Traditional Fixed Rate Mortgage

With a **traditional fixed rate mortgage**, the loan is repaid in equal monthly payments over the term of the loan, calculated at a fixed interest rate that applies for the entire term of the loan.

Monthly payment for 30 year (360 months) $200000 mortgage loan at 5.5% compounded monthly
$200000(1+.055/12)^{360} = m((1+.055/12)^{360}(1)/(.055/12)$
$m = \$1135.58$

Adjustable Rate Mortgage (ARM)

An **adjustable rate mortgag**e (ARM) starts out using a specified **initial interest rate**. The loan payment is calculated for the term of the mortgage using that rate. After a time specified in the loan contract (**initial period**) the interest rate for the loan may change as interest rates in general change. The interest rate adjusts again in the future at specified times (**adjustment periods**)

- A 3/1 ARM has a 3 year initial period. At the end of 3 years the interest rate adjusts, and the monthly payment is recalculated; the interest rate then adjusts at the end of every year.
- A 7/2 ARM has a 7 year initial period. At the end of 7 years the interest rate adjusts, and the monthly payment is recalculated; the interest rate then adjusts every two years.

The **adjusted interest rate** is determined by referring to an "**interest index**". The particular interest index used is specified in the mortgage agreement. A "**margin**" is added to the index rate. Recently, most of the more frequently used interest indices have been between 4% and 5%, some slightly higher. One bank states on its website that the margin usually is between 2% and 3%. If the index was 5% and the margin was 2%, then the adjusted rate would be 7% = 5% + 2%.

When the adjustable rate mortgage loan is taken out, the initial interest rate is used to calculate the initial monthly payment as if it would apply for the entire term of the mortgage
At any later time that the interest rate is adjusted, the payment is recalculated using a 2 step process:

- first the outstanding balance of the loan is calculated using the most recent interest rate and payment before the new adjustment
- then the new payment is calculated so that it would pay off the outstanding balance at the new adjusted interest rate over the remaining term of the loan.

In the example on the next page, a 3/1 adjustable rate mortgage is used.

- The initial payment is calculated using the initial interest rate and the 30 year term of the loan; the initial payment is paid every month for the first 3 years.
- After 3 years, the outstanding balance is found, using the initial rate and payment. The new payment is calculated at the adjusted interest rate (higher in this example).
- After another year, (end of the fourth year) the rate increases again. The outstanding balance is found using the previous rate and a new payment is calculated using the new adjusted rate and the remaining term of the loan.
- One year later (end of the fifth year) the rate adjusts again (this time it decreases in this example). Again, the outstanding balance is found using the previous rate and a new payment is calculated using the new adjusted rate and the remaining term of the loan.

As long as interest rates change, the monthly payment on this mortgage will be adjusted at the end of each year for the rest of the term of the loan.

Adjustable Rate Mortgage Example

$200,000 30 year 3/1 ARM with interest rates:
- 5% in years 1 through 3
- at end of year 3, rate adjusts to 6% for year 4;
- at end of year 4, rate adjusts to 7% for year 5;
- at end of year 5, rate adjusts to 6% for year 6;

For years 1 through 3:
For a $200,000 3/1 ARM with an initial interest rate of 4%, the initial payment is

Monthly payment for 30 year (360 months) $200000 mortgage loan at 4% compounded monthly
$200000(1+.04/12)^{360} = m((1+.04/12)^{360}(1)/ (.04/12)$
$m = \$954.83$

End of year 3; start of year 4:
Suppose that at the end of the third year the interest rate increases to 6%.

After paying $954.83 for 3 years (36 months) at 4%, at the end of the third year the present value of the outstanding loan is $188997.33:
There are 360 – 36 = 324 months remaining; OR find this as (12)(30 – 3) = 12(27) = 324
$P(1+.04/12)^{324} = 954.83 ((1+.04/12)^{324}(1)/ (.04/12)$
$P = \$188997.33$

Monthly payment for 324 month (27 years remaining) $188997.33 mortgage loan at 6%.
$188997.33 (1+.06/12)^{324} = m((1+.06/12)^{324}(1)/ (.06/12)$
$m = \$1179.32$

End of year 4; start of year 5:
Suppose that at the end of the fourth year the interest rate increases to 7%.

At the end of the fourth year the present value of the outstanding loan is $186107.43:
There are 360 – 48 = 312 months remaining; OR find this as (12)(30 – 4) = 12(26) = 312
$P(1+.06/12)^{312} = 1179.32 ((1+.06/12)^{312}(1)/ (.06/12)$
$P = \$186107.43$

Monthly payment for a 312 month (26 years remaining) $186107.47 mortgage loan at 7%.
$186107.43 (1+.07/12)^{312} = m((1+.07/12)^{312}(1)/ (.07/12)$
$m = \$1296.87$

End of year 5; start of year 6:
Suppose that at the end of the fifth year the interest rate decreases back to 6%.

At the end of the fifth year the present value of the outstanding loan is $183490.12:
There are 360 – 608 = 3002 months remaining; OR find this as (12)(30 – 5) = 12(25) = 300
$P(1+.07/12)^{300} = 1296.87 ((1+.07/12)^{300}(1)/ (.07/12)$
$P = \$183490.12$

Monthly payment for a 300 month (25 years remaining) $183490.12 mortgage loan at 6%.
$183490.12 (1+.06/12)^{300} = m((1+.06/12)^{300}(1)/ (.06/12)$
$m = \$1182.23$