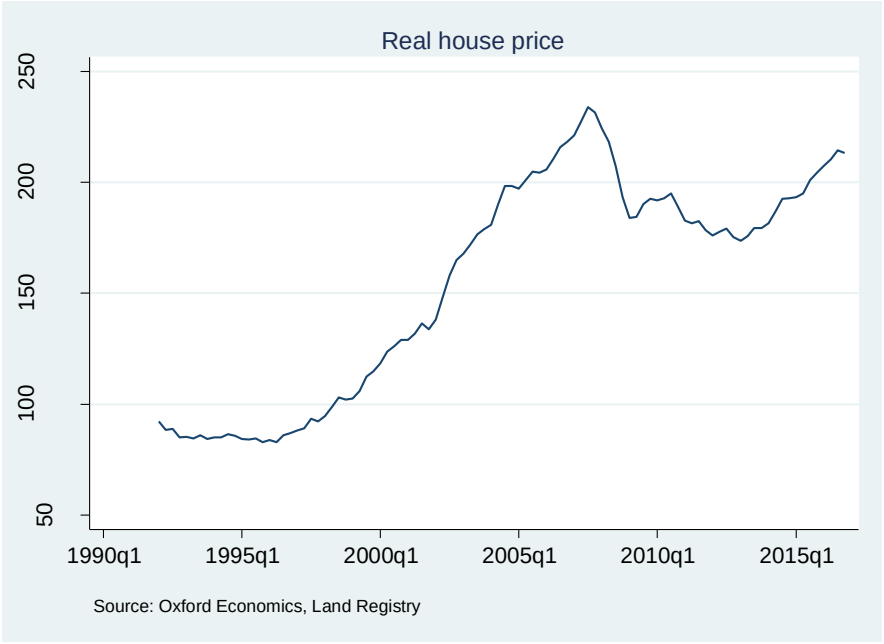
House price equation

$$rHP_t = i2_t + rRent_t + rIncome_t + Mort\_Gap_t$$

where:

- rHP_t is the real house prices at time t;
- $rRent_t$ real housing cost index on rental equivalent basis;
- $rIncome_t$ household disposable income and inequality (HDII);
- $Mort\_Gap_t$ captures constraints or slack in the mortgage market;
- $i2_t$ is the user cost of capital, consisting of
  - mortgage interest rate
  - taxes, subsidies, depreciation and maintenance costs
  - expected capital gains.



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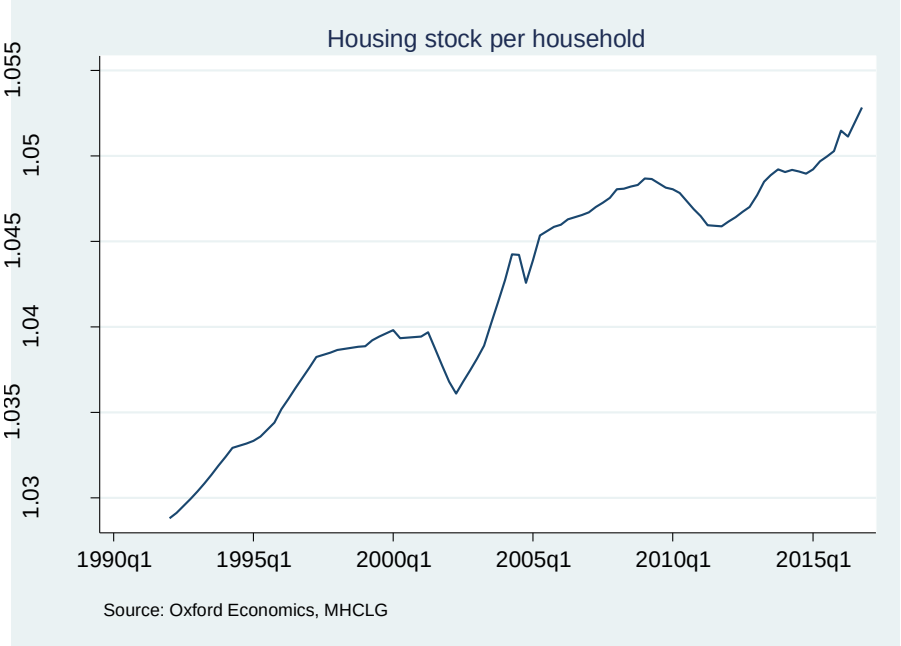
MODEL STRUCTURE

Stock per household equation

$$HSHH_t = rRent_t + Egains_t + PopUK_t + MigRat_t$$

where:

- $HSHH_t$ is housing stock per household;
- $Egains_t$ measures the expected change in price, proxied by the growth rate in price over the last 8 quarters;
- $PopUK_t$ is the UK population level;
- $MigRat_t$ is the proportion of migrants in the UK population - average migrant household size is significantly above that for UK-born.



