

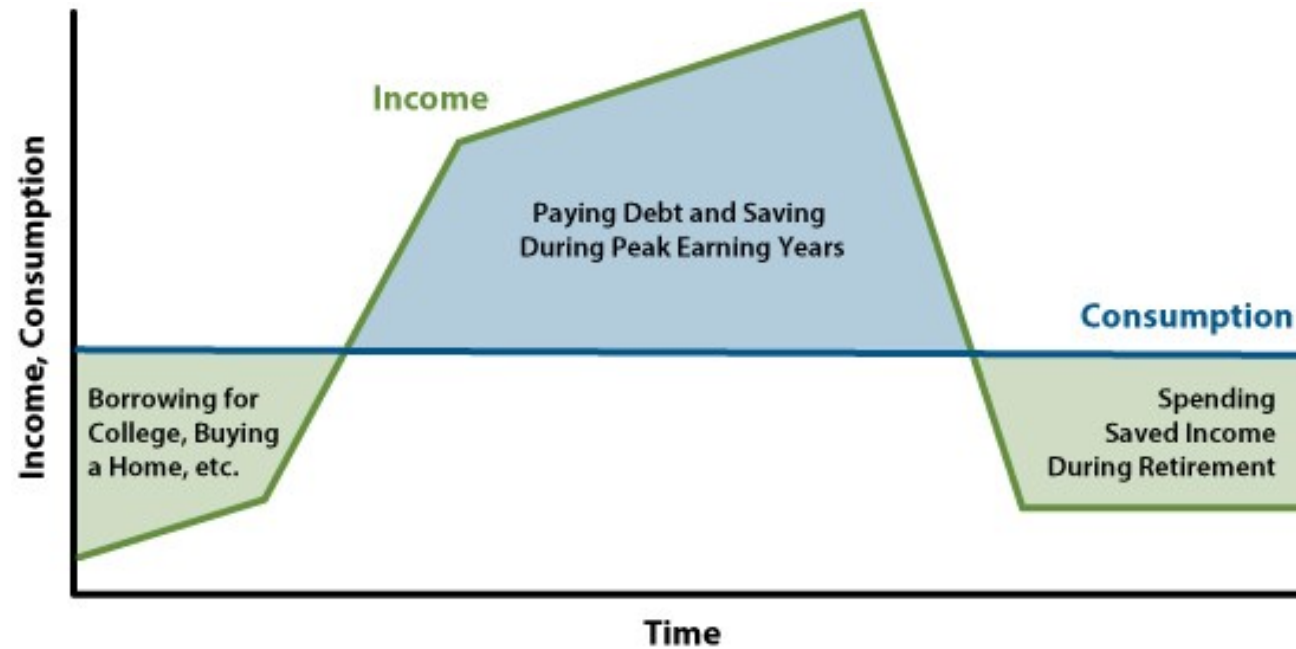
Intertemporal Consumption and Investment

Intertemporal Choice

- “Intertemporal” means “between time”.
- In the standard consumer choice, the consumer allocates his income between two goods, good X and good Y.
- In the intertemporal choice, the consumer allocates his **life-time income** between two goods: **current consumption** and **future consumption**.

Intertemporal Choice

- The theory explains why people try to “smooth” consumption by borrowing and lending/saving.



Assumptions

- Two time periods: Current Period (denoted by 0)
Future Period (denoted by 1)
- Two goods: Current Consumption (C_0)
Future Consumption (C_1)
- Two incomes: Current Income (Y_0)
Future Income (Y_1)

Assumptions

- There is a **money market** for borrowing and lending/saving at a given interest rate “ r ” per period.
- C_0 and C_1 are normal goods.
- There is no uncertainty nor risk for the consumer.
- There is no bequest nor debt for the consumer at the end.

Extra Note: Time Value of Money

- The time value of money is the conjecture that a sum of money now is worth more than an identical sum later.
- This may be due to time preference, inflation, etc.
- For this reason, people distinguish between **present value** and **future value**.

Extra Note: Present and Future Values

- Present Value (PV)
 - Is the value of income or asset at the present time.
- Future Value (FV)
 - Is the value of income or asset at the future time.
- In the two-period time frame,

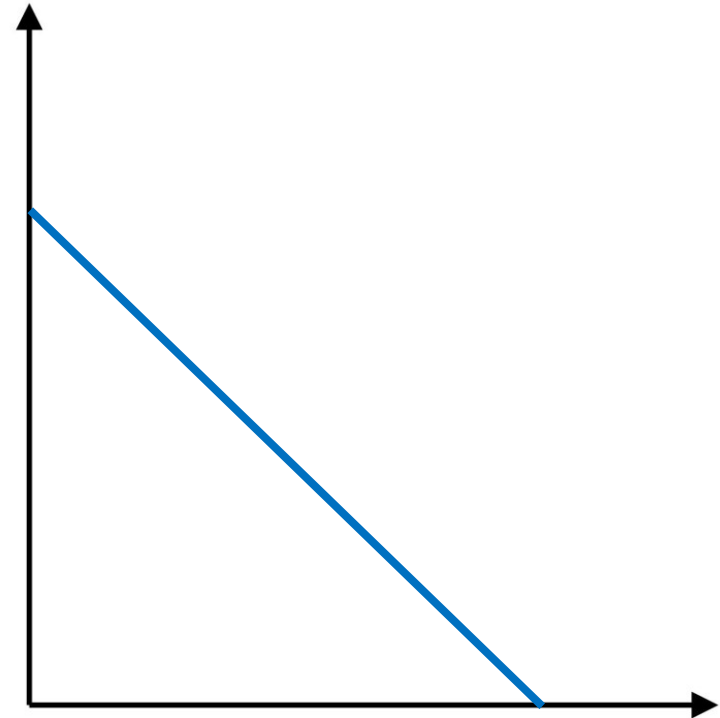
Intertemporal Budget Constraint

- Life-time consumption must be equal to life-time income.
- In PV,
- In FV,

Intertemporal Budget Constraint

Endowment is determined by the current and future incomes.

Choice of Consumption can be any point on the BL as the consumer can freely borrow or lend/save in the money market.

