3.0 FIXED INTEREST RATE MORTGAGE LOANS: PRICING, PAYMENT PATTERNS AND EFFECTIVE BORROWING COSTS

3.1 Overview of Determinants of Interest Rates

- ❖ Changing economic conditions necessitates an understanding of sources of funds for lending and the nature of how risk, economic growth, and inflation affect the availability and cost of mortgage funds.
- ❖ The demand and supply of mortgage funds must be considered when considering the determinants of interest rates on mortgage loans.
- ❖ It is determined by what borrowers are willing to pay for the use of funds over a specified period of time and what lenders are willing to accept in the way of compensation for the use of such funds.
- ❖ On the demand side the demand for mortgage loans is a derived demand i.e. determined by the demand for housing e.g.
  - No of households desiring housing
  - Their income
  - Size
  - Age
  - Tastes
  - Preferences for other goods
  - Interest rate
- ❖ The supply side of the mortgage is established by what interest rates lenders are willing to accept when providing funds to borrowers.
- ❖ The supply is a function of
  - Cost of attracting funds from savers.
  - The cost of managing and originating loans.
  - Losses from loan defaults and foreclosures.
  - Potential losses due to unexpected changes in interest rates for fixed interest rates.
- ❖ The determinants of mortgage interest rates include:

- The real rate of interest – the minimum rate of interest that must be earned by savers to induce them to divert the use of resources from present consumption to future consumption **(time preference for consumption).**
  The real rate of interest is imbedded in all interest rates and investment returns as the basic or minimal return that productive uses of funds must earn to attract savings for investment **(production opportunities in the economy)**.
- Interest rates & inflation expectation: Investors are concerned on how inflation will affect investment returns. Lenders and investors must be convinced that interest rate commitment is sufficiently high to compensate for any expected loss in purchasing power over the investment period. Therefore, lenders and investors expectations of inflation rates are incorporated into interest rates. Nominal interest rate on any investment is partially determined by the real interest rate plus a premium for the expected rate of inflation.
- Interest rate and risk: Lenders and borrowers here are concerned whether interest rates and returns available on various loans and investments compensate adequately for risk.
  Risks affecting mortgage loans include

1. Default risk – risk that borrowers will default on obligation to repay interest and principal.
   It varies with the nature of the loan and the credit worthiness of individual borrowers.
   Therefore, it necessitates charging of a premium to offset possible loan losses.
   Default may arise from fall of borrower's income or fall of property value below the loan balance.
2. Interest rate risk – arise from the fact that we live in a world of uncertainty thus future supply of savings, demand for housing, and future levels of inflation cannot be known with certainty.
   Interest rate risk refers to the uncertainty of what interest should be charged when a loan is made.
   It affects all loans especially those made with fixed interest rates.
   A premium is therefore charged to compensate for the interest rate risk.
3. Liquidity and marketability
4. Prepayment risk
5. Legislative risks – changes in the regulatory environment eg tax status, rent control etc.

❖ Summary of factors important in mortgage pricing
- Interest charged on a particular mortgage loan depends on
  1. Real interest rate
  2. Expected inflation
  3. Interest rate risk
  4. Default risk
  5. Other risks
- These relationships can be summarized in general as follows:

$$i = r + p + f$$

Where i is the rate of interest on a mortgage loan.
r is the real rate of interest
p is the premium to compensate for default and other risks
f is the premium or expected inflation

- If lenders systematically underestimate any of the components, they will suffer real economic losses.
- The fact that mortgage loans under discussion are made at fixed interest rates for long periods of time makes pricing decisions by lenders complex.
- For one year maturity loan the interest would be

$$i_t = r_1 + p_1 + f_1$$

- For longer term maturities loans an assessment of what these components of interest rates would be each year that the loan is expected to be outstanding must be made.
- The lender may form expectations of what interest rates on a series of one-year loans would be over the maturity period.

$$(1+i_t)^n = (1+i_1)(1+i_2)(1+i_3).....(1+i_n)$$

3.2 Mortgage Payment Patterns

Development of Mortgage Payment Pattern

- In the early days when there was relatively stable economic environment characterized with very low rates of inflation, changes in mortgage instruments occurred gradually. However, volatility in interest rates and inflation since the 1970's led to changes in the design of mortgage loan instruments.

- Early mortgage lending patterns characteristics:
  - Lenders required substantial down payment from borrowers.
  - Lenders would limit maximum loan amounts to 50% of property value.
  - The term of the loans ranged from one year to a maximum of five years.
  - Repayments were generally interest only with the full loan balance due after five years.
  - Key facts in the early times were:
    1. Mortgage loans were considered to be very risky
    2. The borrower's ability to repay the loan was considered far important than the collateral value.
    3. Non renewal of loan after the term meant that the borrower could be required to repay the full loan balance.

3.2.1 The Constant Amortization Mortgage Loan (CAM)

- With economic prosperity lenders recognized the possibility that longer term loans could be made with increase in real incomes.
- Lenders were willing to make longer-run assessment of both the borrower and the collateral when making lending decision.
- Lenders devised loans referred to as self-amortizing loan made for longer term with monthly payments consisting of partial repayment of principal.
- Amortization means the process of loan repayment over time.
- The first effort to accomplish this was referred to as Constant Amortization Mortgage (CAM) loan.
- Determination of payment under CAM
  1. Computing a constant amount of each monthly payment to be applied to the principal.
  2. Computing interest on the monthly loan balance.
  3. Total monthly payment was determined by adding the constant amount of monthly amortization and interest on the outstanding loan balance.
- Illustration (BFS, page 105)

Loan made	-	sh 60,000
Loan term	-	30 Years
Interest	-	12% compounded monthly

Amortization	=	sh 60,000/360 Months
	=	sh 166.67 p.m

Monthly Payment and loan Balance (Constant Amortization Loan)

(1) Month	(2) Opening Balance	(3) Interest (.12÷12)	(4) Amortization	(3) + (4) Monthly Payment	(2) - (4) Ending Balance
1	60,000.00	600.00	166.67	766.67	59,833.33
2	59,833.33	598.33	166.67	765.00	59,666.67
3	59,666.67	596.67	166.67	763.33	59,500.00
4	59,500.00	595.00	166.67	761.67	59,333.33
5	59,333.33	593.33	166.67	760.00	59,166.67
6	59,166.67	591.67	166.67	758.33	59,000.00
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
360	166.67	1.67	166.67	168.34	0

- From the above table it can be noted that:
  - Monthly payment declines each month.
  - Interest in the early months is far much higher than the monthly amortization.
  - Interest declines below the monthly amortization towards loan maturity.

- CAM is considered an improvement but still very conservative since:
  - Emphasized amortization of loan
  - Ignores increase of borrowers' growth in real income hence
- Warranted further modification to the fully amortization, constant payment mortgage loan.

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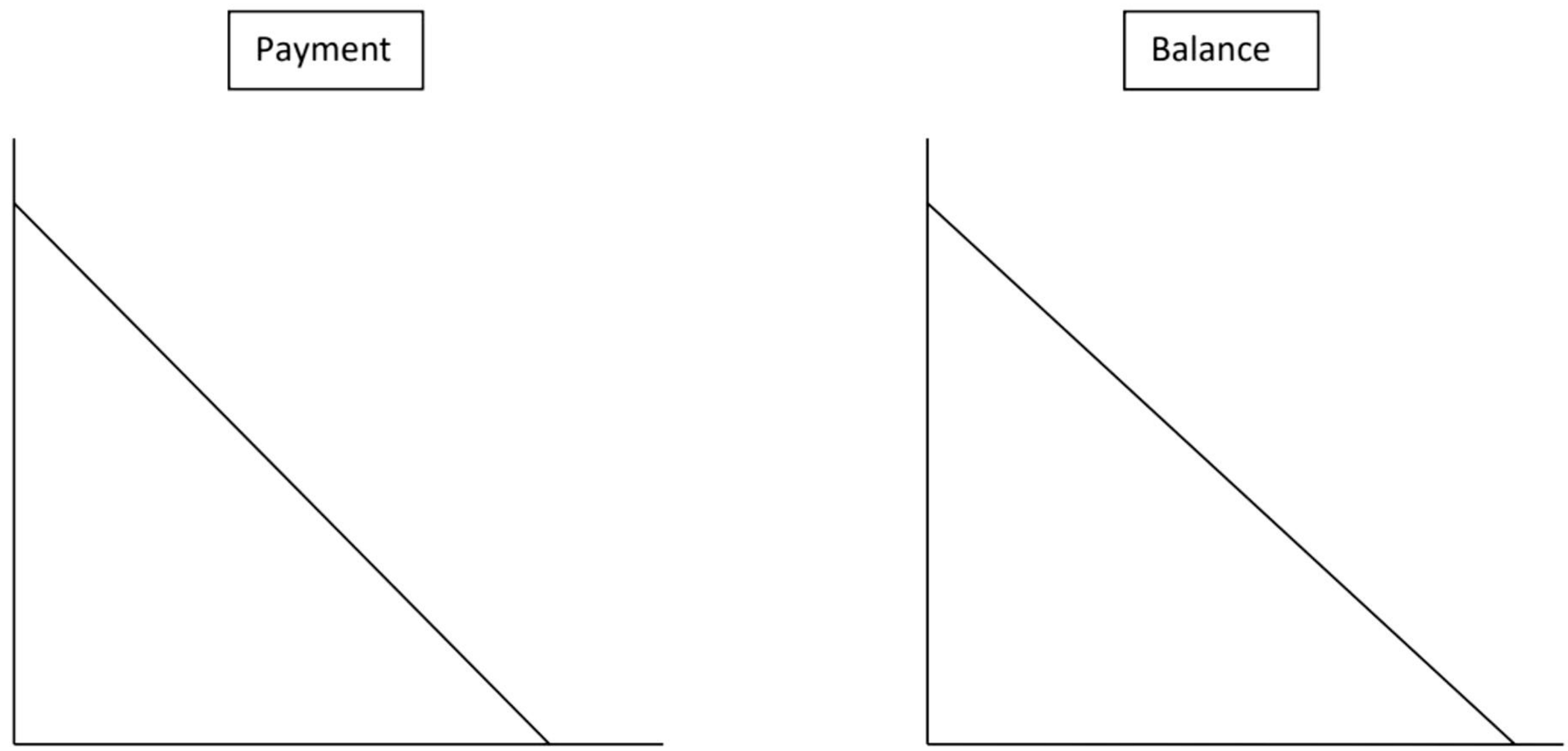
Figure 1 Loan payment and balance patterns for CAM



3.2.2 Fully Amortizing constant Payment Mortgage Loan (CPM)

- Most common loan payment pattern used in real estate finance from the post depression era to the present.
- Used extensively in financing single family residences and long-term lending on income producing properties.
- A constant monthly payment is calculated on an original loan amount at a fixed rate of interest for a given term.
- Payment includes interest and some repayment of principal.
- Like CAM the original loan amount is completely repaid at the end of the term and lender has earned fixed interest on monthly loan balance.
- The amount of amortization unlike with CAM varies each month
- Using the previous example calculation involves use of present value knowledge particularly discounting of annuities.

$$PV = R\sum_{t=1}^{n}\left[\frac{1}{1+\frac{i}{12}}\right]^{t}$$

Therefore, PV = R $\left((1- 1/(1+i)^{n})/i \right)$

Where PV represents the present value
R represents constant monthly payment (Annuity)
i represents fixed interest rate on mortgage
n represents number of months loan will remain outstanding

- Using the previous example calculate the constant monthly payment.

