STUDY MATERIAL

VIVEKANANDA COLLEGE THAKURPUKUR

NAAC ACCREDITED
GRADE—’A’

Subject: Economics
Topic: Growth Model

Name of the Teacher:

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BACKGROUND

- Growth Theory had its beginning in the year following the Second World War
- Focus is on reconstruction as quickly as possible.
- This called for high savings=> curtailment of current consumption=> high investment=> production of capital goods
- The role of Savings and Productivity of capital.

Technical Growth Theory

- Let us denote saving rate (S/Y) by s.
- There is no depreciation.
- Incremental Capital Output Ratio (ICOR) is inverse of MPK
- ICOR is denoted by v.
- Higher v=> capital is less productive and vice versa.
- v is the measure of overall efficiency of economy
- v is assumed to be constant.

Equations

- $S = sY$……..(i)
- $I = \Delta K$……..(ii)
- $\Delta K / \Delta Y = v$……..(iii)
- $S = I$ ……..(iv)

- **$g^* = \Delta Y / Y = s/v$ …….(v)**

•Equation (v) provided the theoretical foundation for the economic plans undertaken by numerous developing countries.

•India belonged to this group.

•It ignores the role of labour.

•Solow model, also known as Solow-Swann Model (1956) rectifies this problem and tries to develop a more general model.

•Plan: 1. We first try to understand Simple model

2. Then we try to understand the determinants of savings and investment and also try to present two models with endogenous and time varying savings: (i) when Saving & Con. Decision is made by infinitely lived household (ii) they are made by households with finite horizons.

3. Endogenous Growth model

Basic Model

Assumptions regarding Inputs and Outputs

- Solow Model focuses on four variables: Output (Y), Capital (K), Labour (L) and Knowledge (A).
- The basic production fun:

$$Y(t)=F(k(t), A(t)\, L(t)) \ldots\ldots\ldots\ldots (1)$$

where t=time

AL = effective labour

Contd…

- $Y(t)=F(K(t),A(t)L(t))$—Harrod-Neutral/ Labour Augmenting
- $Y(t)=F(A(t)K(t),L(t))$—Capital Augmenting
- $Y(t)=A(t)F(K(t),L(t))$—Hicks-neutral

Assumptions regarding Production Fun

- Constant Returns to Scale
- Economy is sufficiently large
- Inputs other than capital, labour and knowledge are unimportant (neglects land and natural resources)
- MP > 0 and Diminishing Marginal Productivity operates.
- CRS=> Intensive form of production

Intensive Form

Setting c=1/AL in equation (1) we have

F (K/AL,1) = 1/AL. F(K,AL)……(2)