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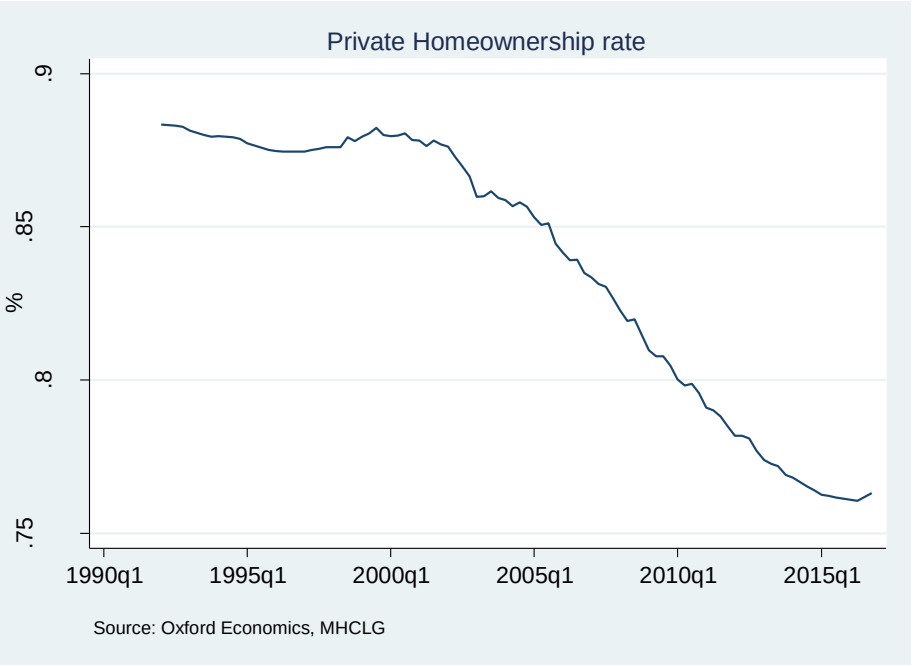
MODEL STRUCTURE

Homeownership equation

$$LO_t = rHP_t + rRent_t + i2_t + Y\_Rat_t + FTB\_Credit_t$$

where:

- LO_t log of odds of the **market sector** home ownership rate (HO_t)
- $LO_t = ln\left(\frac{HO_t}{1-HO_t}\right)$
- Y_Rat_t is the ratio of average earnings of 28-to-40 years old to that of 40-plus years old;
- FTB_Credit_t captures recent credit conditions faced by first time buyers, proxied by the spread between 75% and 90% LTV mortgage interest rates.