Loan made	-	sh 60,000
Loan term	-	30 Years
Interest	-	12% compounded monthly

- We are interested in solving for R ie constant monthly payment (annuity) that will repay loan amount, Present Value, and earn lender 12 per cent interest compounded monthly.

Monthly Payment × (MPVIFA, 12%, 360 Months) = sh 60,000

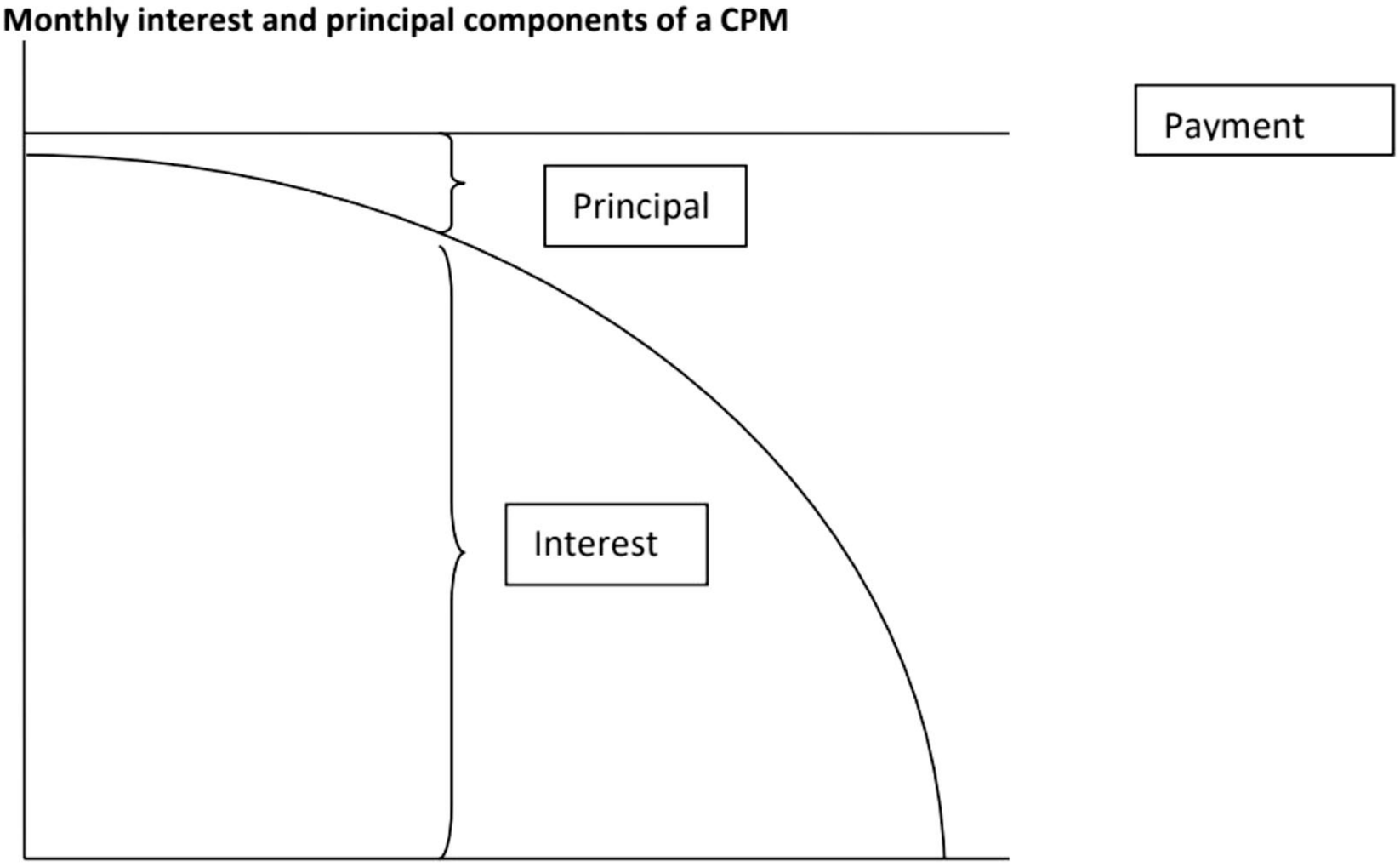
Monthly Payment × 97.218331 = sh 60,000
= sh 617.17

This is equivalent to multiplying the present value with (1 ÷ 97.21833) which simplifies calculation by allowing the use of Monthly Mortgage loan Constants. It represents a series of interest factors for various interest rates and loan maturities.

- Analysis of principal and interest:
  - Mortgage payments made over the term of the loan (sh 617.27 × 360 = sh 222,181.20) are much higher than the amount of the loan (sh 60,000) since interest must be paid monthly.
  - Interest is determined from the loan balance
  - Low initial principal reduction, payments, results in a high portion of monthly interest charge.

Month	Opening Balance	Monthly Payment	Interest (.12÷12)	Amortization	Ending Balance
1	60,000.00	617.17	600.00	17.17	59,982.83
2	59,982.83	617.17	599.83	17.34	59,965.49
3	59,965.49	617.17	599.65	17.52	59,947.97
4	59,947.97	617.17	599.48	17.69	59,930.28
5	59,930.28	617.17	599.30	17.87	59,912.42
6	59,912.42	617.17	599.12	18.05	59,894.37
.	.	.	.	.	.
.	.	.	.	.	.
358	1815.08	617.17	18.15	599.02	1,216.06
359	1216.06	617.17	12.16	605.01	611.05
360	611.06	617.17	6.11	611.06	0.00

Figure 2 Monthly interest and principal components of a CPM

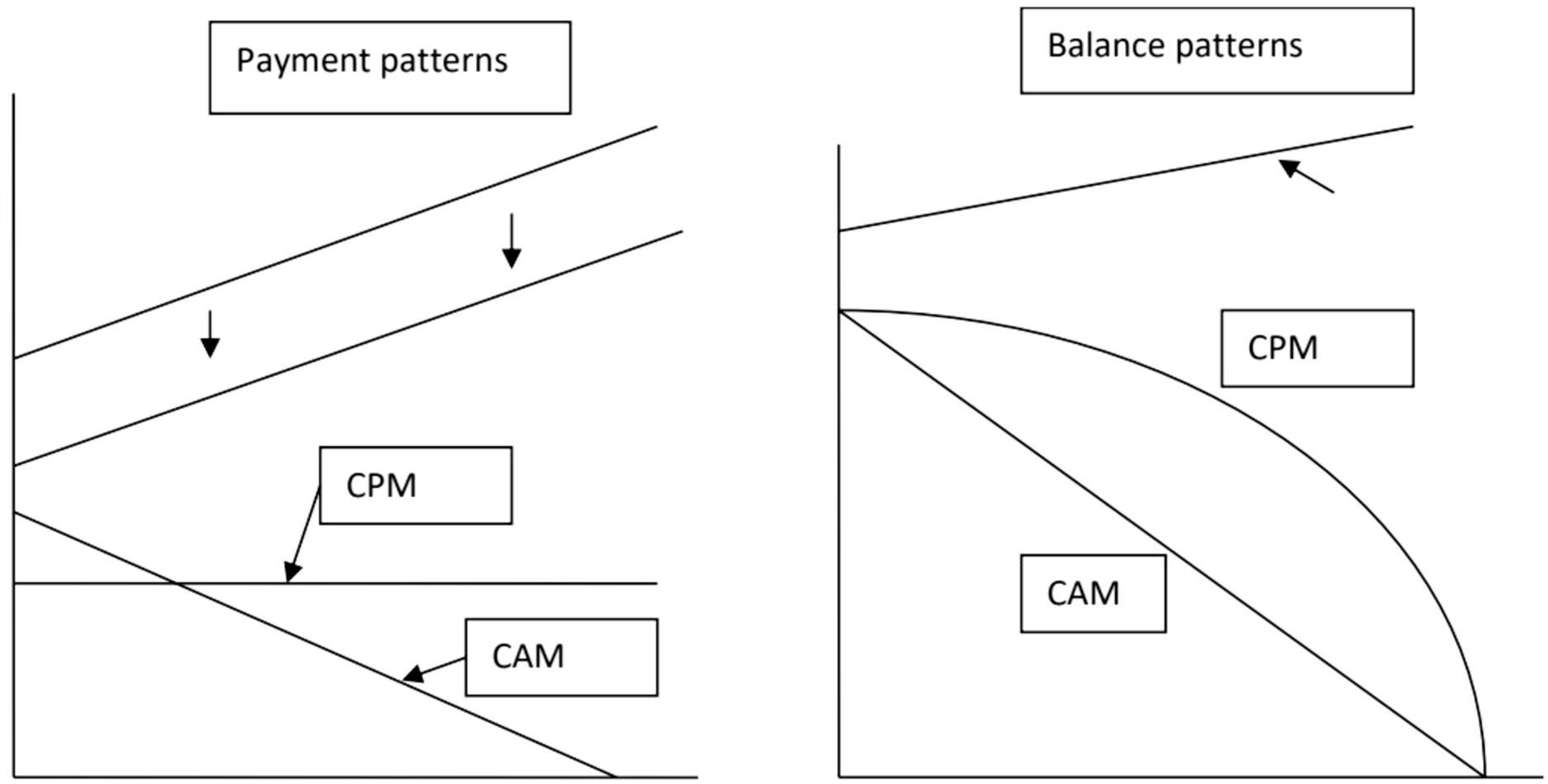


- Comparison of CAM & CPM
  - Significant reduction of monthly payment under CPM as opposed to CAM.
  - Under CAM payment decline through time while CPM payments remain constant throughout the term of the loan.
  - Present value of each stream is the same.
  - Value of the differences in monthly payment are offset in subsequent years .
  - Loan balance for CPM always exceeds that for CAM.

Economic interpretation

- More households could qualify for CPM loans than for a CAM.

Figure 3 Comparison of monthly payments and loan balances for CAM versus CPM



3.2.3 Partially Amortizing, Constant Payment Mortgage (CPM) Loans

Loans may be structured to accomplish one or more goals e.g. the borrower may desire (1) a payment that is lower than what would be available with a fully amortizing loan, (2) a non-zero outstanding loan balance on the maturity date.

Illustration;

A borrower and lender agree that a 6,000,000-loan made at 12 percent interest for 30 years will have a 400,000 balance (sometimes referred to as a balloon payment) on the maturity date if the loan will be on CPM terms. The following formula will be used.

$$PV = \sum_{t=1}^{n} \frac{PMT_t}{\left(1+\frac{i}{12}\right)^t} + \frac{FV_n}{\left(1+\frac{i}{12}\right)^n}$$

To determine how much will be paid the following steps should be followed;

1. Determine the present value of the loan balance at the end of the loan term using the present value of a single sum formula.
2. Deduct the present value of the loan balance from the initial loan. This will constitute the amount to be amortized.
3. Determine the amount to be paid using the present value annuity factor.

$PV = FV(1+i)^{-n}$

The present value of 400,000 in 30 years compounded monthly will be 11, 126.67.

The loan balance to be amortized is 6,000,000 – 11, 126.67 = 5, 988, 873.3

The amount to be paid monthly is 5, 988, 873.3 ÷ 97.22 = 61, 602.3

3.2.4 Zero Amortizing, or Interest Only—Constant Payment Mortgage (CPM) Loans

Constant monthly payments will be "interest only." Because the loan is interest only, the payment is simply equal to accrued interest or (12%÷12) × 6,000,000 = 60,000. This means, of course, that the loan balance at the end of each month will remain at 6,000,000. The monthly pattern of accrued interest, payments, and loan balances for the interest only loan

3.2.5 Negative Amortizing, Constant Payment Mortgage (CPM) Loans

This pattern may occur when: (1) the borrower and lender agree that the loan balance at maturity will be greater than the initial loan amount; that is, FV > PV, or (2) payments are negotiated to be lower than the periodic interest due on the loan.

Illustration;

If 60,000 is borrowed but the amount due at maturity will be 80,000, then monthly payments will be 594.28. It is important to note that the pay rate used to determine monthly payments is less than the interest rate specified in the note, also referred to as the "accrual rate," negative amortization occurs. This is because payments are not large enough to meet monthly interest requirements. The difference between payments actually made and those that would be made on an interest only loan are deferred and become additional amounts owed by the borrower to the lender. These amounts must also earn interest. The rate at which they earn interest is usually the same rate as the interest rate on the note.

❖ **Determining Loan Balance**

- Statistical evidence indicate that most mortgage loans are repaid from 8 to 12 years after they are made.
- This therefore means that determination of mortgage balance becomes necessary during the term of the loan.
- In the example covered assume after 10 years the borrower decides to sell the property and to buy another.
- The balance can be determined in two ways:
  1. Discounting monthly payments by the annual rate:

     Mortgage Balance = sh 617.17 (MPVIFA, 12%, 20 Years)
     = sh 617.17 (90.819416)
     = sh 56,051.02

     Note that by discounting using the annual rate in essence removes the interest from the payments, which includes interest.

  2. Using future value interest factor to calculate the percentage mortgage balance:

     Percentage Mortgage Balance = 1 – {(MFVIFA, 12%, 10 Yrs) ÷ (MFVIFA, 12%, 30 Yrs)}
     = 1 – (230.03867 ÷ 3,494.96451)
     = 93.42%

Mortgage Balance = 93.42% of sh 60.000
= sh 56,052

3.2.3 Loan Closing costs & Effective Borrowing Costs

❖ Categories of closing costs

1. Statutory costs:

- Charges for legal requirements pertaining to title transfer, recording of the deed and other fees required by state and council by laws.
- They are charged to the borrower and collected at the title closing or loan closing.
- They do not provide income to the lender and thus not included as additional finance charge.
- Statutory costs are also charges that would have been paid even on cash purchase.

2. Third-party charges:

- Third party charges include charges for services such as legal fees, appraisals, surveys, past inspection and title insurance.
- They occur even on cash purchase.
- May be collected by the lender or Title Company and in turn paid out to third parties.
- They do not constitute additional income to the lender and not associated with financing the real estate.

3. Additional finance charges:

- These are charges that affect the cost of borrowing and are levied by the lender.
- They are referred to as loan fees by lenders and intended to cover expenses such as processing loan application; preparation of loan document and amortization schedules; obtaining credit reports; and any other expenses to be covered by the borrower.
- They may be separately itemized or grouped as origination fees.
- They are charged by lenders instead of higher interest rates.
- This will ensure recovery of fixed cost in case of early repayment of the loan. That is to say if interest rate were to be increased the origination costs would not have been recovered were the borrower to make early repayment of the loan.
- Loan discounts which also constitute additional charges may be itemized separately. Here the lender and borrower agree to discount the loan based on a specified loan amount and thereby increasing the yield on the mortgage. Payments however are based on the contract amount. For example, a discount of 3 percent charged on sh 60,000 loan means that only sh 58,200 is disbursed to the lender but will make payments based on the loan contract amount, sh 60,000.

The reasons for loan discounts include

a) Upward and downward movements of mortgage rates necessitate change in contracted rate. This however can be avoided by using loan discounts and continuing to quote the original loan rate.
b) Mortgage loans are originated by lenders then sold to investors. Loan discounts therefore ensures that the lender gains from increase in interest rates by adding discount points. The loan will be originated at an interest rate equal to the yield promised to the investor and the lender will earn the discount points.

c) Ensures better pricing of loans to the risk taken. They may be charged to compensate for higher risk taken by some borrowers.
   - Note that loan origination and discount fees increased borrowing costs and therefore effective borrowing is calculated for alternative

❖ Assignment on effect of loan fees and borrowing costs (example in course text)

Loan made	-	sh 60,000
Loan term		-30 Years
Interest	-	12% compounded monthly
Origination fee	-	3%

1. Calculation of net cash disbursed

Contractual loan amount	sh 60,000
Less: Origination fee	1,800
Net cash disbursed	sh 58,200

2. Calculation of monthly repayments

Monthly Payment × (MPVIFA, 12%, 360 Mths) =sh 60,000
Monthly Payment × 97.218331 = sh 60,000
= sh 617.17

3. Calculation of the effective interest rate

Monthly Payment × (MPVIFA, ?%, 360 Mths) = Amount disbursed
sh 617.17 × (MPVIFA, ?%, 360 Mths) = sh 58,200
(MPVIFA, ?%, 360 Mths) = sh 58,200 ÷ sh 617.17
= 94.301408

Using tables the interest factor that we are looking for is between 12% and 13% and the exact interest rate can be found using interpolation as follows.

(MPVIFA, 12%, 30 Yrs)	= 97.218	(MPVIFA, 12%, 30 yrs)	= 97.218
(MPVIFA, 13%, 30 yrs)	= 90.400	Desired MPVIFA	= 94.301
Difference	= 6.818	Difference	= 2.917

(2.917 – 6.818) × 1% = 0.43%
12% + 0.43% = 12.43%

4. Rule of thumb – for every 2 percent points in origination fee charged the borrower the effective cost to the borrower, or investment yield earned by the lender, increases by approximately one fourth of a percent above the contract rate.

- Truth in lending requirements and the Annual Percentage Rate (APR)
    - Lender must disclose to the borrower the annual percentage rate being charged on the loan.
    - Calculated as above and disclosed to the borrower at closing rounding the interest rate up or down to the nearest one-eight.
- Loan fees and early repayment
    - When loan fees are charged and the loan is paid off before maturity, the effective interest cost of the loan increase even further.
    - Using our example if the loan was repaid after five years, we need to determine the loan balance after the five years.

      Loan balance factor × Mortgage amount
      0.9766 × sh 60,000 = sh 58,596
    - The effective interest rate is given by:

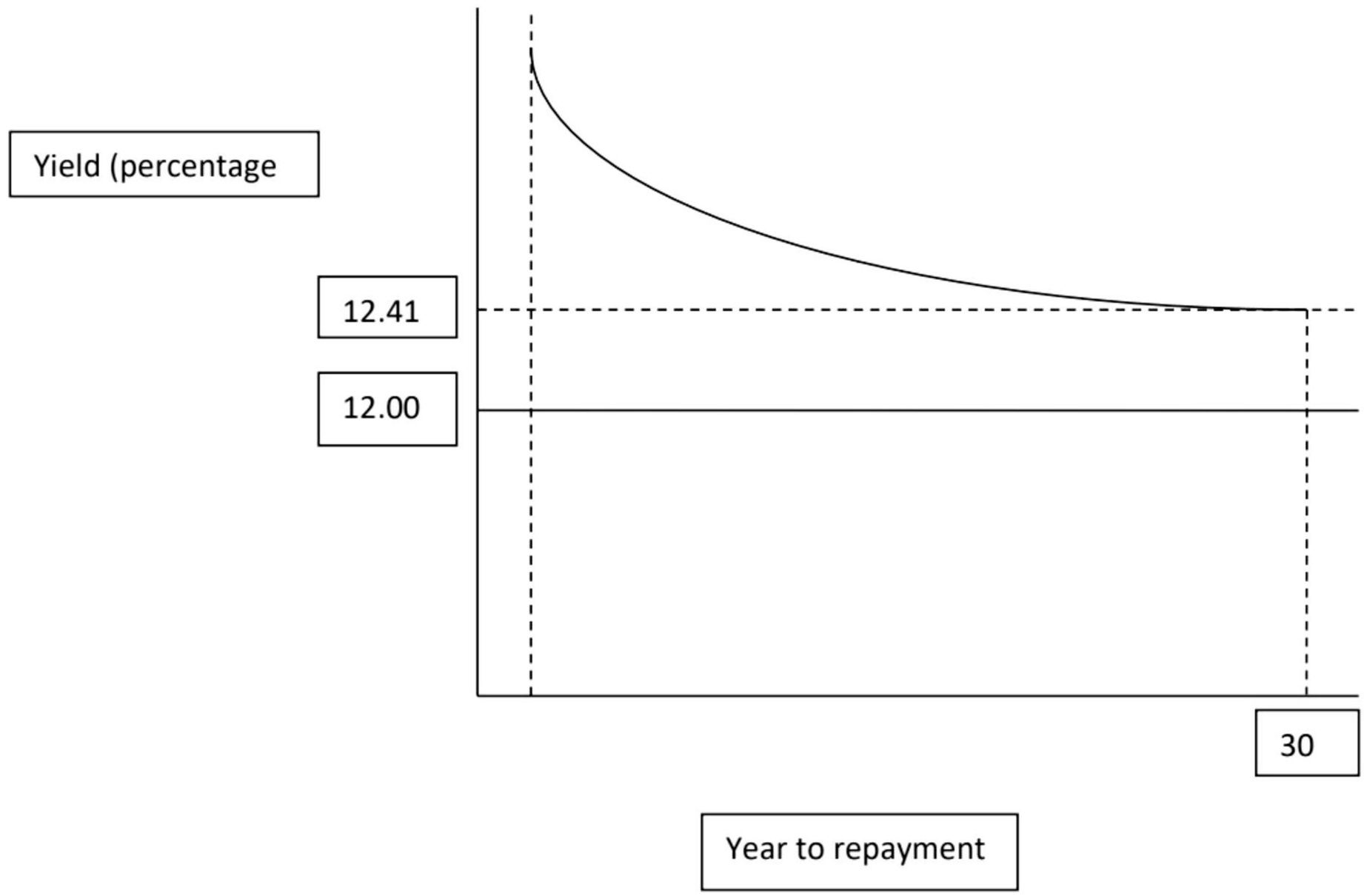
      sh 58,2000 = sh 617.17 (MPVIFA, ?%, 5 yrs) + sh 58,200 (MPIF, ?%, 5 yrs)
    - The above problem brings about a complicated discounting situation since we have an annuity in the form of monthly payments for the five years and a loan balance or single lump sum receipt of cash.
    - This can be solved using the following steps:
        1. Discounting at 12%:
           sh 617.17 (44.955038) + sh 58,596 (0.55045)= PV = sh 60,000
           Discounting at 13%:
           sh 617.17 (43.950107) + sh 58,596 (0.523874) = PV = sh 57,822

           Difference in Discounting factor 1% and PV , sh 2,178
        2. Desired present value = sh 58,200
        3. Difference in PV at 12% and desired PV
           sh 60,000 - sh 58,200 = sh 1,800
        4. Interpolating:
           (sh 1800 ÷ sh 2,178) × 1% = 0.83

           12% + 0.83% = 12.83%
    - Actual yield is higher than both the contract interest rate and the effective yield assuming loan fees of 3%.
    - The 12.83% yield is not reported as being the APR since neither the borrower nor lender knows for certain that the loan will be repaid ahead of schedule.

- Relationship between yield and time
    - The effective interest cost on a mortgage will always be equal to the contract rate when no finance charges are made.
    - Where origination fees are charged two situations occur:
        1. The effective yield will be higher than the contract rate of interest.

2. The yield will increase as repayment occurs sooner in the life of the mortgage.



❖ Prepayment penalties
- Many mortgages provide explicitly for a penalty to be paid by the borrower should the borrower desire to prepay the loan.
- Reasons for penalties:
  1. To recover loan origination fees charged at closing.
  2. Lender has contracted to extend funds for a specified time in our example, 30 years; hence early repayment represents unanticipated inflow of funds.
  3. Penalties are not included in the computation of the APR, thus not disclosed. It therefore represents a technique used by lenders to increase yield.
- Illustration (course text): assume that further to the details in our last example there was a 3% prepayment on the mortgage balance in addition to the 3% discount.

  If the loan is repaid after five years the effective interest cost is determined as follows:

The mortgage balance as earlier calculated is sh 58,596 and therefore the prepayment penalty will be:

Prepayment penalty = 3% of sh 58,596
= sh 1,758

The determination of the discount factor is given by:

sh 58,200 = sh 617.17 (MPVIFA? %, 5 yrs) + sh 60,354 (MPVIF, ?%, 5 yrs)

This can be solved using the following steps:

1. Discounting at 13%
   PV = sh 617.17 (43.950107) + sh 60,354 (0.523874)
   = sh 58,743
2. Discounting at 14%
   PV = sh 617.17 (42.977016) + sh 60,354 (0.498601)
   = sh 56,617
3. Difference in interest rate is 1%
4. Difference in PV is sh 2,126
5. Difference in PV in step 1 and desired PV is sh 543
6. Therefore the effective interest rate or yield is
   (sh 543 ÷ sh 2,126) × 1% = 0.26

   13% + 0.26% = 13.26%

3.3 Inflation and Mortgage Pricing Problems

- From our discussion on CAM and CPM:
  - Arising from problems caused by inflation in relation to the standard mortgage instruments (CAM & CPM) other mortgage instruments have been proposed.
  - We therefore need to look at the effect inflation has on standard mortgage instruments and problems faced by the borrowers and lenders.
- Effects on lenders and borrowers:
  - Using our previous example
    1) Assuming no inflation

       Loan amount = sh 60,000
       Loan term = 30 yrs
       Inflation = 0%
       Real interest rate = 3%
       Risk premium = 1%

