Lectures 13 – Housing

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1 Intro to housing

1. Today we start 3rd section of the course
   (a) Section 1: Location choice models
   (b) Section 2: Transportation
   (c) Section 3: Housing
2. Overview of Lectures 13-17
   (a) Consumer decision problems
      i. Housing is durable
         A. No longer a static model. Both current prices and interest rates and future prices and interest rates matter.
         B. Consumer must decide whether to buy or rent.
      ii. Chooses to buy if user cost of ownership is lower than rental cost.
      iii. Durable good.
         A. Housing value should equal present value of rent in equilibrium.
         B. What is present value?
   (b) Public interventions in housing markets.
      i. Tax treatment of housing.
      ii. Rent control.

iii. Housing subsidies: supply side vs demand side.
iv. Regulation.

(c) Externalities and market failures related to housing

i. Abandoned buildings potentially cause negative externalities
ii. Safety related externalities exist.
iii. Market insurance against housing price fluctuations is often not available.
iv. Borrowing constraints are important.
v. Contracts between landlords and tenants and between neighbouring owners can be costly to enforce.

2 Housing: Why is it different?

1. It is both an important asset and and an important consumption good.

   (a) Importance as an asset.

      i. The lifespan of a house can range from a few years to 100's of years.
      ii. Value of the house comes from current services provided plus present value of future services.
      iii. Housing is one of the most important assets.
         A. End of 2002, housing stock in UK excluding land accounted for 40% of total UK capital stock.
         B. 86% of the housing stock owned by households.
         C. In the UK, the average house price to average income ratio rose from 2.64 in 1969 to 4.76 in 2006. It was higher in London.
         D. Housing is the largest component of wealth for nearly all households. The major components of wealth are: 1) housing, 2) value of human capital (present value of future earnings), 3) present value of pension, 4) savings.
         E. In the UK, approximately 70% of households own. In the US, approximately 65% own. Other western European countries typically have lower rates of homeownership.

   (b) Importance as a consumption good.
      i. In 2002, housing expenditures made up about 17% of UK household expenditures.
   (c) Importance as collateral.
   (d) Risk in house prices is important.

2. Transaction costs in both renting and buying/selling are large.
   (a) Stamp duty, varies between 1-5% of the house value.
   (b) Search costs are large.
      i. One day a week for a month is 4 days.
      ii. Two months, 8 days.
   (c) Moving costs in time and materials are large.
   (d) Fees associated with buying and or selling are large: realtors fees, legal fees, insurance fees, etc.
   (e) Management costs of rental property.

3. Housing related externalities
   (a) Fire hazard and other building safety issues.
   (b) Architectural and aesthetic values.
   (c) Noise and other nuisances from use.
   (d) Potential spillovers of quality on labour productivity, crime, public health.
   (e) Pollution
      i. Water pollution.
      ii. Air pollution.

4. Other issues (that we will ignore).
   (a) Quality variations in housing are important.
   (b) Housing value depends on location for a number of reasons.
   (c) Demolition and renovation costs are very large.
      i. Complementarity between land value and house value

3 Relation between rent and value: simplest case

1. The issues above potentially make analysis of housing complicated. Instead of addressing all the issues at once, we will treat them one at a time. So, for the time being, we will ignore almost all of the above complications.

2. Instead, assume all housing is homogenous and each person consumes one unit. For example, one unit of housing could be defined as one one-bedroom flat in Camden. The consumer must decide whether to rent or buy. To analyse this problem we must take into account dynamics. Assume that the consumer would like to live in the flat for T years.

3. If the consumer rents, they pay rent R_t per year. Assume the first rental payment is made at time $t = 0$,at the beginning of year 0. That is, assume that $R_0 > 0$. The consumer rents for T years paying R_0, $R_1, ..., R_{T-1}$.

4. If the consumer buys, they pay V_0 now, hold the property for T years and then sell at the end of year $T - 1$ for value V_T.

5. Should they rent or buy? Remember, we are considering the choice between renting a flat and buying an **identical** flat. The two are **identical in every dimension** including size, quality, and location.

6. The consumer should rent if the cost of renting is lower than the cost of owning. The cost of owning is V_0. To make a proper comparison, we must compare this with the *present value* of the stream of rental payments. The *present value* of the stream of rental payments is the sum of the future rental payments discounted by the interest rate. See below.

7. We need to make some assumptions about borrowing and lending. Assume the consumer can borrow and lend at interest rate i.

   (a) We assume that i is contant across time.

   (b) We assume that there is no inflation and that the value of the house will not increase or decrease over time. That is, we assume that $V_0 = V_T$. Remember, this is the simplest case, we will relax some of these assumptions later.

(c) We assume that the interest rate is the same for both borrowing and lending and that there are no limits on how much the consumer can borrow.

(d) This is the simplest case.

(e) We will relax some of these assumptions later.

