Shared Appreciation Mortgage (SAM)

- For example, Paul wants to buy a house sold for 275,000. He needs a mortgage of 200,000. Two mortgage options:
- Option 1- A standard mortgage: 200,000 with j2=15%, monthly payment, amortized over 25 years, 8-year term. j2=15% is the market rate.
- Option 2 - Shared Appreciation Mortgage (SAM): a lower j2=12% (bonus rate), but has to give the banker 20% of any increase in the property value (called SHARE); The SHARE is payable whenever the house is sold or if not sold at some deemed date (for example, at the end of 8 years). also monthly payment, amortized over 25 years, 8 year term.
- Question: Assume house price grows 10% each year, and Paul expects to sell the house in 8 years, which option to pick?

For Option 1, what is the PV of its costs (cash outflows)?

Two costs for Paul: (1) pay a monthly payment for 96 months (=12*8); (2) at the end of year 8, need to pay back an amount of OSB96.

1) Get PMT: i=1.2126403; PV=200,000;N=300; FV=0;CPT PMT=2492.30;
2) Get OSB96: PMT & i & PV=200,000: above; N= 96, CPT FV =187,947.31;
3) Get PV of the above costs:

PV of a monthly payment of 2492.30 for 96 months (PV of annuity):

i=1.2126403; N=96, PMT= - 2492.30; FV=0; CPT PV= 140,911.94

PV of the OSB96: i & N: above; PMT= 0; FV =OSB96= -187947.31; CPT PV= 59,088.06

Total PV = 200,000

For Option 2, what is the PV of its costs?

Three costs for Paul: (1) pay a lower monthly payment for 96 months (=12*8); (2) at the end of year 8 after sale, pay the OSB of the loan, and (3) at the same time give away 20% of increase in property value – the SHARE.

1) Get PMT: i=0.9758814; PV=200,000; N=300, FV=0; CPT PMT=2063.80;
2) Get OSB96: i & PV & PMT: above; N=96; CPT FV=182,315.75;
3) What is the SHARE?

Property value in 8 years: i = 10; N = 8; PMT = 0; PV = -275,000;

CPT FV=589,486.92

Increase in property value = 589,486.92 – 275,000 = 314,486.92

SHARE = 20% * 314,486.92 = 62,897.38

PV of the three costs:

PV of a monthly payment of 2063.80 for 96 months:

i=1.2126403; N=96, PMT= - 2063.80; FV=0; CPT PV= 116,685.02

PV of the OSB96:

N: above; i=1.2126403; PMT= 0; FV =OSB96= -182315.75; CPT PV= 57,317.57

PV of the SHARE:

N: above; i=1.2126403; PMT= 0; FV = -62897.38; CPT PV= 19,774.07

Total PV = 193,776.66

Decision:

PV of the costs: Option 1 = 200,000 > Option 2 = 193,776.66

→ *Pick option 2*

Question: is Option 2 always the better one?

- Not always, it depends
- The higher the growth rate, the costlier Option 2 → less favored

The 'break-even' housing growth rate:

➔ The rate which makes the two options same good.

Option 1 - Standard mortgage, PV of costs = 200,000;

Option 2 - SAM: three costs; first two are not affected by housing price growth

- PV of a monthly payment of 2063.80 for 96 months = 116,685.02
- PV of the OSB96 = 57,317.57

Two options same good means:

116,685.02 + 57,317.57 + PV of the SHARE = 200,000

PV of the SHARE = 25,997.41

From here, we then back out the growth rate

1st step:

N=96; i=1.2126403; PMT= 0; PV = 25,997.41; CPT FV= 82, 692.57

82, 692.57 is the dollar amount of SHARE to give up 8 years from now.

2nd step: SHARE is 20%

82,692.57 / 20% = 413,462.86

413,462.86 is the increase of property value over 8-year term

3rd step: terminal property value (the value in 8 yrs)

275,000 + 413,462.86 = 688,462.86

4th step:

N = 8; PMT = 0; PV = -275,000; FV = 688,462.86; CPT i = 12.15

In conclusion, when housing growth rate:

= 12.15%, same good;

> 12.15%, Option 1 better;

< 12.15%, Option 2 better.

Price Level Adjusted Mortgage (PLAM)

- Lenders concerned with inflation and want to adjust mortgage payments to reflect the rate of inflation.
- Without such adjustments, money loaned today is repaid with 'cheaper' or deflated dollars.
- PLAM protects the lenders from a loss in purchasing power of their money loaned. Preferred in high inflation environment.

How does PLAM work?

Example: Jane wants a mortgage of 100,000. Her banker offers a PLAM plan. For simplicity, assume it is annual payment, the rate is 7% compounded annually, amortized over 25 years.

PMT for year 1: PV=100,000; i=7; N=25; FV=0; CPT PMT = 8581.05

- Suppose inflation rate of year 1 is 9%. At the end of year 1: make two adjustments based on the inflation rate.
- First adjustment is made for the OSB at the end of 1st year:
  - OSB1 before adjustment: PV & i & PMT: above; N=1; CPT FV=98,418.95
  - OSB1 after adjustment: 98,418.95 * (1 + 9%) = 107,276.66
- Second adjustment is for PMT – this will be the PMT for year 2:
  - PMT of year 2 = 8,581.05 * (1 + 9%) = 9,353.34

Similarly, at the end of 2nd year, two adjustments. Suppose inflation is 4% for year 2.

- First adjustment is for the OSB at the end of 2st year:
  - OSB2 before adjustment:
  - i = 7; PV = 107,276.66; PMT = -9,353.34; N = 1; CPT FV = 105,432.69
  - OSB2 after adjustment:
  - 105,432.69 * (1 + 4%) = 109,650.00
- Second adjustment for PMT – this will be the PMT for year 3
  - PMT of year 3 = 9,353.34 * (1 + 4%) = 9,727.47
- At the end of year 3, suppose the inflation rate of year 3 = 10%. You can make similar adjustments.

So, under PLAM, amortization schedule looks like:

Year	Beginning OSB	PMT	Ending OSB before adjustment	Ending OSB after adjustment
1	100,000.00	8,581.05	98,418.95	107,276.66
2	107,276.66	9,353.34	105,432.69	109,650.00
3	109.650.00	9,727.47	107,598.03	118,357.83

How does Simple Reverse Mortgage (SRM) work?

Example: Mr. Elder, age 70, has a life expectancy of 10 years, and wants to get a reverse mortgage to improve his monthly income. His house is worth 300,000 which is debt-free, i.e. all is equity. CHIP gives him a reverse mortgage of 75,000 with a term of 10 years equal to his life expectancy & j2 =8%. He opts to let CHIP serve him monthly payments.

Questions:

1) What is the monthly cash flow he will receive?

PV = 75,000; i=0.6558198; N= 120, FV=0;

CPT PMT= 904.81

2) What is the loan amount at the end of the term? FV of the loan.

PV = 75,000; i = 0.6558198; N = 120; PMT = 0

CPT FV = 164,344.26

3) Suppose the house value appreciates 2% per year and at the end of the term how much equity left in his home?

PV = 300,000; i = 2; N = 10; PMT = 0

CPT FV = 365,698.33

Equity = 365,698.33 – 164,344.26 = 201,354.07

- At the end of the term, if senior still alive, two options:

1) Sell the house, pay the loan, take the equity, and move to somewhere like retirement housing.

2) Borrow another reverse mortgage based on the equity left (which is still quite large in the above example).