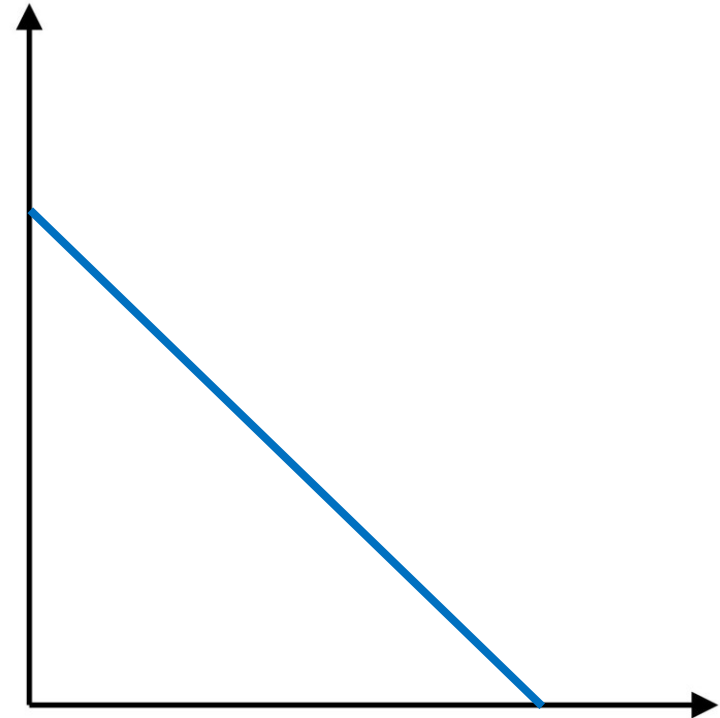


Intertemporal Budget Constraint

X-intercept

Y-intercept

Slope



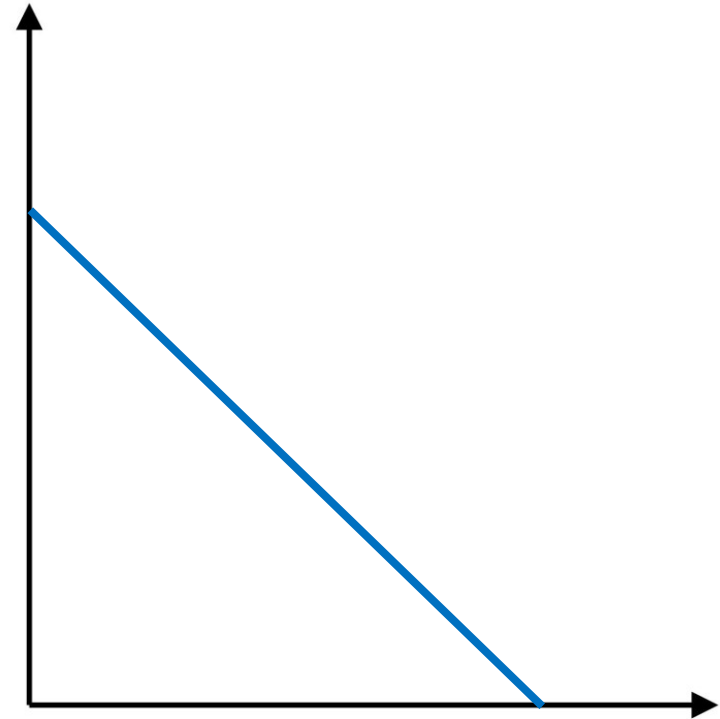
Intertemporal Budget Constraint

Interpreting the Slope of the Budget Constraint

Intertemporal Budget Constraint

What happens when...

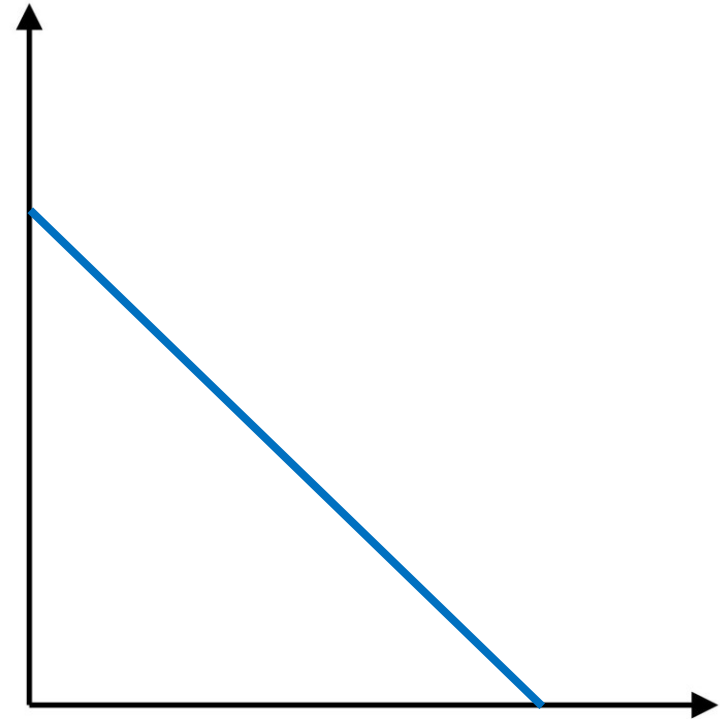
Y_0 or Y_1 changes?



Intertemporal Budget Constraint

What happens when...

Interest rate “ r ” changes?



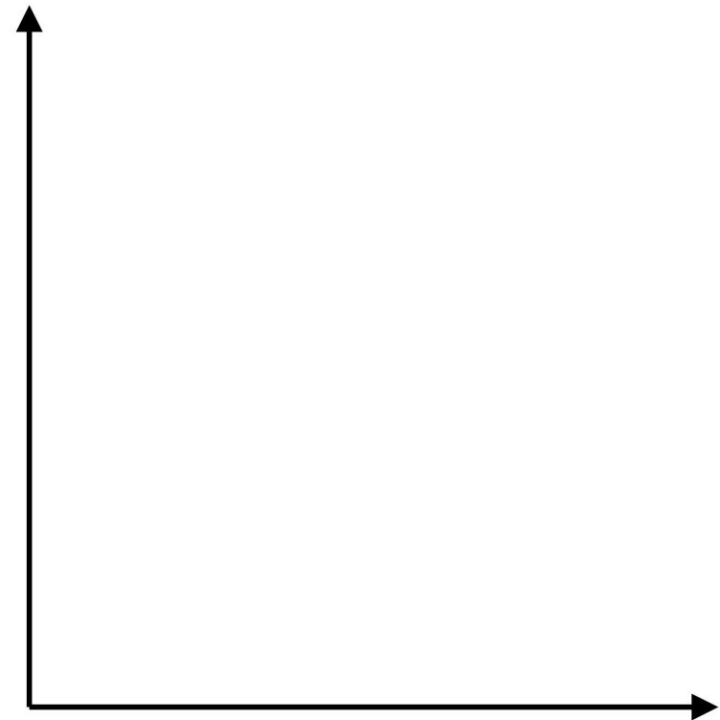
Intertemporal Indifference Curves

Standard Assumptions

- MU is positive.
- MU is diminishing.