       i = r + P + f
       = 3% + 1% + 0%
       = 4%

       Monthly payment = sh 286 pm

2) Assuming inflation is 6%

Inflation premium = 6%

$i = r + P + f$

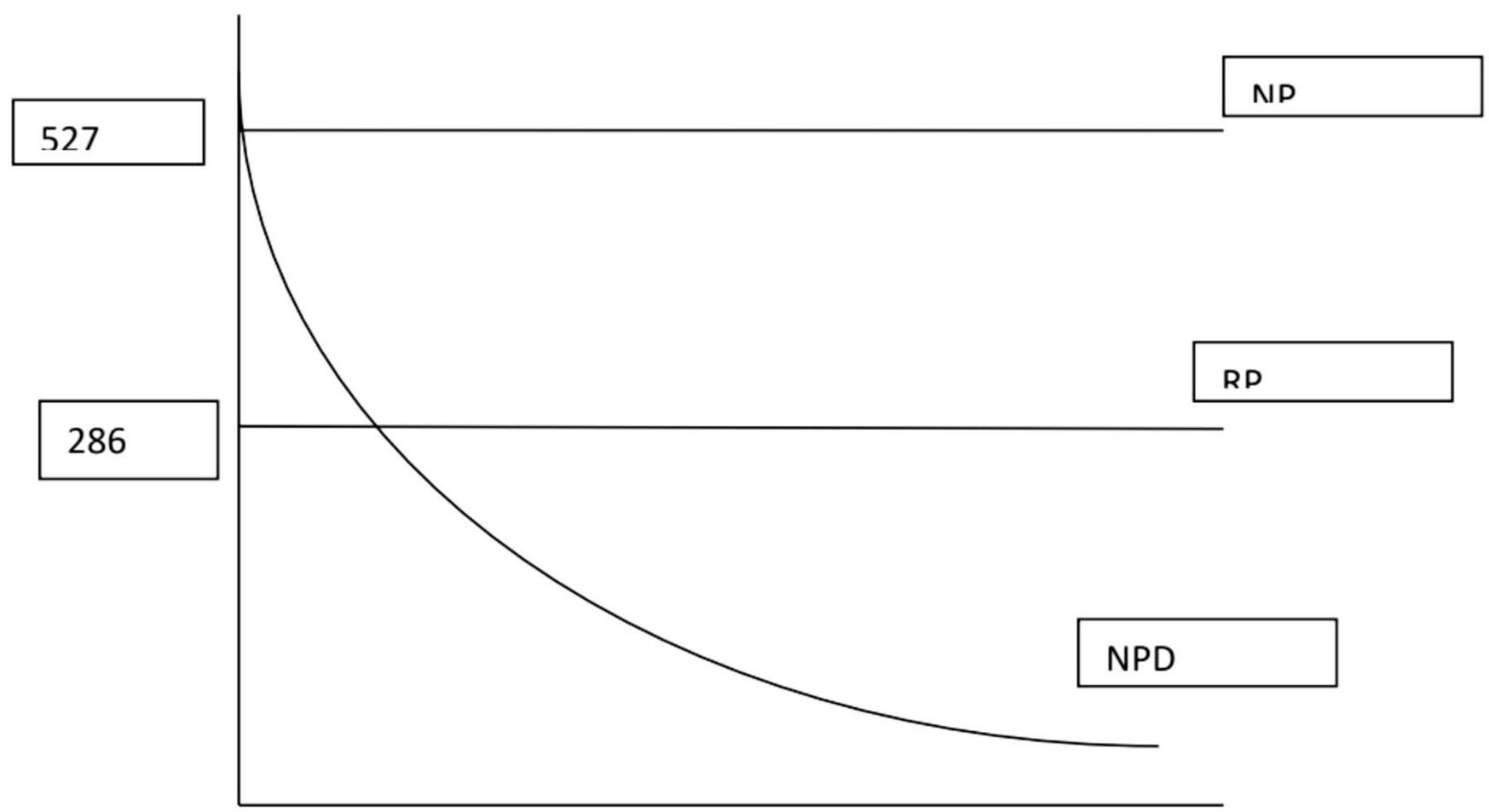
$= 3\% + 1\% + 6\%$

$= 10\%$

Monthly payment = sh 527 pm

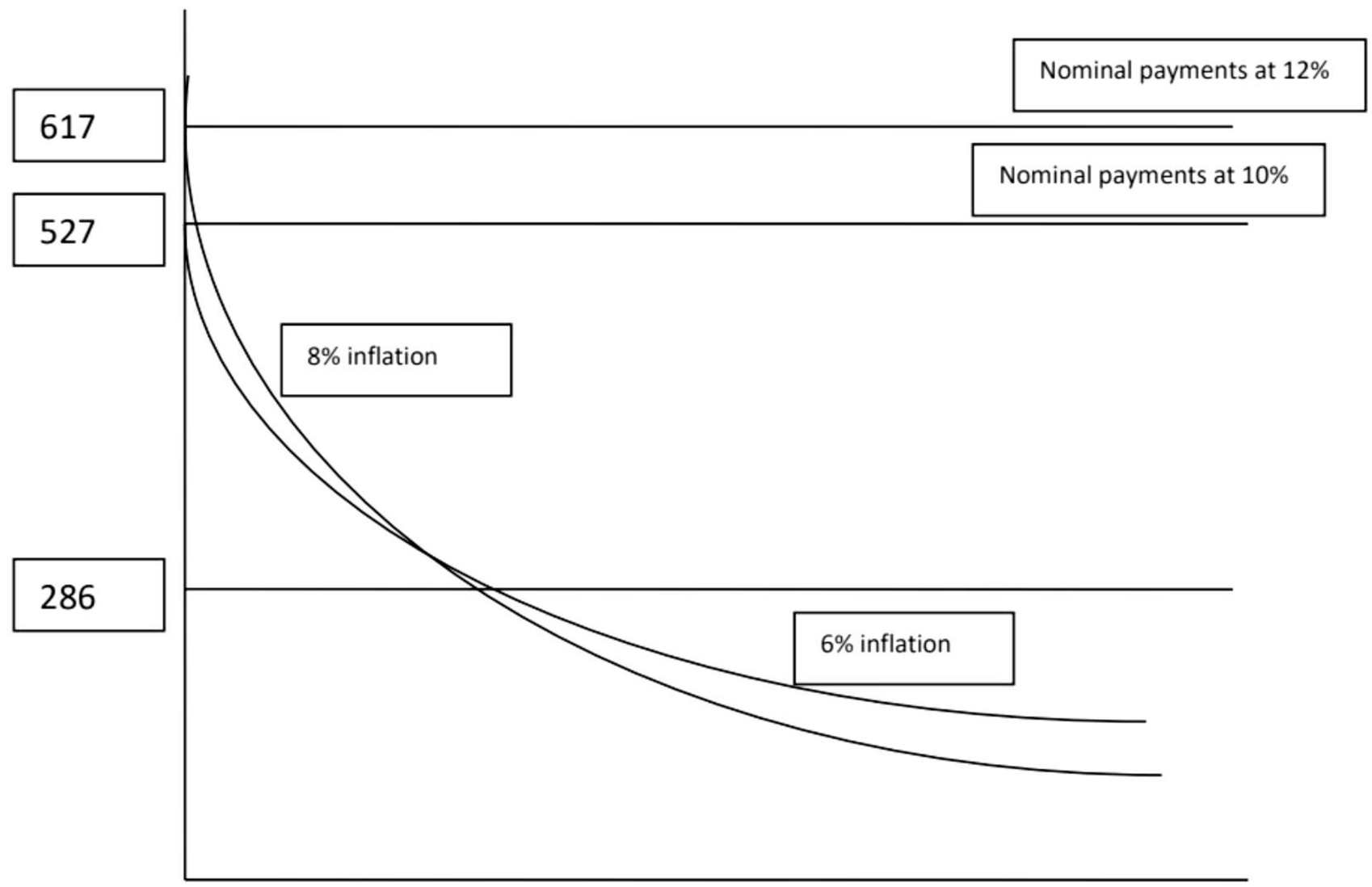
- Note that there is an 84% rise in monthly payment with inflation ie by sh 241

Figure 4 Real and nominal values of mortgage payments



- Curve NPD represents the real value of the monthly payment determined by deflating the sh 527 nominal monthly payment by the rate of inflation.
- More real dollars must be collected in the early years of the loan.
- Tilting is the relationship in which the real value of the payment stream (NPD) is greater than RP in the early years and falls below RP in the last years. That is tilting the real payment stream in the early years to make up for the loss in purchasing power in the later years.
- Note that:
  1) Even with increase in nominal and real income it would not be enough to offset the tilt effect in the early years of a loan.
  2) First-time homeowners would therefore not qualify for Constant payment Mortgages during periods of rising inflation.
  3) As the rate of inflation increases the tilt effect increases.

Figure 5 Relationship between Real and Nominal Mortgage Payments at various rates of inflation



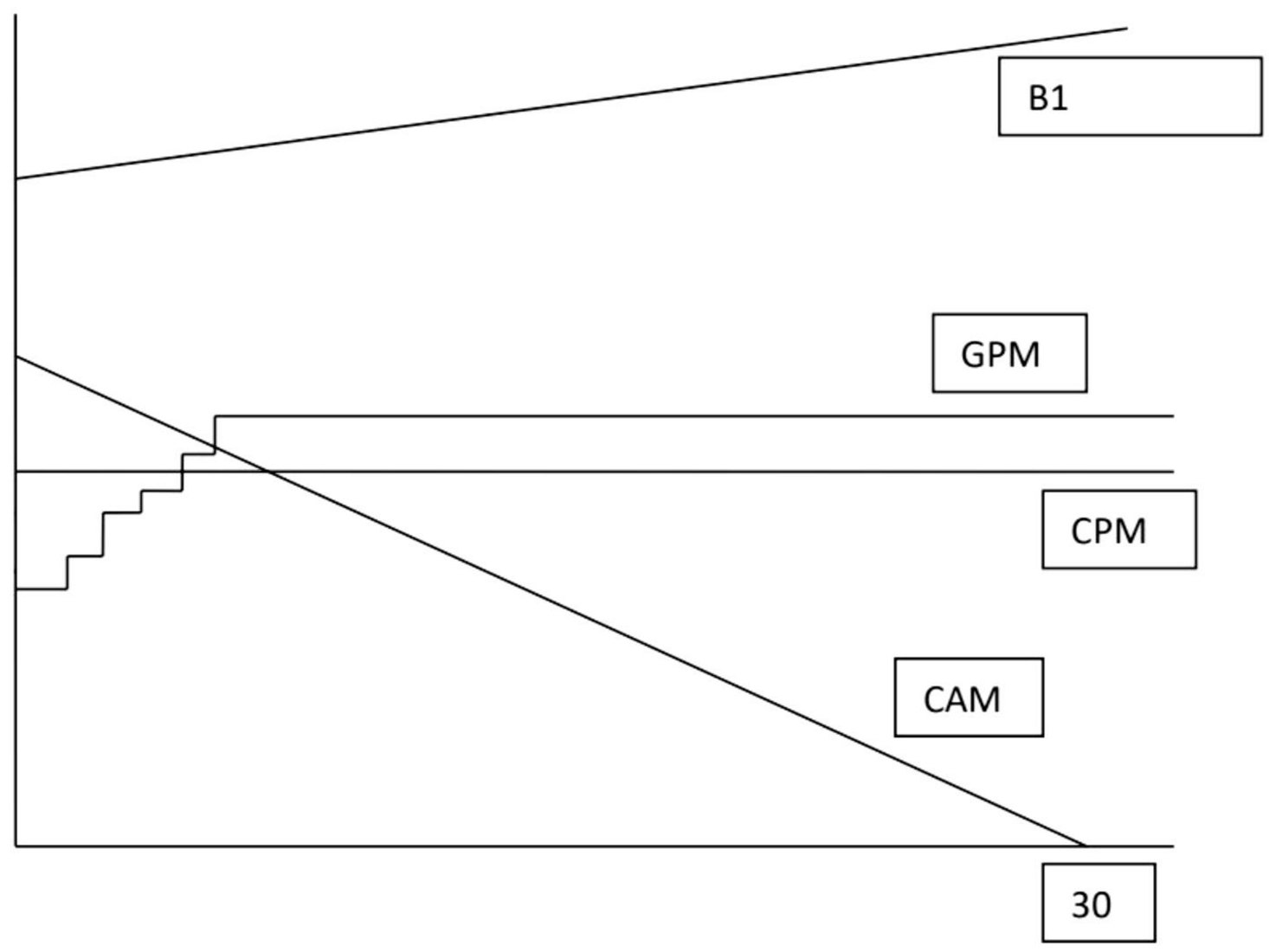
3.3.1 The Graduated Payment Mortgage (GPM)

❖ Overview of GPM

- Represents an example of new mortgage instruments introduced by lenders to mitigate the effect of inflation on mortgage interest rates.
- The objective of GPM is to provide for a series of mortgage payments that are lower in the initial years of the loan than they would be with a standard mortgage loan.
- GPM payments then are gradually increased at a predetermined rate as borrower incomes are expected to rise over time.
- The tilt effect is thus offset to some extent and reduces the burden to households.
- In the early years GPM payments are lower than those of CPM.
- However, GPM payments must eventually exceed the level payment on the CPM loan to make up for the lower payments on the GPM in the early years.
- Advantages of GPM:
    1) Initial payment levels are significantly lower.
    2) In the early year's payment correspond more closely to increase in borrower's income.

Interest Rate	10%	11%	12%	13%	14%
Constant Payments	sh 526.54	sh 571.39	617.17	sh 663.72	sh 710.94
GPM payments graduated (7.5% annually)					
1	400.22	436.96	474.83	513.71	553.51
2	430.24	469.73	510.44	552.24	595.03
3	462.51	504.96	548.72	593.66	639.65
4	497.19	542.83	589.87	638.18	687.63
5	534.48	583.55	634.11	686.04	739.2
6 to 30	574.57	627.31	681.67	737.5	794.64

