Home Equity

The amount needed for a mortgage payment are generally larger than the amount needed to amortize a loan since the buyer must also pay taxes and insurance on their monthly mortgage. Read the example of page 807 for an example of a median priced home for a family with median income.

For what follows, we will ignore these details, as well as any increase in value of the house. The downpayment simply reduces the size of the loan that is required, so we can ignore it for now. The downpayment will simply add to the equity you have in your house.

We saw in the previous lecture that when a home loan is amortized, you pay towards the interest and the principal with each payment. Your early payments are heavily weighted towards the interest, and very little goes towards reducing the principal. Equity refers to the amount of money you have paid towards paying off the principal in your home.

Example You purchase a home for $89,000 with an annual interest rate of 6.375% and a 30 year mortgage. How much equity do you have in the house after 5 years?

First, we need to know how much the monthly payment is for this house. We can use the amortization formula to figure this out:

$$
\begin{aligned}
P &= d\left[\frac{1-(1+i)^{-k}}{i}\right] \\
\$89,000 &= d\left[\frac{1-(1+0.06375/12)^{-360}}{(0.06375/12)}\right] \\
\$89,000 &= d\,[160.29] \\
d &= \frac{\$89,000}{160.29} = \$555.244
\end{aligned}
$$

Now, for the equity. The principal at time 0 is the entire $89,000, and the principal after 360 payments should be $0:

$$
\begin{aligned}
P &= d\left[\frac{1-(1+i)^{-(360)}}{i}\right] \\
&= \$555.244\left[\frac{1-(1+0.06375/12)^{-(360)}}{(0.06375/12)}\right] \\
&= \$89,000
\end{aligned}
$$

$$
\begin{aligned}
P &= d\left[\frac{1-(1+i)^{-(360-360)}}{i}\right] \\
&= \$555.244\left[\frac{1-1}{(0.06375/12)}\right] \\
&= \$0
\end{aligned}
$$

The above motives the following. Now we can use the amortization formula again, this time to figure out what the principal is after 5 years or $5 \times 12 = 60$ months.

$$
P = d\left[\frac{1-(1+i)^{-(360-60)}}{i}\right]
$$

$$= \quad \$555.244 \left[\frac{1 - (1 + 0.06375/12)^{-(360-60)}}{(0.06375/12)} \right]$$

$$= \quad \$83,192.34$$

Yikes! We have only paid $\$89,000.00 - \$83,192.34 = \$5807.66$ towards the principal, which is the equity we have built up after 5 years.

The equity builds slowly initially, and then grows faster near the end of the mortgage period. Here is a plot of how equity varies over time for this example: