

Economics 26 – Lecture 11

The Mortgage Market

Professor Katerina Simons
Dartmouth College



Today

The Mortgage Market

- Mortgage Basics
- Mortgage Characteristics
- Mortgage-Backed Securities

Mortgage Basics

- A mortgage is a long-term loan secured by real estate.
 - Often for a home
 - Often for 15 or 30 years
- Generally amortized
 - Equal payments, usually each month.
 - Amount of each payment that is principal repayment rises each month.

Mortgage Loan Borrowers

TABLE I Mortgage Loan Borrowing, 2001

Type of Property	Mortgage Loans Issued (\$ billions)	Proportion of Total (%)
One- to four-family dwelling	5,285	75.33
Multifamily dwelling	419	5.97
Commercial building	1,203	17.15
Farm	110	1.55

Source: Federal Reserve Bulletin, 2001, Table 1.54.

How Payments are Determined

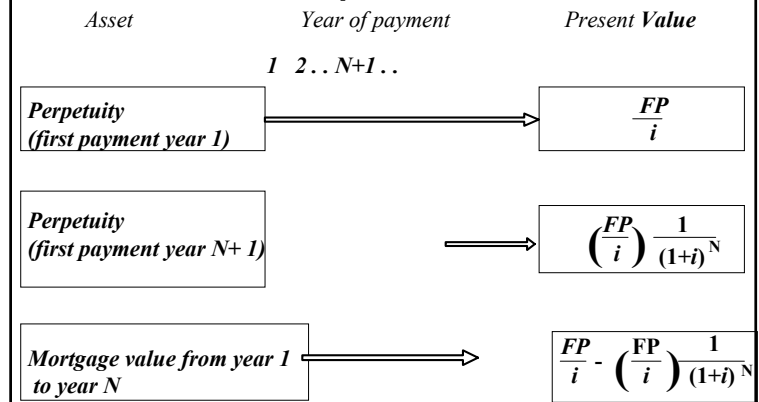
- A mortgage is a fixed-payment loan.
- Unlike a coupon bond, a large payment is not due at maturity.
- For a 30 year mortgage,

$$LV = \frac{FP}{(1+i)} + \frac{FP}{(1+i)^2} + \dots + \frac{FP}{(1+i)^N}$$

where $N = 360$ and $i = \text{annual rate} \div 12$

- Given LV , i , and N , we can solve for FP .

Present value of Mortgage as Difference Between Values of Two Perpetuities



Present Value of Mortgage (Cont.)

- Suppose $N = 360$ months.
- Consider a perpetuity that starts now and pays FP forever. Consider a second perpetuity that starts in month 361 and pays FP forever.
- The difference between the two perpetuities must be equal to the present value of the mortgage (i.e., an annuity that starts now pays FP for 360 months).

$$LV = FP \left[\frac{1}{i} \left(1 - \frac{1}{(1+i)^N} \right) \right]$$

Distribution of Principal and Interest

- Each payment consists of principal and interest.
- The amount of principal in each monthly payment increases over time.
- For example, consider a 1 year mortgage for \$1,125.51 at a 12% annual interest rate

$$LV = FP \left[\frac{1}{i} \left(1 - \frac{1}{(1+i)^N} \right) \right]$$

- $LV = \$1,125.51$, $i = 0.01$, $N = 12 \Rightarrow FP = \100

Distribution of Principal and Interest

i = 12%					
Month	FP	PV	Interest Paid	Principal Paid	Principal Remaining
1	\$100	\$99.01	\$11.26	\$88.74	\$1,036.76
2	\$100	\$98.03	\$10.37	\$89.63	\$947.13
3	\$100	\$97.06	\$9.47	\$90.53	\$856.60
4	\$100	\$96.10	\$8.57	\$91.43	\$765.17
5	\$100	\$95.15	\$7.65	\$92.35	\$672.82
6	\$100	\$94.20	\$6.73	\$93.27	\$579.55
7	\$100	\$93.27	\$5.80	\$94.20	\$485.34
8	\$100	\$92.35	\$4.85	\$95.15	\$390.20
9	\$100	\$91.43	\$3.90	\$96.10	\$294.10
10	\$100	\$90.53	\$2.94	\$97.06	\$197.04
11	\$100	\$89.63	\$1.97	\$98.03	\$99.01
12	\$100	\$88.74	\$0.99	\$99.01	\$0.00
		\$1,125.51			

Mortgage Example

- 30-year \$100,000 fixed rate mortgage at 12% p.a. with monthly repayments.
- The present value of the repayments is the amount you borrowed:

$$LV = FP \left[\frac{1}{i} \left(1 - \frac{1}{(1+i)^N} \right) \right]$$

$$100,000 = 1,028.61 \times \left[\frac{1}{.01} \left(1 - \frac{1}{(1+.01)^{360}} \right) \right]$$