K/AL=capital per unit of effective labour= k

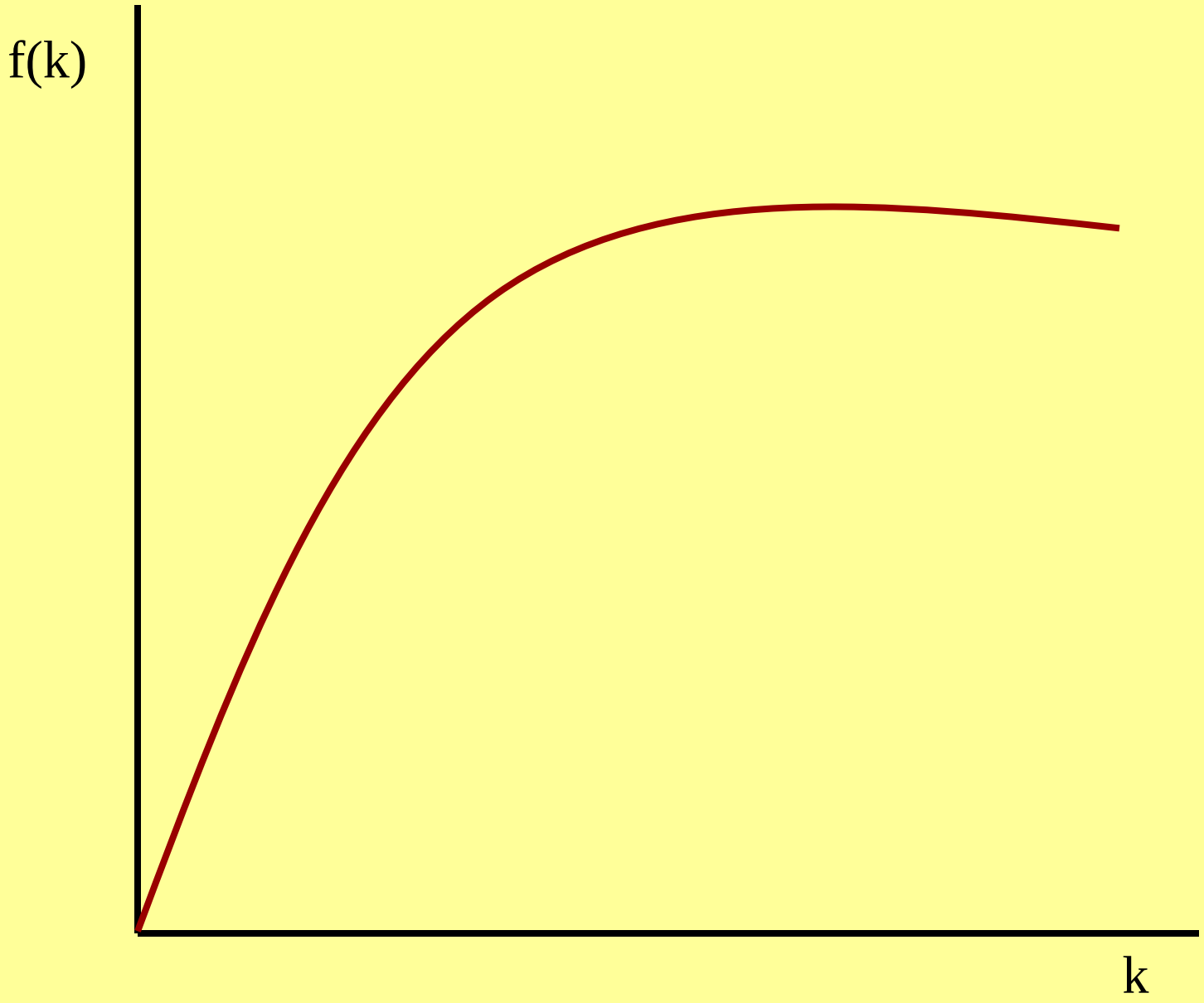
F(K,AL)/ AL = Y/AL= y

f(k) = F (k,1), then we can write equ (2) as

y = f(k)……(3)

Inada Condition

- Production Fun also satisfies Inada Condition
- $\lim_{k \to 0} f'(k) = \alpha$ and $\lim_{k \to \alpha} f'(k) = 0$
- A specific example is Cobb-Douglas Production Function
- $F(K,AL) = K^{\alpha} (AL)^{1-\alpha} \quad 0<\alpha<1$


f(k)
k

Assumptions regarding inputs

- Initial level of capital , labour and knowledge are considered as given
- Labour and Knowledge grow exponentially, that means
- $L(t)=L(0)e^{nt} \Rightarrow \acute{L}(t) = n\, L(t)\ldots\ldots(4)$
- $A(t)=A(0)e^{gt} \Rightarrow \acute{A}(t) = g\, A(t)\ldots\ldots \quad (5)$
- $\acute{L}(t)= dL(t)/dt$ & $\acute{A}(t) =dA(t)/dt$
- n & g are exogenous