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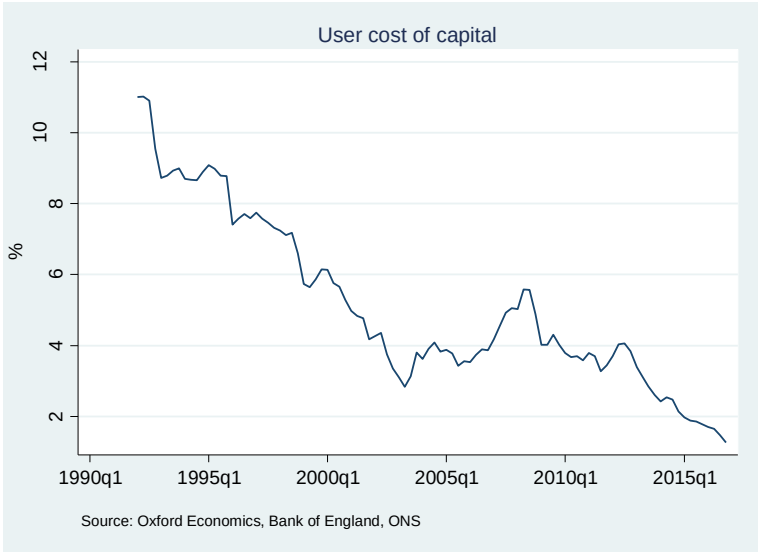
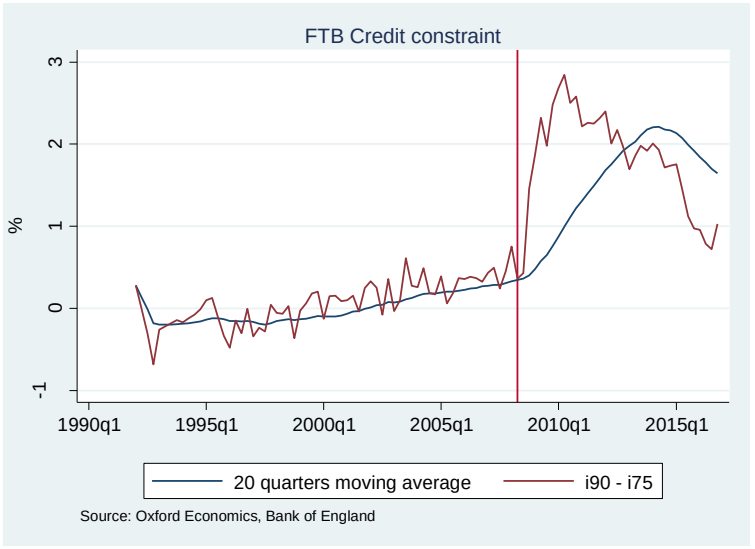
MODEL STRUCTURE

Key determinants





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ECONOMETRICS RESULTS

Rent

Rent Model	Direct Effects	Indirect Effects	Total Effects
Real rental price	-	-0.015***	-0.015***
		(0.005)	(0.005)
Housing stock per household	-1.092*	0.017*	-1.075*
	(0.635)	(0.009)	(0.625)
Real disposable income	0.712***	-0.011	0.701***
	(0.002)	(0.008)	(0.005)
Recession dummy	-0.071***	0.001	-0.070***
	(0.007)	(0.000)	(0.007)
Real house price growth (8 qtrs)	-	-0.0001	-0.0001
		(0.005)	(0.005)
UK Population	-	0.264*	0.264*
		(0.152)	(0.152)
Migration Ratio	-	-0.577*	-0.577*
		(0.333)	(0.333)

legend: * p<0.1; ** p<0.05; *** p<0.01

- *Housing stock per household* and *income* are the key determinants, as expected.
- The recession and subsequent wage squeeze have had a negative effect on real rent.
- The outcome variable (*Real rent*) is used as a determinant in the house price equation.

ECONOMETRICS RESULTS

House prices

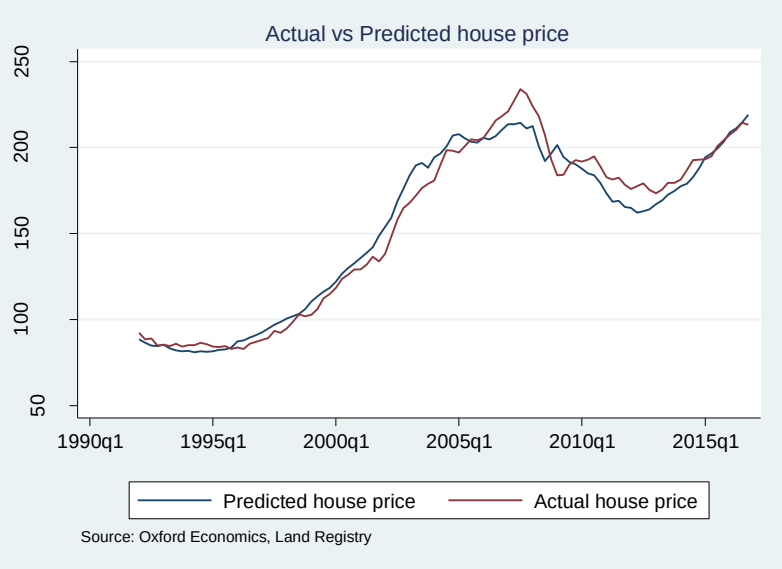
- The key determinants are
  1. Stock per household
  2. Income
  3. Use cost of capital
  4. Rental price
- As expected, *User cost of capital* and *Stock per household* have negative effect on real house price.
- *Income* and *rental price* have a positive association with real house price.

House Price Model	Direct Effects	Indirect Effects	Total Effects
Real rental price	1.741***	-0.027***	1.714***
	(0.168)	(0.008)	(0.168)
Housing stock per household	-	-1.873*	-1.873*
		(1.089)	(1.089)
User cost of capital	-0.170***	-	-0.170***
	(0.013)		(0.013)
Mortgage gap (lag)	-8.064***	-	-8.064***
	(2.002)		(2.002)
Real disposable income	1.226***	1.221***	2.447***
	(0.077)	(0.118)	(0.041)
Recession dummy	-	-0.122***	-0.122***
		(0.017)	(0.017)
Real house price growth (8 qtrs)	-	-0.0001	-0.0001
		(0.009)	(0.009)
UK Population	-	0.460*	0.460*
		(0.269)	(0.269)
Migration Ratio	-	-1.005*	-1.005*
		(0.588)	(0.588)

legend: * p<0.1; ** p<0.05; *** p<0.01

ECONOMETRICS RESULTS

House prices



- The model fit is good even when including the recession in the sample.

- Results are close to other estimates in the literature

Study	Income elasticity	Supply elasticity	Last data point used
(per household)			
Oxford Economics Model	**2.4**	**-1.9**	**2016Q4**
OBR model	2.7	-1.1	2013Q4
Meen (2013)	2.8	-1.7	2009Q4
(per capita)			
Mullbauer/Murphy (1997)	2.6	-2.2	1994
Cameron/Muellbauer/Murphy (2006)	1.6	-1.6	2003
(unscaled)			
OBR model, re-estimated without number of households	2.3	-1.2	2013Q4
OECD (2011)	2.9	-2.1	2010Q1
Meen (2009)	2.1	-1.5	2007Q2

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ECONOMETRICS RESULTS

Stock and household formation

Stock per Household Model	Direct Effects	Indirect Effects	Total Effects
Real rental price	0.014***	-0.0002***	0.014***
	(0.004)	(0.000)	(0.004)
Housing stock per household	-	-0.015*	-0.015*
		(0.009)	(0.009)
Real disposable income	-	0.010***	0.010***
		(0.003)	(0.003)
Recession dummy	-	-0.001***	-0.001***
		(0.000)	(0.000)
Real house price growth (8 qtrs)	9.30E-05	-1.45E-06	9.15E-05
	(0.004)	(0.000)	(0.004)
UK Population	-0.245***	0.003	-0.241***
	(0.005)	(0.002)	(0.003)
Migration Ratio	0.536***	-0.008	0.528***
	(0.008)	(0.006)	(0.009)

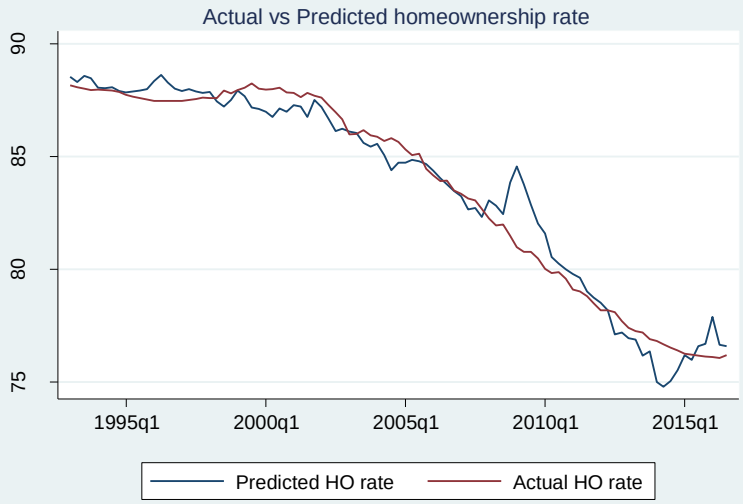
legend: * p<0.1; ** p<0.05; *** p<0.01

- Household formation is negatively affected by housing costs (rent) hence we include an equation for housing stock per household in the system.
- The effect is small in magnitude. A 10% increase in *rent* reduces the number of households by 0.14% or around 40,000.
- *Population* has a negative effect while the *migration ratio* has a positive effect, as expected.

ECONOMETRICS RESULTS

Homeownership

- FTB credit conditions a key barrier to HO.
- Similarly, house price and cost of capital have significant negative effect on HO.
- Rental price boosts HO!
- Effect of stock per household is small – operating through indirect effects on rent and prices.