Implication

- MRS is diminishing.

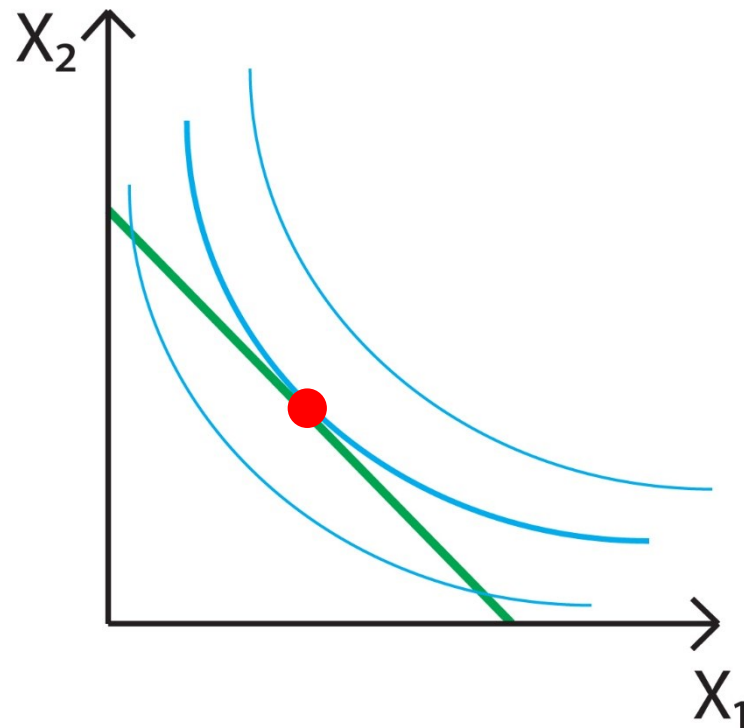


Intertemporal Indifference Curves

Interpreting the Slope of the Indifference Curves

Optimal Intertemporal Choice

That is, the optimal choice is the bundle on the highest IC (maximizing U) and on the BL (using all income).