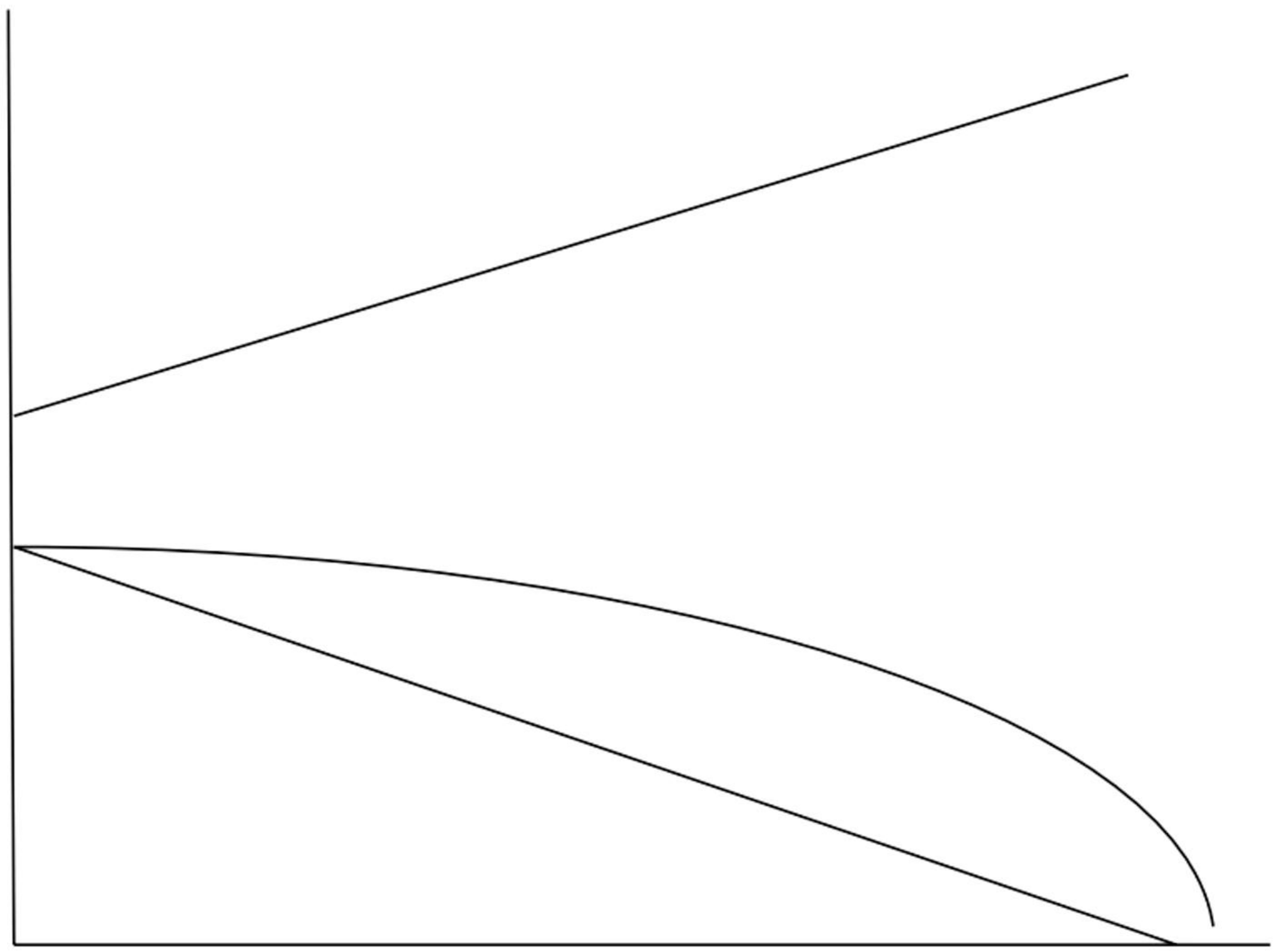
Figure 6 Comparision of mortgage payment patterns



❖ Outstanding loan balances under GPM

- Loan balances increase in the initial years of the loan.
- Remains higher than those of standard mortgage instrument until maturity.
- If borrower sells property in the early years the borrower would pay more than originally borrowed.
- Loan balance increase because GPM payment are lower than the monthly interest requirement at 12%.
- Margin of safety refers to the difference between property value and loan balance which is lower for GPM hence making GPM loan riskier than CMP.

Year	Beginning Balance	Required monthly interest payment	GPM payment	Loan (amort)	Change in balance	Ending Balance
	sh					
1	60,000.00	600.00	474.83	125.17	1,587.47	61,587.47
2	61,587.47	615.87	510.44	105.43	1,337.12	62,924.59
3	62,924.59	629.25	548.72	80.53	1,021.32	63,945.91
4	63,945.91	639.46	589.87	49.59	628.93	64,574.84
5	64,574.84	645.75	634.11	11.64	147.62	64,722.46
6	64,722.46	647.22	681.67	(34.45)	(436.91)	64,285.55



4.0 ADJUSTABLE RATE & VARIABLE PAYMENT MORTGAGES

- Overview
  - Fixed rate mortgages loans may cause serious problems to lenders who must pay market interest rates on savings.
  - Interest costs on savings may rise relative interest revenues from mortgage loans.
  - ARM is designed with variable payments provision that change with economic conditions.
  - Lenders and borrowers share the risk of interest rate changes or interest rate risk to different level.
- **ARMS and lender considerations**
  - Under FRMs lenders underwrite the risk of any significant changes in the implicit components of mortgage interest rates.
  - Any underestimation of any of the components leads to a financial loss.
  - Losses incurred by lenders result in gains to borrowers.
  - When interest rates decline borrowers usually try to refinance their loans hence lenders do not benefit.
  - Therefore, with FRM risk bearing is not symmetric: loss when interest rate increase is not equally offset by gains if interest rates decline.
  - This gives rise to borrowing short and lending long ie imbalance in the maturity structure of assets and liabilities (maturity gap).

4.1 The Price level Adjusted Mortgage (PLAM)

- Overview
  - Recall the determinants of mortgage interest rates.

$$i = r + p + f$$

  - Most difficult variable to predict was premium for inflation *f*.
  - It has been suggested that lenders should originate mortgages at interest rates that reflect lender expectations of *r* plus *p* ($r + P$).
  - After determining r and p, the PLAM loan balance would be adjusted up or down by a price index.
  - Payments would then be based on a new balance adjusted for inflation.
  - All risks are thereby shifted to the borrower ie risk of changes in market interest rates brought about by inflation, f.
  - Lender would still bear the risk of any unanticipated change in r or p (variables may not be independent ie may interact with one another.
- Illustration

Loan amount	=	sh 60,000
Loan term	=	30 yrs
Real rate	=	3%
Risk premium	=	1%

Loan balance indexed to consumer price index (CPI) and adjusted annually.

Initial monthly payment will be sh 286
Loan balance after one year will be sh 58,943

If CPI increase by say 6% during the first year then:
Loan balance at the end of the first year will be

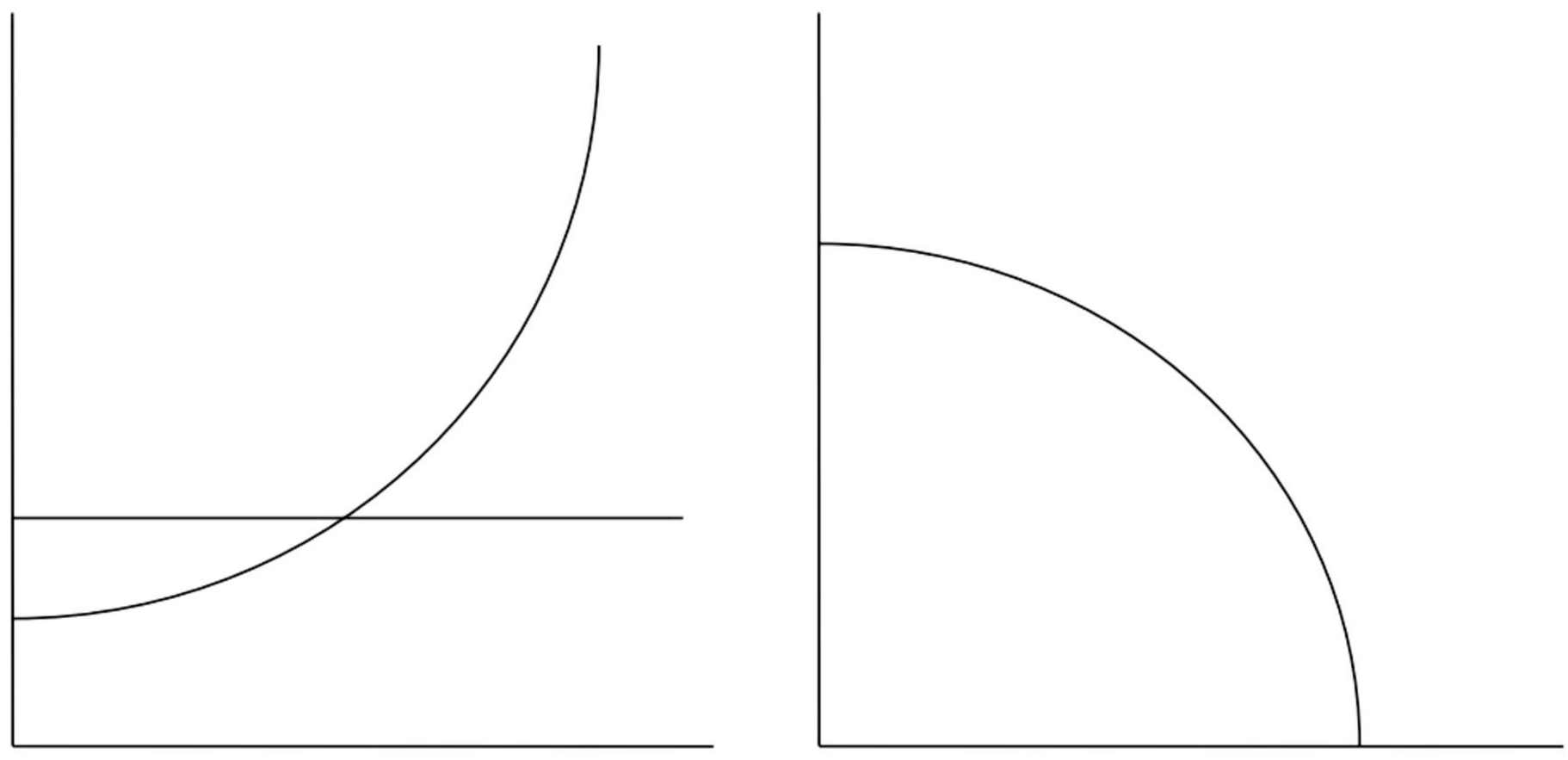
$$\text{sh } 58{,}943 \times 1.06 \quad = \quad \text{sh } 62{,}480$$

New balance will be repayable over 29 years

Each year thereafter the process would take three steps:

1) Computing loan balance using amortization schedule based on 4% interest rate.
2) Increasing the balance by the change in the CPI during the next year.
3) Computing the new payment over the remaining loan term.

Figure 7 Payments and loan balance patterns



❖ Note the following:

- PLAM payments increase at approximately the same rate as the change in price level.
- PLAM outstanding balance increase but declines towards maturity.
- Payments rise because of the effect of increasing price index on loan balance and each succeeding year payments is computed over a shorter remaining loan term.
- Comparing PLAM to CPM in FRM payment in the later are higher and lower in the former implying many households could qualify under PLAM.
- Mortgage yields would correspond more closely with changes in interest rates on deposits.

