

Intertemporal Choice - Handout 5

Simona Montagnana¹

I. INTRODUCTION

In this handout we describe briefly the choices over time. A budget constraint over time is called: *intertemporal budget constraint*. It shows how much a consumer can consume today ($t = 0$) and how much he can consume in the future ($t = 1$).

The basic idea of intertemporal choice of consumption is to understand how the consumer interacts with the capital market.

II. INTERTEMPORAL BUDGET CONSTRAINT

We start by assuming there are only two periods: today ($t = 0$) and tomorrow ($t = 1$). The **Intertemporal Budget Constraint** shows the **tradeoff** between consumption today and consumption in the future. The consumer's decision about this tradeoff will lead to his choice about how much to save and how much to borrow.

We assume M represents the individual's income and C the individual's consumption. Then the budget constraint is:

$$p_0 m_0 + p_1 m_1 = p_0 c_0 + p_1 c_1 \quad (1)$$

If we suppose that the prices of consumption in each period are constant at 1, and the consumer has no possibility of borrowing, then the (1) becomes:

$$m_0 - c_0 = c_1 - m_1$$

Graphically:

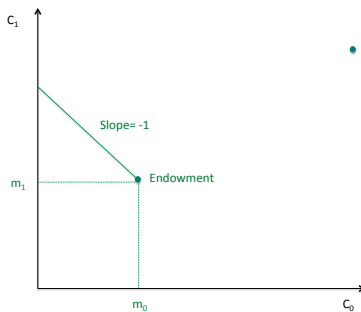


Fig. 1. Budget constraint when no borrowing is allowed

We assume now that the consumer can borrow or lend money at some interest rate r and $p_0 = 1$.

The consumer is a borrower if $c_0 > m_0$ and he pays an interest on his borrowings.

The consumer is a lender if $m_0 > c_0$ and he earns an interest on his savings.

$$c_1 = m_1 - (m_0 - c_0) - r(m_0 - c_0)$$

$$c_1 = m_1 - (1+r)(m_0 - c_0)$$

Rearranging the intertemporal budget constraint and giving $p_1 = 1$, we can express the **future value** as:

$$(1+r)c_0 + c_1 = (1+r)m_0 + m_1$$

or giving $p_0 = 1$, we can express the **present value** as:

$$c_0 + \frac{c_1}{(1+r)} = m_0 + \frac{m_1}{(1+r)}$$

We can call the term $\frac{1}{1+r}$ discount factor.

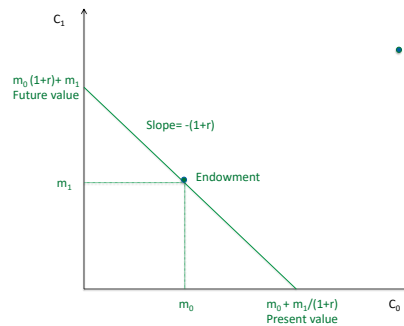


Fig. 2. Present and future values

¹ Department of Economics, University of Bath - England
s.montagnana at bath.ac.uk

III. COMPARATIVE STATICS

If now we introduce the consumer's preferences, we can describe the optimal choices for consumption over time with an increase of the interest rate.

In Fig. 3 the individual is a saver: $c_0 < m_0$.

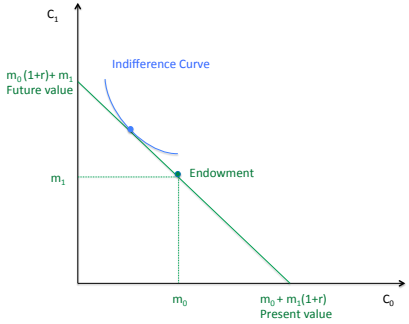


Fig. 3. Lender

In Fig. 4 the individual is a borrower: $c_0 > m_0$.

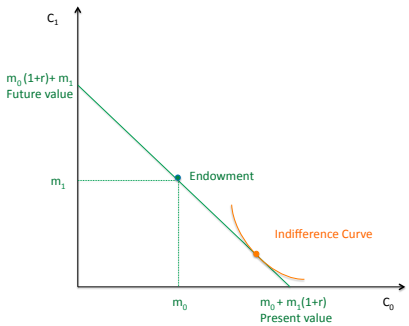


Fig. 4. Borrower

If $c_0 = m_0$ the individual is at zero savings point, and is neither saving nor borrowing (the indifference curve is tangent at the endowment point).

IV. THE SUPPLY OF SAVINGS

Figure 5 shows the intertemporal budget constraint for a saver, and a new budget constraint (steeper) showing what the individual can consume when the interest rate increases. Given his preferences, the individual is better off and he will remain a saver.

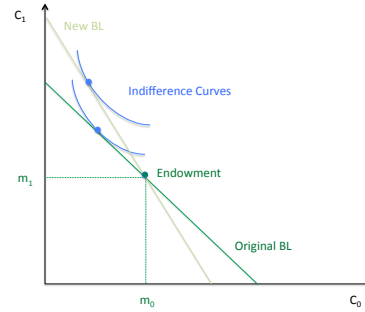


Fig. 5. A saver when Interest rate rises

Figure 6 shows the intertemporal budget constraint for a borrower, and a new budget constraint (steeper) showing what the individual can consume when the interest rate increases. Given his preferences, the individual is be worst off and he will remain a borrower.

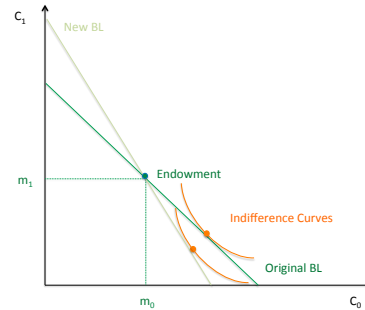


Fig. 6. A borrower when the interest rate rises

REFERENCES

- [1] Varian H. (2017) Intermediate Microeconomics, 9th ed.