Interest-Only Loans

Borrowers with interest-only loans don't make any principal payments. Their entire loan payments are interest. So the loan is not paid off until the very last payment when the original amount must be fully repaid, plus the interest over that last month.

Often this big amount is paid off by re-financing (rolling over) the debt which means borrowing again, or by selling the house.

Most interest-only loans in Australia are actually interest-only for 5 years or less. After this, they convert to fully amortising loans.

Interest-Only Loan Valuation

Interest only loans are easily valued using the 'perpetuity without growth' formula:

$$V_{0\ interest\ only} = \frac{C_1}{r} = \frac{C_{1\ monthly}}{r_{eff\ monthly}} = \frac{C_{1\ monthly}}{\left(\frac{r_{APR\ comp\ monthly}}{12}\right)}$$

This makes sense since an interest-only loan that is repeatedly refinanced always has the same principal, it's never paid off. If the interest rate is constant forever, then the borrower will pay constant interest cash flows ($C_1 = C_2 = C_3 = \cdots$) perpetually.

Another way of looking at the interest-only loan is to assume that the final principal payment is paid off without refinancing. The initial price (V_0) is the present value of the interest payments (C_1, C_2,…) and *also* the final principal payment (V_T):

$$\boldsymbol{V_0} = \frac{C_1}{r}\left(1 - \frac{1}{(1+r)^T}\right) + \frac{V_T}{(1+r)^T}$$

Substitute $V_T = \boldsymbol{V_0}$

$$\boldsymbol{V_0} = \frac{C_1}{r}\left(1 - \frac{1}{(1+r)^T}\right) + \frac{\boldsymbol{V_0}}{(1+r)^T}$$

$$\boldsymbol{V_0} - \frac{\boldsymbol{V_0}}{(1+r)^T} = \frac{C_1}{r}\left(1 - \frac{1}{(1+r)^T}\right)$$

$$\boldsymbol{V_0}\left(1 - \frac{1}{(1+r)^T}\right) = \frac{C_1}{r}\left(1 - \frac{1}{(1+r)^T}\right)$$

$$\boldsymbol{V_0} = \frac{C_1}{r}$$

Calculation Example: Interest Only Loans

Question: Mortgage rates are currently **6**% and are not expected to change. You can afford to pay $**2,000** a month on a mortgage loan. The loan term is **30** years (matures in 30 years). What is the most that you can borrow using an interest-only loan?

Answer: Interest-only loans are equivalent to perpetuities with no growth.

$$V_{0\ interest\ only} = \frac{C_1}{r} = \frac{C_{1\ monthly}}{r_{eff\ monthly}} = \frac{C_{1\ monthly}}{\left(\frac{r_{APR\ comp\ monthly}}{12}\right)}$$

$$= \frac{2000}{(0.06/12)} = \$400{,}000$$

Calculation Example: Interest Only Loans

Question: You wish to borrow $**10,000** for **2** years as an unsecured personal loan.

Interest rates are quite expensive at **60**% pa and are not expected to change.