- Problems with PLAM include:
  - Appropriateness of CPI as a proper index to use. Increase in loan balances faster than property values. This arise when increase in other components of the CPI are faster than housing prices. Borrowers would have an incentive to default.
  - Relationship between mortgage payments and borrower incomes. Tilt problem is reduced since payment would be matched more closely with borrower income. But CPI may not necessarily change in the same way with borrower income.
  - Price level chosen for indexation is usually measured on an historical or ex post basis that is based on data collected in the previous period but published currently. Creates a lag between realization of income in one period and higher payment in the next.
  - Modification in the types of deposits that are offered so that when prices and interest rates increase yields on both PLAM loans and savings deposits would rise together. Otherwise, revenue from mortgage could fluctuate more than deposits costs and a profit squeeze could develop.

4.2 Adjustable-Rate Mortgages

- General overview
  - Lenders preference in increasingly shifting from Price Level adjusted mortgages to mortgages with interest rates that are indexed to other market interest rates.
  - Lenders thus avoid the hassle of estimating real interest rates and risk premiums for term period of the loan.
  - Lenders earn expected yields based on expected future values for r, p and f over a future period of time.
  - Note that such indices are continuously updated in the market eg base rates, Treasury bill rates etc.
  - ARM adjustments are therefore timelier for lender than PLAM.

- ARMs Illustrated
  - An ARM is initiated as follows:

    Loan amount = sh 60,000
    Initial interest = 10%
    Loan term = 30 yrs

    Payments to be adjusted at the end of each year based on an interest rate determined by a specified index.

    Monthly payment in the first year will be sh 527 per month

    In the second year assume that the market index was to rise and change the interest rate on the ARM to 12% the monthly payment is given by:

$$
\begin{aligned}
MP &= \text{sh } 59{,}666(MLC, 12\%, 348 \text{ mos}) \\
&= \text{sh } 59{,}666(0.010324) \\
&= \text{sh } 616
\end{aligned}
$$

- Observations:
    1) Use of ARMs does not completely eliminate the possibility of lender realizing losses.
    2) The longer the adjustment interval the greater the interest rate risk to the lender.
    3) As the lender assumes less interest rate risk the borrower incurs more interest rate risk.
- ARM indexes
    1) Interest rates on 6-month Treasury bill
    2) Interest rate on 1-year Treasury securities
    3) Interest rate on 3-year Treasury securities
    4) Interest rate on 5-year Treasury securities
    5) Weighted average national cost of funds (deposits)
- Other ARM characteristics
    1) Initial interest rate
    2) Index – interest rate series agreed by borrower and lender
    3) Adjustment interval – period of time between mortgage payment adjustment.
    4) Margin – constant spread/premium in addition to index.
    5) Composite rate – the sum of the index plus the margin which is used to establish the new rate of interest.
    6) Limitations or caps – maximum increases allowed in payments, interest rates, maturity extensions and negative amortization
    7) Negative amortization
    8) Floors – maximum reduction in payments and / or interest rates between adjustment intervals and/or over the life of the loan.
    9) Assumability – the ability of borrower to allow a subsequent purchaser of a property to assume a loan under the existing terms.
    10) Discount points
    11) Prepayment privileges – allowed without penalty.

- Problems with ARMS faced by lender and borrowers
    1) Complex and difficult to understand – borrowers.
    2) Uncertainty when making ARMs – lenders.
    3) Lack of market experience – borrower.
    4) Increase of risk of default – lender.
        - Affects borrower ability to make mortgage payments
        - If negative amortization is allowed loan balance may increase more than value of property.
- Expected yield or cost of borrowing with an ARM depends on the ARM provisions:
    1) Initial interest rate
    2) The index to which the interest rate is tied
    3) The margin, or spread over the index choosen
    4) Discount points charged at origination
    5) Frequency of payment adjustments

6) Whether caps or floors on the interest rate, payments and/or loan balances are included.

4.4 Shared Appreciation Mortgages (SAM)

- Overview
  - Designed also to deal with the problem of uncertain future inflation.
  - Similar to PLAM with lower contract interest rate which is adjusted for inflation.
  - However, with SAM the lender receives an agreed upon percentage of the appreciation in the value of the home used as collateral for the loan.
- Illustration

Loan amount	sh 60,000
SAM interest	9%
Loan term	30 Years
Value of property	sh 90,000

Lender receives one third of appreciation in the value of the home.
Payment to lender for appreciation due after 10 years or whenever home is sold whichever is earlier.

1) Monthly payment calculated based on our previous formula is
   MP = sh 482.77 per month

   Note that the monthly payment is lower than for CPM.
2) Value of house after 10 years assuming that it is expected to increase at the inflation rate of 6% is given by:

   Value = sh $90{,}000 \times 1.06^{10}$
   = sh 161.176

3) The appreciation is therefore sh 161.176 - sh 90,000 = sh 71.176. The lender gets a third of the difference.

   = 1/3 of sh 71.176
   = sh 23,725

   The lender will receive this in addition to the loan balance.
4) The effective yield or effective cost of borrowing is given by the monthly payments over the 10 years and the sum of the loan balance and the appreciation portion payable to the lender given by:

   sh 60,000 = sh 482.77 (MPVIFA, ?%, 10 yrs.) + sh 77,382(MPVIF, ?%, 10 yrs)

   The effective yield based on the above is 11.24%.

- Observations
  - Mortgage payments are based on a lower interest rate like PLAM.
  - Payments remain the same.
  - Adjustment for inflation is made at once at a pre-determined future date.
  - Inflation premium is paid from the sale of the property or on re-financing the loan.
  - Inflation rate is that of the property and not CPI.

- Reasons why SAM is not common.
  Despite the appealing features represented by SAM it is not common in practice and this is because.
  1) Lenders prefer not to wait for years before receiving compensation.
  2) Other factors in addition to inflation may affect the future value of a property.
  3) Amount of appreciation depends on other actions by the borrower which may affect the value of property such as maintenance.
  4) Tax implications of compensation: is the compensation interest income or capital gain and what is the tax implication under each?

6.0 UNERDERWRITING & FINANCING RESIDENTIAL PROPERTIES

6.1 Underwriting

❖ **Underwriting Default Risk**

- Refers to the problem of evaluating a borrower's loan request in terms of profitability and risk.
- It is performed by a loan officer based on information contained in
  1) The submitted loan application
  2) Appraisal of the property
  3) Institutional lending policy/guidelines
  4) Default insurance
- The basic relationships and terms used in mortgage underwriting
  1) Payment-to-income ratio: monthly payments on the loan amount being applied plus other housing expenses divided by borrower's income. The higher the ratio the greater the default risk hence a higher default risk premium.
  2) Loan-to-value ratio: loan amount requested divided by the estimated property value. Increase in loan to value ratio increases the likelihood of loss.
- The major problems faced by a lender when reviewing loan requests made by a borrower include:
  1) Assessment of the many variables that affect default risk.
  2) Determining whether a fixed rate mortgage or adjustable rate mortgage should be made.
  3) Where total risk of loan is high, a decision on whether loan should be refused or made with default insurance or guarantee from third party, has to be determined.

❖ **Classification of mortgage loans**

In the previous topic classification was carried out in terms of interest rate risk. Loss arising from default risk may be shared: shared between lender and borrower; shared with third parties; or fully assumed by the third parties.

The following are thus classifications of mortgage loans

1. Conventional mortgages
- Negotiated between borrower and lender
- Loan-to-value and payment-to-income ratio are established. Loan-to-value determines the downpayment.
- Maximum loan amount is 80% of the value of the real estate purchased.
- Borrower provides equity of 20% of value.
- Losses must exceed 20% before lender suffers a loss.

2. Insured conventional mortgage loans
- Borrowers may not have the necessary wealth accumulation to make 20% down payment.
- Where income earning ability and property location are satisfactory more than 80% loan may be granted with a purchase of insurance against default risk.
- Insurer is paid to assume the increase in default risk above that taken by a conventional loan.

- Only the amount in excess of 80% of the property value is usually covered under mortgage insurance policy.
- Interest rate charges may be higher.
- For example if 95% mortgage is made: borrower makes 5% down payment, mortgage insurer insures an amount equal to 15% and lender would make a 95% loan.

Examples of other mortgage classification the United States include:

3. FHA insured mortgage loans

- Federal Housing Administration (FHA) insure mortgage loans.
- FHA mortgage insurance completely insurers the lender against any default losses unlike conventional insurance.
- Strict qualification procedures before acceptance into insurance program.
- Has had a long-standing policy objective to make housing affordable to lower- and middle-income families.

4. VA Guaranteed mortgage loans

- Meant for veterans who meet certain length of service tests.
- Veterans administration provide guaranteed mortgage.
- VA guarantees a mortgage lender repayment of a specified maximum amount in case of a loss.
- VA guarantees default losses as opposed to insuring the lender against losses.
- Small qualifying fee is charged and default losses paid by VA availed by US government.
- The advantage is that there is no down payment required.

6.2 The underwriting process

❖ **Overview**

- The process is the same regardless of the type of mortgage involved.
- Goal is to determine whether the loan-to-value ratio, the payment-to-income ratio, assets of borrower and credit history are acceptable to the lender/insurer.

❖ **The process**

1) Borrower income

- Borrower is requested to allow lender to; verify place of employment, verify wages and inquire employment status.
- Other possible sources of income are also verified; part-time employment, working spouse, rentals, alimony or child support, commissions, self-employment, bonuses, dividends and interest, retirement annuity and public assistance.
- The tests in establishing borrower income would be the continuity of income and verifiability of income via tax authorities.
- Variable income which may be difficult to verify and assess is averaged over a specified period of time.
- In case of two individuals, judgment must be made relating to the future stability of the joint income.

2) Verification of borrower income
   - Borrower assets must be at least sufficient to close the transaction i.e., pay closing costs and make down payment.
   - An important indicator is the period the borrower assets have in deposits.
   - Other assets also play an important role in the rating of the loan quality by the lender: consistent ability to save; investments in other property; ownership of life insurance; purchases of securities; and ability to meet obligations associated with the acquisition of assets.
   - In situations of individual with shorter life expectancy than the mortgage maturity, the loan may be granted based on other considerations such as investment in other property etc.

3) Assessment of credit history
   - Acceptability of the borrowers past payment history on other obligations.
   - Credit reports from credit bureaus.
   - Loan may be rejected where there is adverse credit experience.
   - Explainable brief interruptions may be acceptable such as divorce.