Mortgage Characteristics

- Interest Rates
- Loan Terms
- Types of Mortgages
 - Fixed-Rate
 - Adjustable

Loan Contract Terms

- APR - annual percentage rate
 - Monthly interest rate = APR / 12.
 - Points, costs, and fees required to be reported by law.
- Down payment -- 5-20% of purchase price.
- Collateral - usually property being financed
 - A *lien* is placed on property until loan is paid off. (Gives bank legal right to seize it if borrower defaults.)
- Closing costs and fees
 - e.g., origination fee, credit report fee, appraisal fee, title search fee, attorney fee, title insurance fee,...
- Other terms
 - Borrower qualification, insurance requirements, residence requirements.

Interest Rate Determinants

- Market Rates
 - Which market rates influence mortgage loan rates?
- Term
 - How does the length of a mortgage affect its interest rate? Why?

Mortgage Rates versus Treasury Bonds



Figure 11-1: Mortgage Rates and Long-Term Treasury Interest Rates, 1985–2002

Current mortgage interest rates
<http://www.interest.com/>

Average Mortgage Rates by Term

Year	30-year	15-year
1992	8.39	7.96
1993	7.31	6.83
1994	8.36	7.86
1995	7.93	7.48
1996	7.81	7.32
1997	7.60	7.13
1998	6.94	6.59
1999	7.44	7.06
2000	7.83	7.50
2001	6.61	6.09

source: <http://www.freddiemac.com>

Discount Points

- What are they? (M&E, Ch. 11, question 4)
- How do they affect mortgage rates?

Discount Points

- Discount points refer to money that you pay up front expressed as a percentage of the loan.
- Points are paid in exchange for a lower interest rate.
- Whether or not this is a good deal depends on how long you keep the loan (i.e., before you prepay).
 - You pay a fixed cost to reduce your monthly payments.
 - The longer you have the loan, the more worthwhile it is to pay this fixed cost.
 - Points are usually a bad deal if there's a good chance that you will move or refinance within ~7 years.

Effective Annual Rate

- Reflects the true costs of borrowing.
- Better for comparing mortgage terms.
- Example: annual quoted rate = 12%
⇒ effective annual rate = $(1.01)^{12} - 1 = 12.68\%$

Should you pay points?

- \$100,000 30-year loan
- Pay 2 points, lower APR from 12% to 11.5%
- Is it worth it?
- Borrow only 98,000 but pay as if borrowed 100,000

$$LV = FP \left[\frac{1}{i} \left(1 - \frac{1}{(1+i)^N} \right) \right]$$

Effective Annual Rate with Points

- First, find fixed payment at 11.5% APR:
- \$990.28 at 11.5% vs. 1,028.61 at 12%
- Your payment is less but you only borrowed 98,000 and had to come up w \$2,000
- What monthly rate will result in FP=\$990.29 for a loan of \$98,000?

$$\$100,000 = \$990.29 \times \left[\frac{1}{.009583} \left(1 - \frac{1}{(1+.009583)^{360}} \right) \right]$$

EAR with 2 Points

$$\$98,000 = \$990.29 \times \left[\frac{1}{i} \left(1 - \frac{1}{(1+i)^{360}} \right) \right]$$

- $i=0.98\%$ monthly rate
- $(1+.098)^{12} - 1 = .1242$ effective annual rate
- EAR=12.42% less than 12.68% w 12% APR and no points.
- So, it is worth it to pay 2 points if do not refinance for at least 6 years. Why?

Effective annual rate with points falls over time

- 2 points buy you a .5% reduction in APR
- APR = 11.5%

■ TABLE 2 Effective Rate of Interest on a Loan at 12% with 2 Discount Points

Year of Prepayment	Effective Rate of Interest (%)	Year of Prepayment	Effective Rate of Interest (%)
1	14.54	6	12.65
2	13.40	7	12.60
3	13.02	10	12.52
4	12.84	15	12.45
5	12.73	30	12.42

Should You Refinance? (1)

- Loan = \$100,000, 30 yrs, 12% APR, no points
- 5 years later, 9.6% APR, no points
- Find PV of remaining 300 payments at original rate:

$$PV = \$1,028.61 \times \left[\frac{1}{.01} \left(1 - \frac{1}{(1+.1)^{300}} \right) \right] = \$97,662.97$$

Should You Refinance? (2)

- Find the new fixed payment if take out \$97,662.97 mortgage at the new lower rate of 9.6%/12-0.8%

$$\$97,662.97 = \$860.08 \times \left[\frac{1}{.008} \left(1 - \frac{1}{(1+.008)^{300}} \right) \right]$$

- New monthly payment is \$860.08 or \$168.53 less.