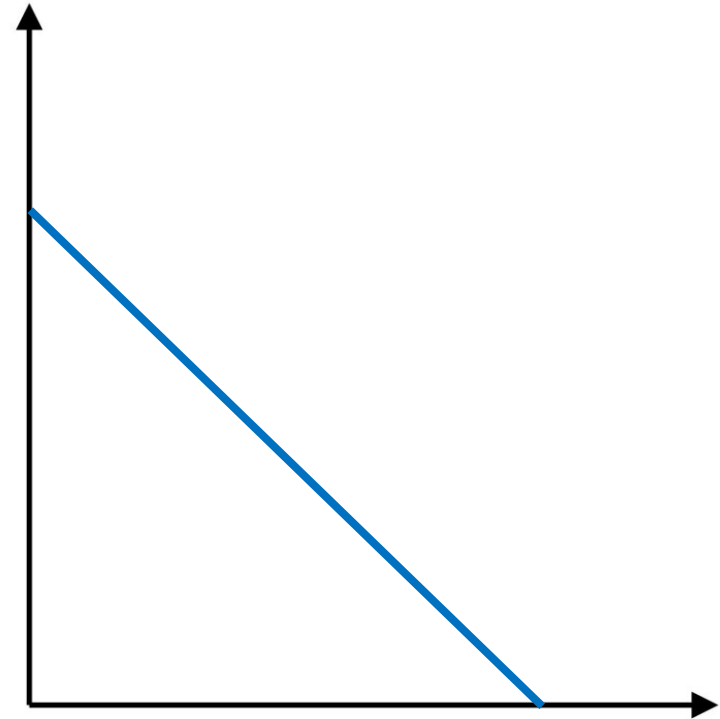


Optimal Intertemporal Choice

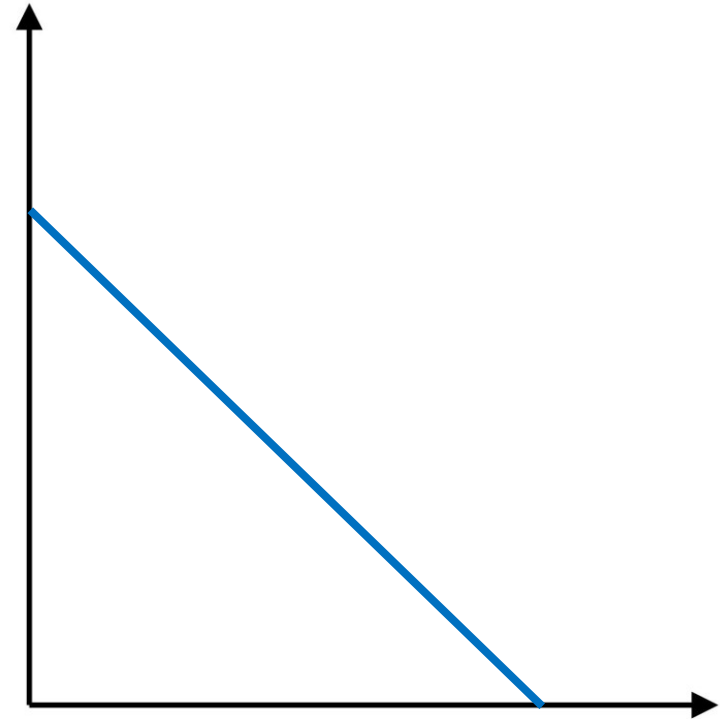
Bang for the Buck

Two Rates of Exchange

Borrowing Equilibrium



Lending/Saving Equilibrium



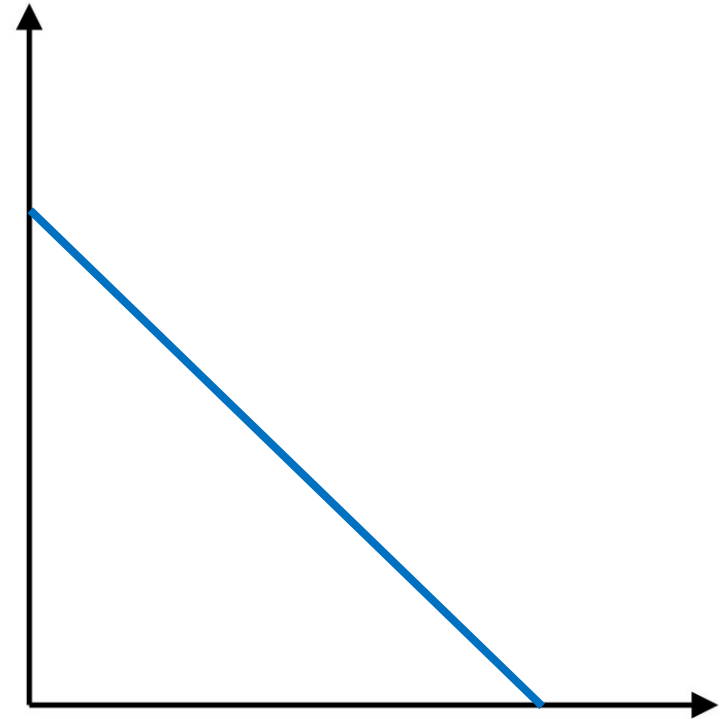
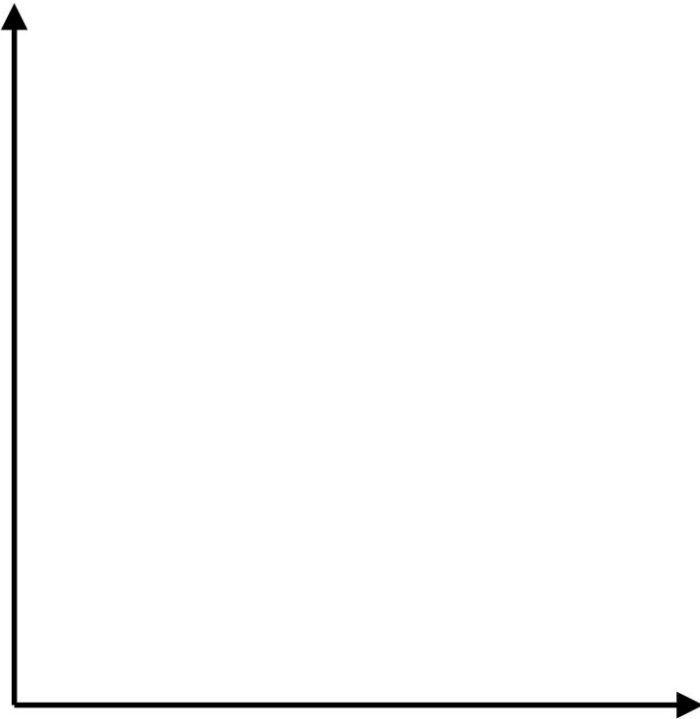
The Loanable Fund Market