Source: Oxford Economics, MHCLG

Homeownership Model	Direct Effects	Indirect Effects	Total Effects
Real house price	-0.848***	-	-0.848***
	(0.101)		(0.101)
Real rental price	1.942***	-1.485***	0.456
	(0.270)	(0.142)	(0.306)
Housing stock per household	-	-0.499*	-0.499*
		(0.290)	(0.290)
User cost of capital	-0.140***	0.144***	0.004
	(0.043)	(0.020)	(0.033)
Mortgage gap (lag)	-	6.845***	6.845***
		(1.887)	(1.887)
Real disposable income	-	-0.715***	-0.715***
		(0.068)	(0.068)
Recession dummy	-	-0.032***	-0.032***
		(0.012)	(0.012)
Real house price growth (8 qtrs)	-	-4.64E-05	-4.64E-05
		(0.002)	(0.002)
UK Population	-	0.122	0.122
		(0.083)	(0.083)
Migration Ratio	-	-0.267	-0.267
		(0.183)	(0.183)
First time buyer credit	-0.225***	-	-0.225***
	(0.018)		(0.018)
First time buyer income ratio	0.669**	-	0.669**
	(0.267)		(0.267)

legend: * p<0.1; ** p<0.05; *** p<0.01

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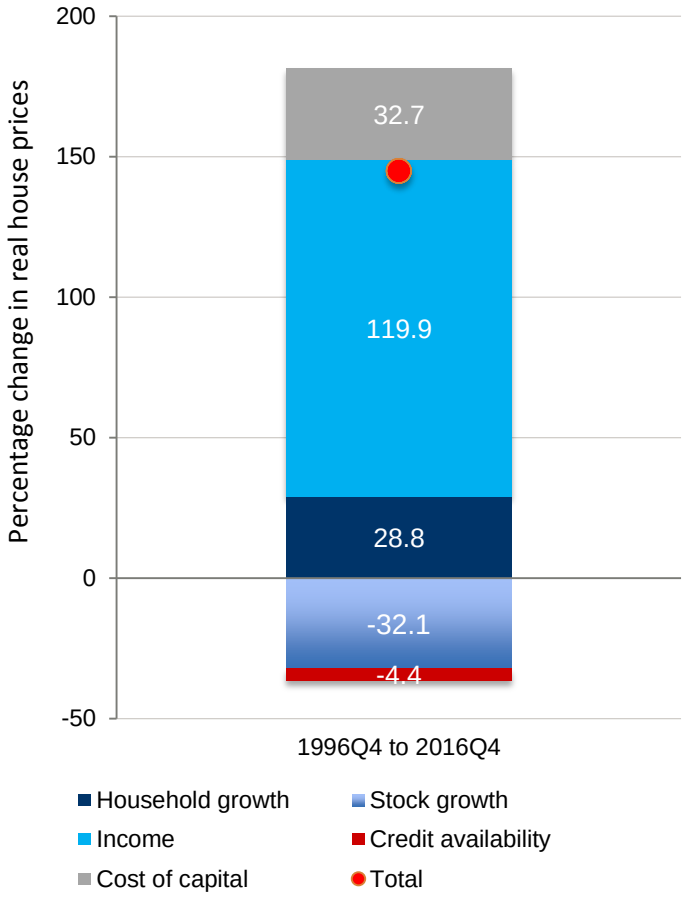
CONTRIBUTIONS

Drivers of house price growth 1996-2016

- Over the 20 years to 2016 real UK house prices rose by approximately 150% in real terms.
- Applying the coefficients from the model allows us to decompose the drivers.
- Income growth and falling interest rates as the primary drivers.
- Housing supply slightly outpaced household growth causing a drag on house price growth.