Should You Refinance? (3)

- But wait... You have to pay \$2000 closing costs. Is it still worth it?
- PV of of the stream of 300 \$168.53 monthly savings is \$19,137.19 exceed \$2,000 cost.
- That is if you stay in the house for the next 25 yrs.
- Or just go to one of mortgage calculators on the web:
- http://www.bankrate.com/brm/calc_vml/refi/rifi.asp

Types of Mortgages

- Fixed-rate mortgage
 - The interest rate stays the same for length of mortgage (or until it is prepaid).
- Adjustable-rate mortgage (ARM)
 - The initial interest rate is usually lower than that for a fixed-rate mortgage of the same length. (Why?)
 - The rate changes with some other market rate at regular intervals (up to some limit).
 - e.g., current 1-yr ARM is 4.19% for the first year and then 2.75% above the annual average T-Bill rate with a cap on yearly changes of 2% and overall cap of 13.25%.

Fixed-Rate vs. Adjustable-Rate?

- Which type do lenders prefer?
 - ARM's pass interest-rate risk on to borrower.
 - ARM's match loan assets with short-term liabilities like deposits.
- Which type do borrowers prefer?
 - Fixed-rate mortgage has lower interest rate risk.
 - If rates rise, borrower is locked in at a low rate.
 - If rates drop, always have option to refinance.
 - May prefer ARM if will resell before rate rises.

Mortgage-Backed Securities

- What are they? (ch. 11, question 14)
 - Securities that are secured by a portfolio of mortgages.
- Why do they exist?
 - Banks often don't want to hold these long term assets (not safe to fund them with short term deposits).
 - Reduce problems caused by regional lending institutions' sensitivity to local economic conditions.
 - Give borrowers access to a national capital market.
 - Give investors low-risk, long-term investments without loan servicing costs.

Mortgage-Backed Security Creation

- A government agency (or bank) buys a large pool of mortgages and acts as the trustee of the pool.
- It issues securities that entitle owner to a share of payments from the mortgage pool.
- The government agency guarantees these securities against default.
- They are purchased by large institutional investors.
- They tend to have better yields than T-bonds and relatively low default risk (due to guarantees).

Mortgage-Backed Security Types

- Mortgage Pass-Through
- Collateralized Mortgage Obligation (CMO)
- Mortgage Strip

Mortgage Pass-Through

- A security that has the payments from the mortgages in the pool pass through the trustee before being disbursed to investors.
- All payments are passed through as they are made by borrowers.
 - This creates reinvestment risk for investors.
- If interest rates drop, borrowers may prepay and refinance their homes at lower rates.
 - This creates additional risk for investors, known as *prepayment risk*.

Collateralized Mortgage Obligation

- Divides pass-through payments by creating classes (or *tranches*) of securities that differ according to likelihood of prepayment.
- Investors choose from among the different classes to best match their investment horizons.
- Lower rated classes are given prepayments first.
 - Have a better yield than higher rated classes to compensate for greater prepayment risk.
- Salomon, Bear Stearns, Lehman, and others specialize in creating these from pass-throughs.

Mortgage Strips

- Pass-through securities which are divided into interest payments and principal payments.
- Creates securities with different durations and different prepayment risks.
- Interest-only strips (IO strips)
 - Prepayments will decrease their value.
 - ⇒ Holders want interest rates to rise (opposite of holders of most other fixed income securities).
- Principal-only strips (PO strips)
 - Prepayment increase their value (yields a higher NPV).
 - ⇒ Holders benefit from interest rate drops.

Main Government Agencies

- Federal National Mortgage Association
 - *Fannie Mae* creates pools from commercial bank and mortgage company loans.
- Government National Mortgage Association
 - *Ginnie Mae* creates pools from commercial bank and mortgage company loans.
- Federal Home Loan Mortgage Corporation
 - *Freddie Mac* creates pools from S&L loans.

Originally created to pool risk among lenders and to insure mortgages for veterans and the poor.

Mortgage-Backed Securities Market

- The Mortgage Backed Securities Clearing Corporation facilitates trade in MBS's.
- The MBS market is now very large.
- Banks no longer have to hold loans to maturity.
- These assets are now held by other investors.
- The net result is that mortgages are much more available throughout the U.S. today.

Next Class Foreign Exchange Market

- Long run determinants of exchange rates
- Exchange rates in the short run
- Interest rate parity
- Equilibrium in the foreign exchange market
- Explaining changes in exchange rates