- The loanable fund market aggregates all borrowers and lenders/savers.
- **Borrowers** bring in the **Demand** for loanable funds.
- **Lenders/Savers** bring in the **Supply** of loanable funds.

Demand for Loanable Funds

- **When r increases, D_{LF} decreases** because of the substitution and income effects on borrowers.
- SE:
- IE:

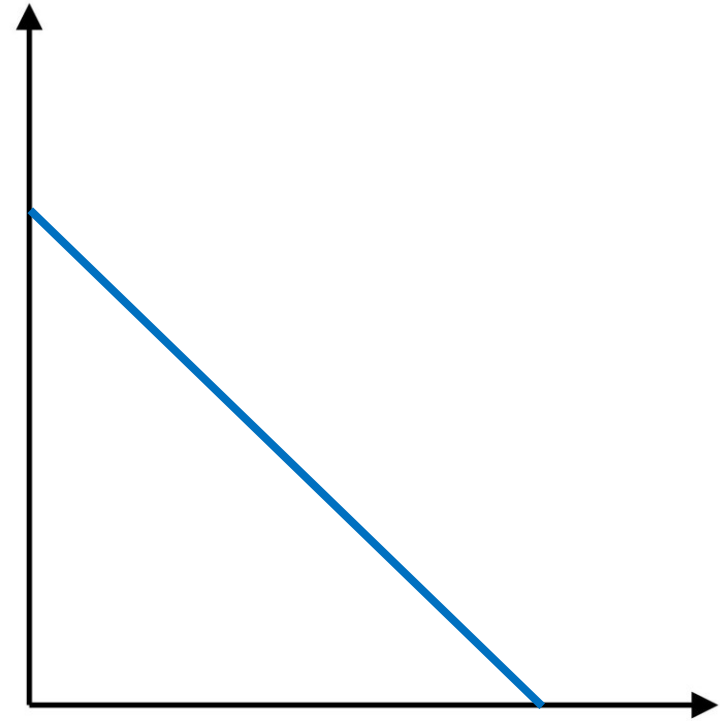
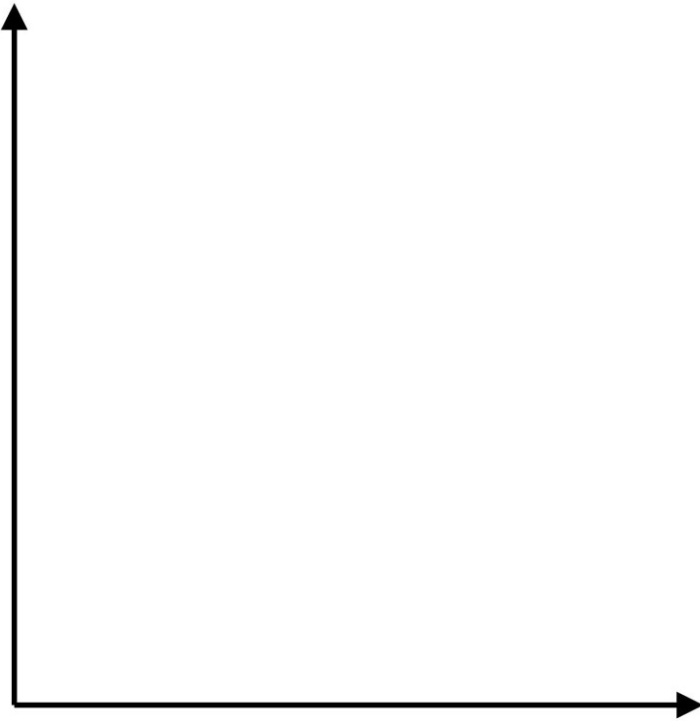
Demand for Loanable Funds



Supply of Loanable Funds

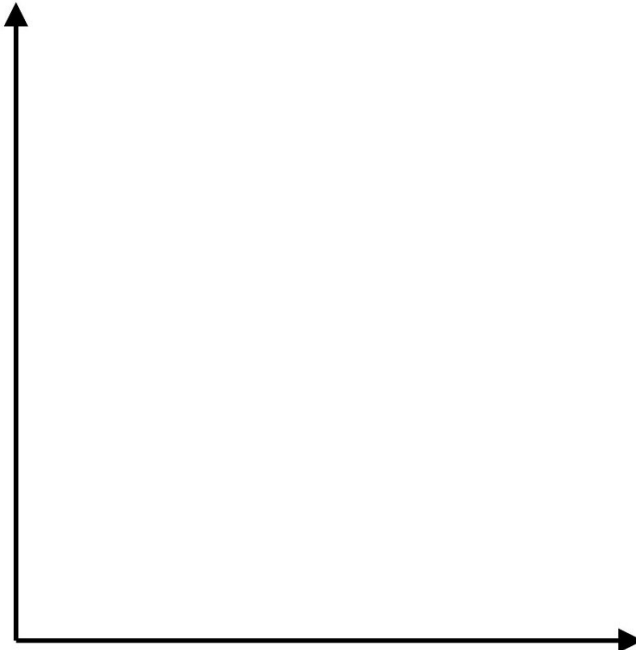
- **When r increases, S_{LF} initially increases and then decrease** because of the substitution and income effects on lenders/savers.
- SE:
- IE:

Supply of Loanable Funds



The Loanable Fund Market

- Demand and Supply together determines the “**price**” of loanable funds, which is the “**real interest rate**”.

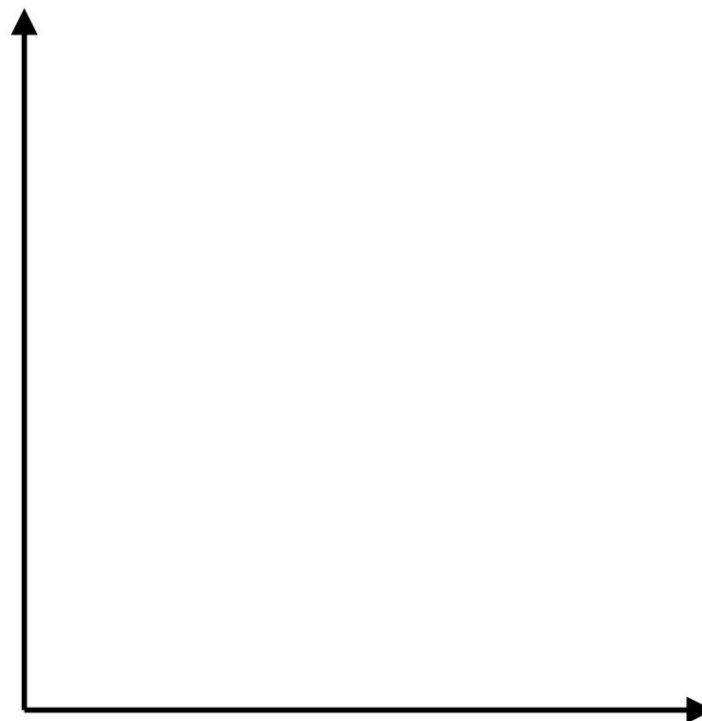


Intertemporal Choice with Investment

- **Suppose there is no money market**, so the consumer cannot borrow nor lend/save money.
- However, the consumer can invest part of his current income in order to get some return in the future.
- This can be shown by the Investment-Possibility Frontier.

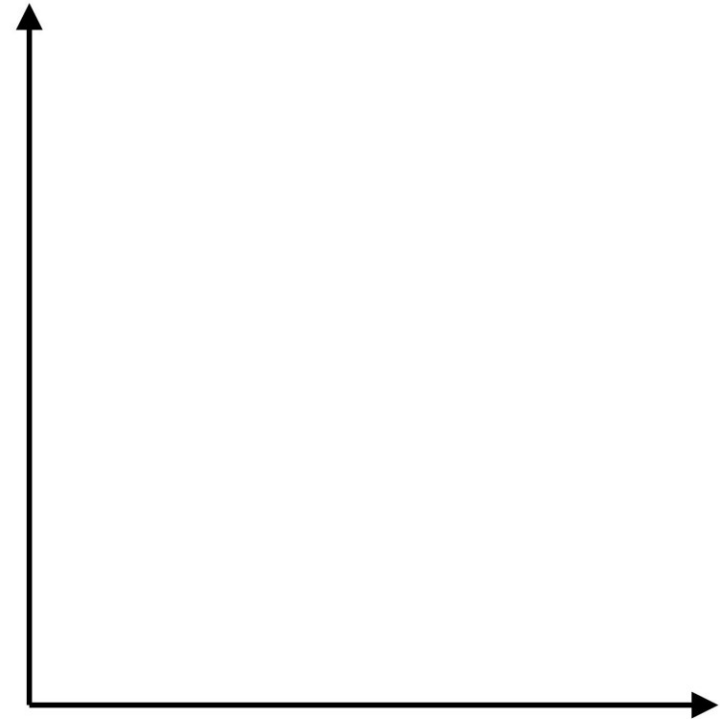
Investment-Possibility Frontier

- Suppose the endowment is where $Y_0 > 0$ and $Y_1 = 0$.
- The frontier shows how Y_0 can be converted into Y_1 .
- The slope is the **marginal rate of transformation (MRT)**, which represent **the rate of return on investment**.



Intertemporal Choice with Investment

Optimality Condition



Intertemporal Choice with Investment

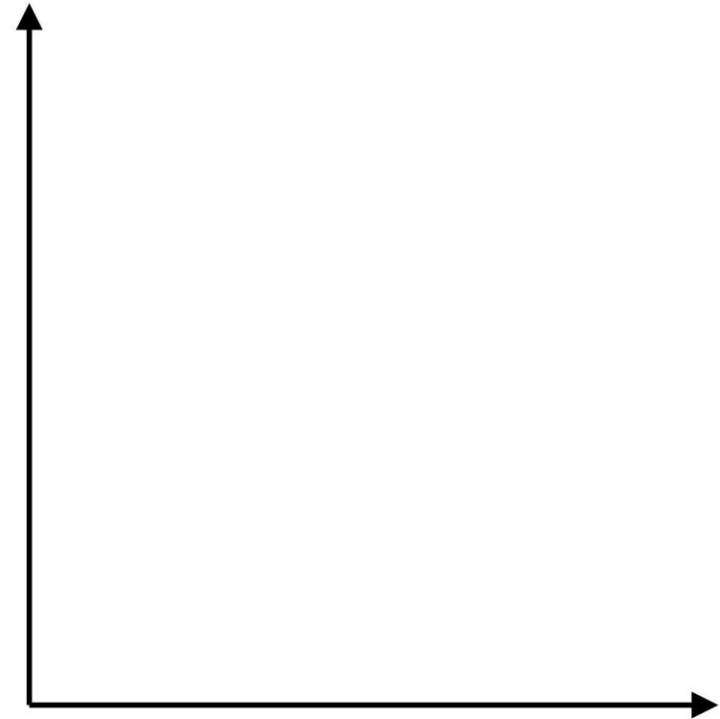
- **Suppose there are a money market as well as an investment opportunity.**
- Assume the endowment with $Y_0 > 0$ and $Y_1 = 0$.
- **The consumer can lend/save or invest.**

Intertemporal Choice with Investment

- If he **lends/saves** his current income, he will move along the **intertemporal budget constraint**.
- The rate of return on lending/saving is given by...
- If he **invests** his current income, he will move along the **investment-possibility frontier**.
- The rate of return on investment is given by...

Intertemporal Choice with Investment

1st Optimality Condition



Intertemporal Choice with Investment

2nd Optimality Condition