Source: Oxford Economics

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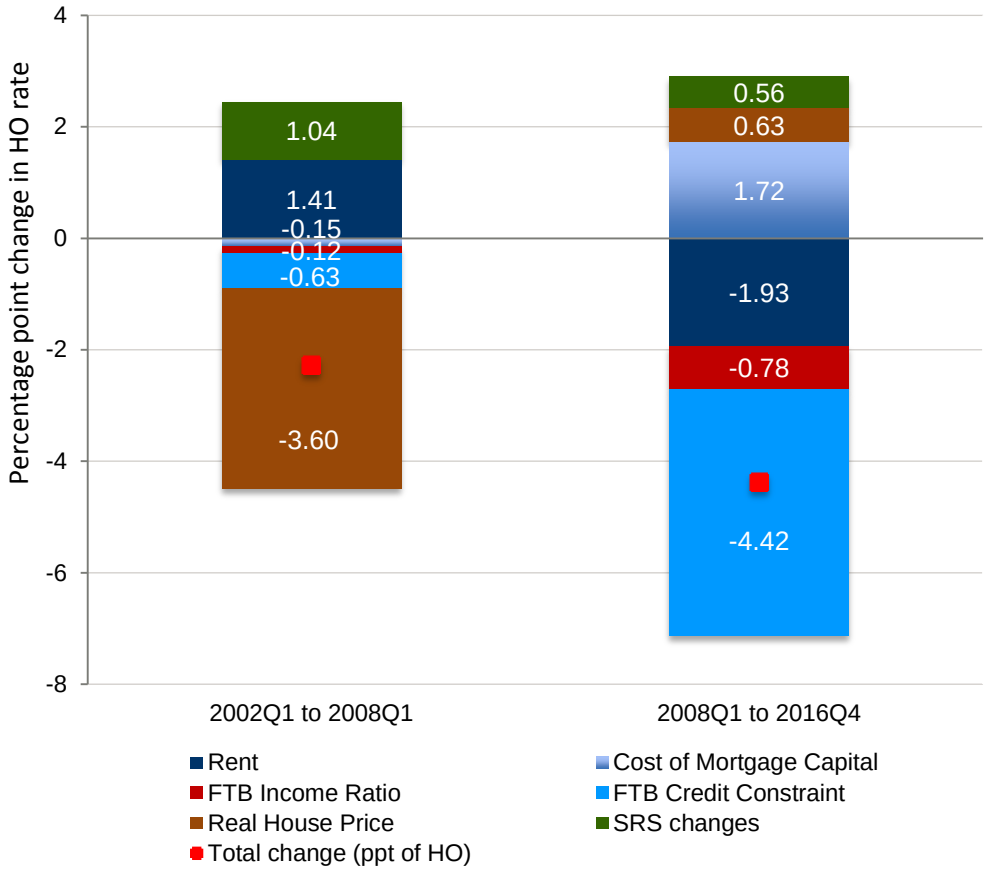
CONTRIBUTIONS

Homeownership – before and after the GFC



- Home ownership peaked in 2002 and has since fallen, particularly after the financial crisis.
- Before the crisis a 2.3ppt fall, with house price increases the dominant factor.
- After the crisis a 4.3ppt fall with FTB credit conditions and weak income growth for younger workers the key contributors.

Source: Oxford Economics

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CONCLUSIONS

- **Housing supply** did not contribute to the 150% increase in house prices between 1996 and 2016. It was in fact a drag on price growth because the stock rose faster than the number of households.
- **Income and falling interest rates** were the key determinants.
- **Higher rates of supply** would put downward pressure on prices, but the sensitivity is such that plausible rates would not reverse the price growth of recent years.
- **Collapse in home ownership after 2007** was primarily caused by the near suspension of high-LTV lending after the crisis.
- **Relative incomes of younger workers** after the GFC also a factor in declining home ownership.
- **Housing supply and home ownership** rates aren't positively related.
- **Endogeneity of household formation** to housing costs is weak.

POLICY IMPLICATIONS

- **Supply as the solution to high prices?** The effect of 300,000 houses per year for 10 years would be in the order of 5% off prices all else equal. Helpful but not a solution to very high house prices.
- **'If you build it, they *won't* come'**. Sensitivity of household formation to housing cost suggests that building much ahead of household formation rates will result in growing stock of vacant houses.
- No evidence that increased **supply raises home ownership**. Other policy solutions are required if high home ownership is desirable.
- GFC and subsequent mortgage regulation: is there is a trade-off between **home ownership and financial stability**?
- Help to Buy schemes can be seen as **socialising the financial risk of high home ownership** – an off-balance sheet return to MIRAS?
- Without a return to high-LTV lending or a bigger social rented sector, a **bigger PRS is here to stay**.
- **Trilemma of home ownership policy?** Policymakers can have any two of: high home ownership rates, fiscal neutrality with respect to tenure, or financial stability – but not all three.

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