Output

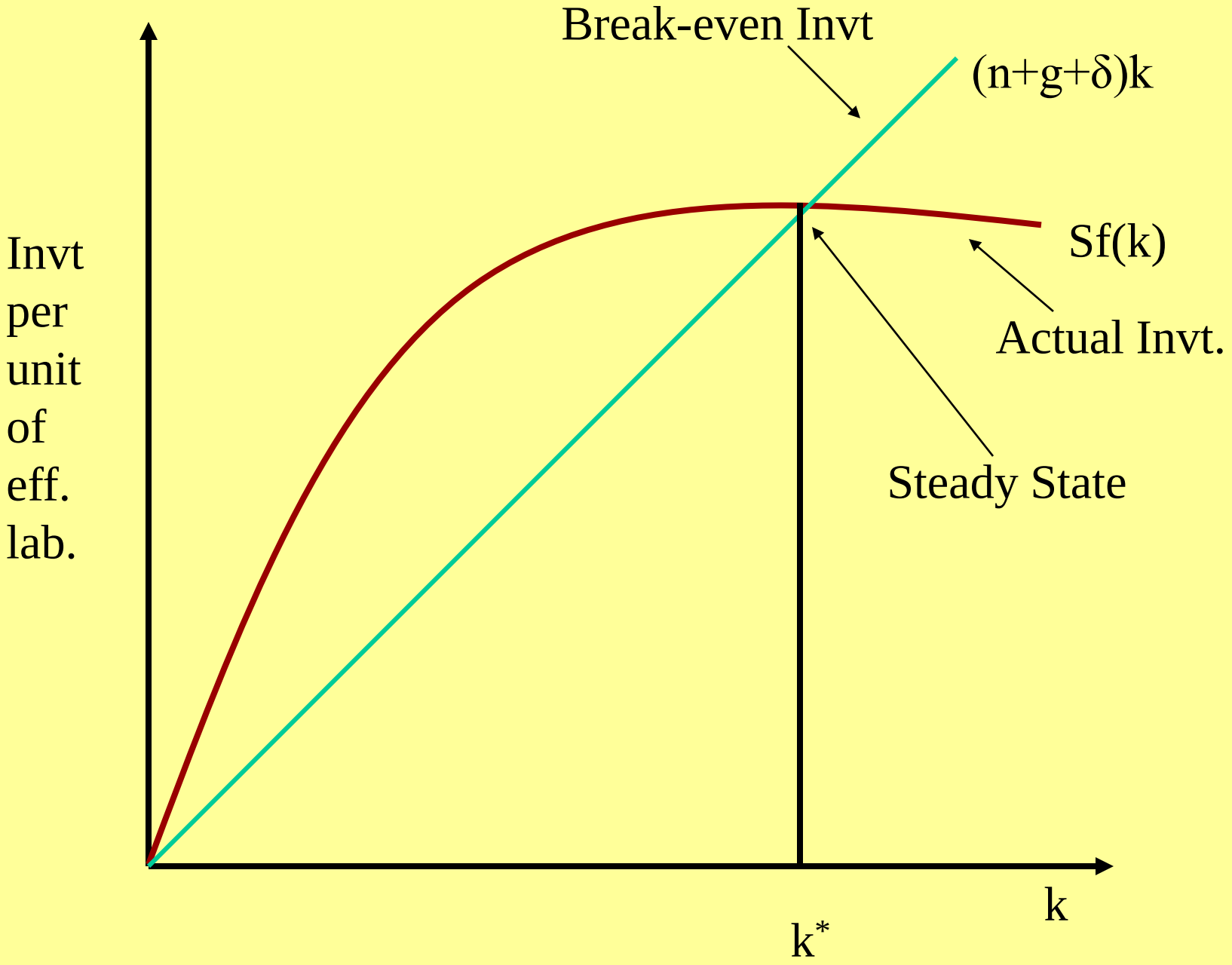
- Output is divided between consumption and savings
- The fraction of output devoted to investment (sY) is exogenous and constant.
- 1unit invt = 1 unit new capital
- Existing capital depreciates at a rate δ
- $K'(t) = sY(t) - \delta K(t)$

The Dynamics of the Model

- Want to determine the behavior of the economy
- Labour and Knowledge are exogenously given
- Behavior of the capital will determine behavior of the economy

Key equation of Solow Model

- $k'(t) = sf(k(t)) - (n+g+\delta)k(t)$
- $sf(k(t))$=actual investment per unit of effective labour
- $(n+g+\delta)k(t)$= Break-even investment
- When $sf(k(t)) = (n+g+\delta)k(t) \Rightarrow k(t)$ is at the steady state.


Break-even Invt
(n+g+δ)k
Sf(k)
Actual Invt.
Steady State
Invt per unit of eff. lab.
k
k*

Balanced Growth Path

- When k converges to or equal k^* then
- Labour and knowledge grow at rates n & g—by assumption
- K=Alk and as k= k^* , K is growing at rate (n+g).
- Due to CRS Y is also growing by the same rate
- Y/L and K/L are growing by g

Effect of increase in s

- If savings increases then there is a change

Thank you