8. How much would it cost to rent if paid R_t pounds per year for T periods?

$$\begin{aligned} C_0 &= R_0 + \frac{R_1}{1+i} + \frac{R_2}{(1+i)^2} + ... + \frac{R_{T-1}}{(1+i)^{T-1}} \qquad (1) \\ &= \sum_{t=0}^{T-1} \frac{R_t}{(1+i)^t}. \end{aligned}$$

(a) The value $\frac{R_1}{1+i}$ is the *present value* of R_1 pounds to be paid at the end of year 0 (or at the beginning of year 1). If one puts $\frac{R_1}{1+i}$ in the bank today at interest rate i, then at the end of the year one has $\frac{R_1}{1+i} * (1+i) = R_1$. If the consumer wants to save enough money today to pay rent R_1 at the end of the year, it will cost them $\frac{R_1}{1+i}$ today. If a consumer can borrow and lend freely at interest rate i, then they will be indifferent between paying $\frac{R_1}{1+i}$ now and paying R_1 paid at the end of year 0.

(b) Similarly, a consumer will be indifferent between paying R_2 at the end of year 1 (at the beginning of year 2) and paying $\frac{R_2}{(1+i)^2}$ now. The cost of paying $\frac{R_2}{(1+i)^2}$ now is $\frac{R_2}{(1+i)^2}$. The cost of paying R_2 at the beginning of year 1 is also $\frac{R_2}{(1+i)^2}$. To save enough today to pay R_2 at the beginning of year 1, the consumer must save $\frac{R_2}{(1+i)^2}$ today. This money will be worth $\frac{R_2}{(1+i)^2} * (1+i)^2 = R_2$ in two years' time.

(c) The total cost now of paying R_0 now, R_1 at the end of year 0, R_2 at the end of year 1, etc., is the sum of all these payments as written in equation.(1) .

9. For example, if $T = 3$, then

$$\begin{aligned} C_0 &= \sum_{t=0}^{2} \frac{R_t}{(1+i)^t} \\ &= R_0 + \frac{R_1}{1+i} + \frac{R_2}{(1+i)^2}. \end{aligned}$$

10. If $T = \infty$, then

$$C_0 = \sum_{t=0}^{\infty} \frac{R_t}{(1+i)^t}.$$

When $R_t = R$ for all t, there is a simple formula for this expression. Let $\delta = \frac{1}{1+i}$. Using this notation and the fact that $R_t = R$, the present value can be written

$$\begin{aligned} C_0 &= R \sum_{t=0}^{\infty} \delta^t \\ &= R\left(1 + \delta + \delta^2 + \delta^3 + ... + \delta^t + ...\right). \end{aligned}$$

Since $\delta = \frac{1}{1+i} < 1$, we can make use of an important fact

$$\text{FACT} \qquad \sum_{t=0}^{\infty} \delta^t = \frac{1}{1-\delta} \ .$$

This fact is very useful and can be either derived from first principles or memorized. Using this fact we can write the present value as

$$C_0 = \frac{R}{1-\delta}$$

and since $\delta = \frac{1}{1+i}$,

$$C_0 = R\frac{(1+i)}{i}.$$

Note that if $R_0 = 0$ and $R_t = R$ for $t > 0$,, then the present value becomes

$$\begin{aligned} C_0 &= R\frac{(1+i)}{i} - R \\ &= \frac{R + iR}{i} - R \\ &= \frac{R}{i}. \end{aligned}$$

11. Assuming $R_0 = R_t = R > 0$, in the case where $T = \infty$, the consumer should rent if $\frac{R(1+i)}{i} < V_0$ and should buy if $\frac{R(1+i)}{i} > V_0$. The consumer is indifferent between renting and buying if

$$V_0 = \frac{R(1+i)}{i}$$

Thus, the fair market value for a flat that earns rent R per year over an infinite horizon is

$$\begin{aligned} V_0 &= C_0 = \sum_{t=0}^{\infty} \frac{R}{(1+i)^t} \\ &= \frac{R(1+i)}{i}. \end{aligned}$$

This is the fair market value because an investor is indifferent between having V_0 in cash and owning a flat that pays R per year if and only if the value of the flat is equal to V_0. This assumes

(a) The ability to borrow and lend as much as you want at interest rate i.

(b) i, R, and V are constant forever.

(c) Zero transaction costs.

12. Note the dual role of housing. When considered as a consumption good, a consumer is indifferent between paying V_0 and R per year to enjoy the services of the flat. From this perspective, both V_0 and R are costs. When considered as an investment good, an investor (who could be a consumer) is indifferent between having V_0 in cash and paying V_0 to buy a flat that earns R per year in rent. From this perspective, V_0 is the value of the flat or asset and R is the flow of dividends. An investor who lives in their flat (a flatowner) is both an investor and a consumer. The owner of a flat of value V_0 who lives in that flat is effectively paying himself or herself rent of R per year. Their income from rent is R per year. Their costs in rent are also R per year. This is the opportunity cost of using the flat. If the owner did not use the flat, they could rent it to someone else.

13. User cost or opportunity cost of ownership

(a) Consider a flatowner who owns a flat of value V. If they sell the flat and invest the money at interest rate i, then they will earn $R = iV$ forever. We define $R = iV$ to be the user cost of owning a flat outright. It is the opportunity cost of *not selling* the flat.

(b) Consider a flatowner who borrows V to purchase the flat. They must pay iV at the end of every year in interest costs. Hence, $R = iV$ is the user cost of ownership to an owner who borrows to purchase their flat.

(c) In both cases, the user cost of owning the home is $R = iV$.

14. This is the simplest case. In the next lecture we will consider the impact of

    (a) Taxes.

    (b) Maintenance costs.

    (c) Capital gains.

    (d) Inflation.