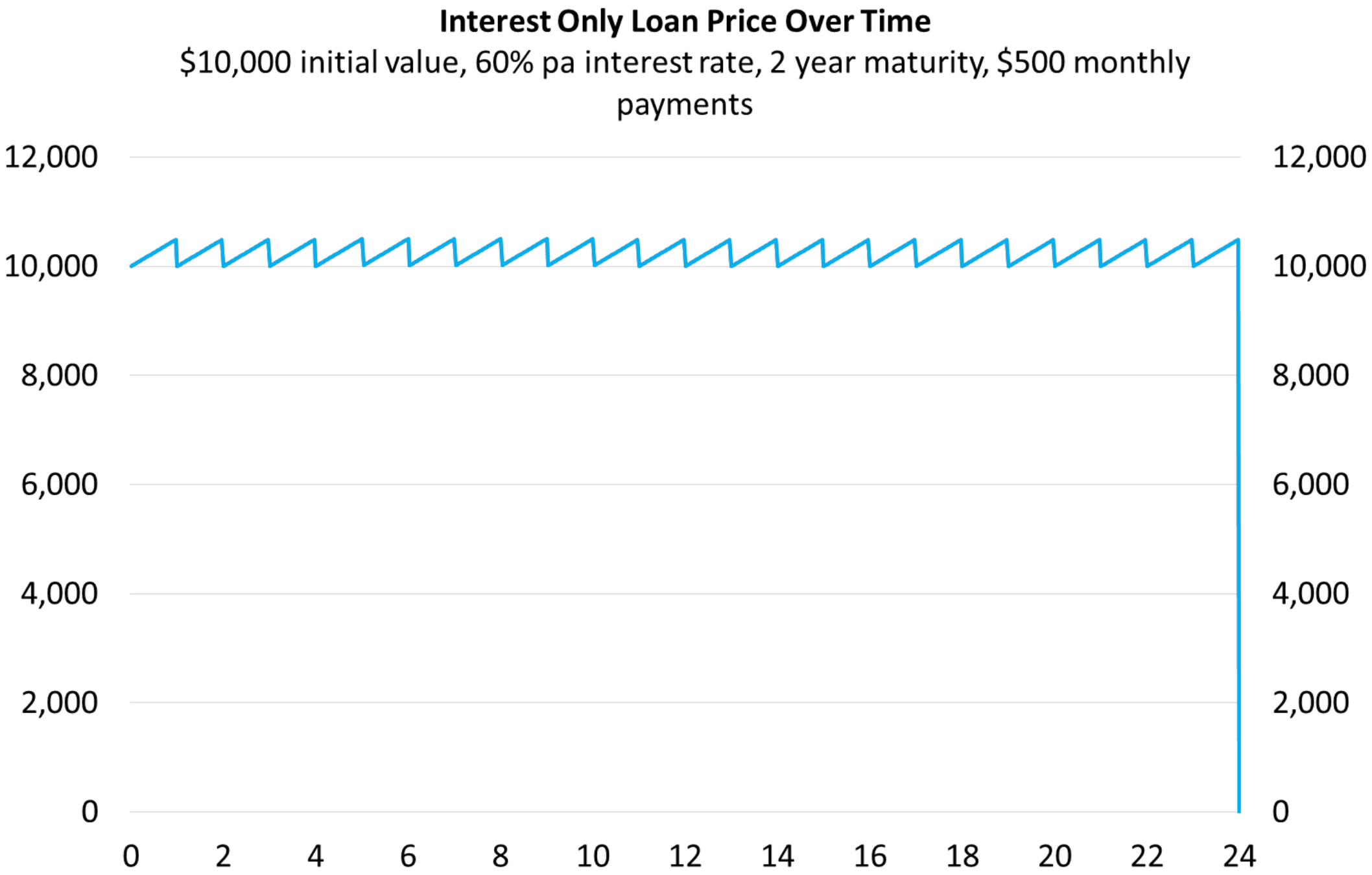
What will be your monthly payments on an interest-only loan?

Answer:

$$V_{0\ finterest\ only} = \frac{C_1}{r}$$

$$10000 = \frac{C_1}{0.6/12}$$

$$C_1 = 10000 \times 0.6/12 = 500$$


Interest Only Loan Price Over Time
$10,000 initial value, 60% pa interest rate, 2 year maturity, $500 monthly payments
12,000
10,000
8,000
6,000
4,000
2,000
0
0
2
4
6
8
10
12
14
16
18
20
22
24

Calculation Example: Loan Schedule

Interest-Only Home Loan Schedule

$1 million initial value, 3.6% pa interest rate, 30 year maturity, monthly payments

Time months	Value $	Total payment $/month	Interest component $/month	Principal component $/month
0	1000000.00			
1	1000000.00	3000.00	3000.00	0.00
2	1000000.00	3000.00	3000.00	0.00
3	1000000.00	3000.00	3000.00	0.00
4	1000000.00	3000.00	3000.00	0.00
5	1000000.00	3000.00	3000.00	0.00
…	…	…	…	…
357	1000000.00	3000.00	3000.00	0.00
358	1000000.00	3000.00	3000.00	0.00
359	1000000.00	3000.00	3000.00	0.00
360	0.00	1003000.00	3000.00	1000000.00

$$C_{1total} = V_0 . r_{eff\ monthly,0\to1} = V_0 . \frac{r_{APR\ comp\ monthly,0\to1}}{12}$$

$$= 1{,}000{,}000 \times \frac{0.036}{12} = 3{,}000$$

$$C_{1interest} = V_0 . r_{eff\ monthly,0\to1} = V_0 . \frac{r_{APR\ comp\ monthly,0\to1}}{12}$$

$$= 1{,}000{,}000 \times \frac{0.036}{12} = 3{,}000$$

$$C_{1principal} = C_{1total} - C_{1interest}$$

$$= 3{,}000 - 3{,}000 = 0$$

Questions: Interest Only Loans

http://www.fightfinance.com/?q=29,42,57,107,160,239,298,459,