4) Estimated housing expenses
   - Used for determining the payment-to-income ratio.
   - Items likely to be included in the estimate of monthly housing expenses: principal and interest on the mortgage being applied; mortgage insurance; property taxes; hazard insurance; and condominium or co-operative homeowners' association dues.
   - Most of the items listed have to be estimated by the underwriter since actual amount may not be known.

5) Other obligations
   - In most cases borrowers will have other obligations.
   - Such other obligations include: auto loans; credit card accounts; insurance premiums; other mortgage debts; and alimony and child support payments.
   - Underwriter would request for such information from the borrower or access through credit report, court house records etc.
   - For first time borrowers additional items such as cost of furnishings, landscaping and fencing may be required for estimating total obligations.

6) Compensating factors
   - Relate to other favorable factors about the borrower that can offset certain unfavorable factors during the underwriting process.
   - This may include: possession of liquid assets; nature of employment such as skills of high demand hence likelihood of increase in wages over time; and high equity down payment.

6.3 Residential Property Appraisal /Valuation

❖ Overview

- Property appraisal is intended to ensure that the market value of the property used as security is sufficiently high to pay the loan balance in the event of default.
- In other words, the property's market value is important to both the lender the borrower since the property will either be the full or partial security for the loan granted. The borrower will not want to pay more than the market value while the lender will not want to loan more than a given proportion of the market value.
- Property appraisal may be carried out by either
  1) Appraisers within the staff of the lender
  2) Independent fee appraiser – a specialist in appraisals who must be unrelated to the parties to the transaction and have no vested interests.
- Property appraisal reports form part of the documentation required by lenders and are fundamental basis of the investment decision.
- Appraisal is an estimate of value which involves the use of a systematic approach which includes:
  1) Ascertainment of physical and legal identification of the property involved.
  2) Identify the property rights to be appraised.
  3) Specify the purpose of the appraisal.
  4) Specify the effective date of the estimate of value.
  5) Gather and analyze market data.
  6) Apply appropriate techniques to derive the estimate of value.
- Appraisal involves assessment of
  1) Demand of property in question – national, regional and local economic conditions including; income, population, employment and interest rate trends.
  2) Supply – the relative cost of land and factors of production (wages, capital)
  3) Current market equilibrium conditions in the housing market which is done by examining aspects such: housing units; absorption rates; rental vacancies; and trends in rents.
  4) Examination of the submarket – this includes neighborhood, nearby retail facilities such as shopping centers, educational facilities and religious facilities for establishing any premiums.

- Types of valuation and their purpose

Type of valuation	Purpose for which required
➢ Statutory valuations	• Ground rents • Stamp duty • Rating • Compulsory purchase • Rent tribunal assessments (business and residential)
➢ Non-statutory valuations Mortgage Insurance Asset valuation Rental assessment Auctions Investment	• Financial security • Mortgage protection, fire and other risks • Book purpose • Business transfer (sale) • Property letting, owner occupied house allowance • Reserve price • Property development appraisal

P.M. Syagga, 1994

- Steps in valuation
    1) Survey of the subject property – collecting information available such as legal, physical, and income aspects.
    2) Collecting data and information necessary for the analysis of activity in the real property market such as sales of comparable properties, incomes and costs.
    3) Analyzing the data to obtain value estimates.
    4) Making estimates of value for the subject property.
    5) Writing the valuation report showing the value estimate.

- Approaches to valuation
    1) Market approach / comparative sales method.
    2) Cost approach / cost reinstatement method.
    3) Income capitalization approach.

  Other approaches
    4) Profits method
    5) Residual method

There are two mutually exclusive Properties X and Y. Each property requires an investment of total costs sh 60,000 and total costs sh 80,000 respectively. Assuming a target rate of return of 10%

Property X

Year	1	2	3
Amount (**sh**)	50,000	30,000	25,000

Property Y

Year	1	2	3
Amount (**sh**)	30,000	40,000	30,000

Required

i) Compute the Benefit-to-Cost Ratios of the two properties

ii) Which of the properties would be chosen and why?

6.3.1 Cost Approach

- Based on the assumption that rational investor would not pay more than what it could cost to buy the land and build the structure.
- For a new property the construction cost of the building is determined and the market value of the land is added.
- While for an existing building the following steps are followed:
    1. The cost of replacing the building is estimated.
    2. Estimate in 1 is reduced by any physical, functional, or economic depreciation
- Determination of land value involves the selection of comparable sites which is adjusted for differences in location, size, shape and topography.
- While improvement cost is estimated by consulting cost manuals for material, labor and profit (overhead) as well as consulting construction companies.
- Depreciation on improvement is of three types: physical depreciation; functional obsolescence (excessive hallway space); and economic depreciation (changing land uses in neighborhood.
- The cost provides a reliable estimate when comparable properties are newly constructed and require very few adjustments for depreciation.
- The approach is also considered where only a few transactions involving comparable properties exist and market approach to value is difficult to use.

6.3.2 Market Approach

- The value of property is estimated by comparing the selling prices of properties similar to and near the property being appraised.
- Comparable properties values are adjusted for dissimilarities.
- Under market approach the appraiser uses his knowledge and judgment of current market conditions to establish market value of each major attribute of a comparable that is different from the subject property.
- Adjustment process begins after verifying that comparable sales were at arm's-length transaction.
- Here adjustments are not based on the cost of constructing improvements but rather the market value of such improvements.
- To obtain the final estimate of value the appraiser gives a quantitative weight to the residual price of each comparable.
- Appraisers using this approach may encounter complications arising from comparable sale price that may contain financing benefit paid for by the seller of a property.

6.3.3 Income Approach

- Under the income approach the market value of property is determined by how much an investor is willing to pay for the income stream that a property produces.
- The relationship between a property's sale price and the monthly income stream would produce is established.
- Gross rent multiplier, ratio of sale price to monthly income is determined for similar properties.
- The ideal rent for the subject property is determined from adjusted comparable rental units which are multiplied by the Gross Rent Multiplier to determine the value of the subject property.

6.3.4 Other considerations

- Final estimate of value
  - The three approaches are reconciled using the qualitative weighting method to make a final estimate.
  - Subjective weights are assigned to the approaches based on the number of adjustments made in each technique.
  - More weight is given for the method requiring fewer adjustments.
- Property appraisal and actual sale price
  - Property price agreed between buyer and seller and the lenders appraised value may not necessarily be exactly the same.
  - The lender will generally use the lower of sale price or appraised value as the value of which the loan will be based.
- Property values over time
  - Cardinal rule – value of mortgaged property should never fall below the outstanding loan balance at any time during the life of the mortgage.
- Loan commitment
  - Issued once the loan application is approved.

- Laon commitment is binding and provides details of loan amount and the terms.
- Gives time lines for acceptance of terms of the loan offer or lose the commitment.

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    - VA guarantees default losses as opposed to insuring the lender against losses.
    - Small qualifying fee is charged and default losses paid by VA availed by US government.
    - The advantage is that there is no down payment required.

SOME COMPUTATIONS

Example 1

Steve has identified a potential real estate investment. The asset will cost sh1,000,000 and will require initial remodeling costs of sh100,000 per year for the first three years. The investment will generate sh 60,000 per year in revenue. At the end of the project, he will be able to sell the asset for sh1,700,000. The discount rate is 8%. Should the investor take on the project?

Example 2

Ms Jane leased 50,000 sq/mts. plot to Lessee in 2015 for 99 years period, at lease rent of sh250,000/month. No initial premium is taken. Lease is renewable for 99 years further period on same terms. Expected rate of return is 7.5 %. Freehold land rate in locality is sh 5,000 /sq/mt. and no building is put up on the plot by the Lessee. Calculate value of Lessor's interest in land and value of Lessee's interest in land as in year 2010.

Example 3

A factory building having 4000 sq./mts. built up floor area is constructed in year 1990. Total area of plot is 7000 sq./mts. Replacement cost of building in March 2015 is sh12,000/sq.mt. Land rate for industrial user is sh 45,000/sq.mt.in 2015. Value the property today for Bank loan purpose

Example 4

X is sold for sh.800,000/-. On market evidence it is learnt that total rent income from house is sh 94,000/year. Property taxes are sh 30,000/6 months. Other expenses are 18% of Gross Rent. Calculate rate of return available to the purchaser landlord.

Example 5

Work out N.P.V. of building if total life of building is 60 years. Replacement Cost is sh 6,000,000/-, Age is 10 years and rate of interest is 4.5% (6 marks)

Example 6

Consider profit rent of sh 20 million receivable for 15 years on a 10% gross yield with tax at 40%. Compute the gross of tax the valuation.

Example 7

A freehold shop property is currently let on a full repairing and insuring lease with five-year rent reviews at a rent of sh 90,000 per annum with three years to run to the next review. The current rental value is sh 1,200,000 per annum; market evidence suggests a yield of 5.5 per cent. Calculate the capital value of the property.

Example 8

A property with a current rental value of sh 20,000 per annum and let on a full repairing and insuring (FRI) terms has been sold to show an all-risk yield of 6 per cent. Calculate the internal rate of return.

Example 9

Value an office block recently let at sh 125 000 per annum on an FRI lease with upward only reviews at five-year intervals. The current market yield on an all-risk basis is 6.5 per cent, while the equated yield is 11 per cent.

Example 10

Christina, an investor, is considering purchasing an apartment building. The estimated remaining economic life of the building is 25 years, the current mortgage interest rate is 3.5%, the local mill rate is 11.0 and the municipality reports a 90% certified ratio. What are the capitalization rates for the land and for the building?

Example 11

Tony is considering buying an apartment building and wants to know what it is worth. He estimates his potential gross income to be sh 150,000, miscellaneous income to be sh 12,000, vacancy and collection loss of 5% of PGI and operating expenses of sh80,000. What is the estimated NOI for this property? If Tony's estimated capitalization rate is 6.7%, what is the value of the property?

Example 12

Errol owns an apartment building that he would like to sell. Before selling, he would like to find out how much he can get for the property. He estimates that his net operating income for the next year will be sh 50,000. Of that total, he estimates that 20% of his income is due to the land, since he has off-street parking for all tenants and can charge higher than average rent for the apartments. The municipal tax rate is 15 mills and the municipal certified ratio is 100%. The area mortgage interest rate is 3.75% and the remaining economic life of the building is 16 years