4. A Two-Period Two-Sector Neo Austrian Model

4.1 Outline of the Procedure
In this chapter we will try to apply the lessons of the previous chapters, that is we will avoid the concept of a period of production and use von Neumann's linear activity approach. To close the system we will introduce the demand side into the model. In addition, we will give up Assumption 2.3 (constancy of the subsistence fund and its given stationary time structure), which implies the stationarity of the system. In contrast to the Austrian theory of capital we will, therefore, allow nonstationary solutions. In this and the following chapters, however, we will restrict ourselves to two-sector models: one for the production of a consumption good and one for a capital good. While in Chapters 4 and 5 we will exclude the possibilities of reswitching and capital reversing we will admit them in Chapter 6, in which we will extend the analysis to a multisector model.

After describing the technology and the production possibilities we will redefine von Böhm Bawerk's notion of greater productivity of roundabout methods, thus bringing out more clearly its essence, and as such apply it within our framework. After discussing the implications of our definitions, we will show under what conditions the rate of interest is positive given that there is superiority of roundabout ways.
We consider for our analysis a planned economy. We will, however, show in Section 4.8 how it can be decentralized.

4.2 The Technology
We consider an economy whose technology consists of only one linear production process \( R_1 \)
\[ R_1 : a_{21} \text{ units of labor } \rightarrow 1 \text{ unit of the consumption good.} \]
If the total supply of labor \( Y_L \) is the same in each period, then the maximal product of the consumption good is also constant and equal to
\[ z^\text{max}_{1C} = \frac{Y_L}{a_{21}}. \]

Now let us assume that there is an invention of two new linear production processes, \( R_2 \) and \( R_3 \):
\[ R_2 : a_{22} \text{ labor } \oplus b_{32} \text{ capital good } \rightarrow 1 \text{ consumption good} \]
\[ R_3 : a_{23} \text{ labor } \rightarrow 1 \text{ capital good}. \]

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1 This chapter represents Bernholz [1971] viewed from Bernholz, Faber and Reiss [1977, 1978].

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A necessary condition for process $R_2$ to be efficient is

\[(4.1) \quad a_{21} > a_{22}.\]

We now state

**Assumption 4.1.** The rate of depreciation $c$ is equal to one, i.e. we have a circular capital good\(^1\).

Before proceeding it is convenient to introduce

**Definition 4.2.** A production technique $T$ for a particular good $j$ consists of a production process $R_j$, with which this good can be produced, and those production processes that are necessary to produce intermediate products and capital goods which are direct or indirect inputs of $R_j$.

Applying this concept to our technology we observe that there are two techniques for the consumption good, namely $T_1$ consisting of $R_1$ and $T_2$ consisting of $R_2$ and $R_3$.

We now want to redefine within our technology Assumption A2.4, the law of greater productivity of more roundabout processes. For this purpose we formulate the restrictions of the technology. Let

\[y_K > 0\]

be the amount of the capital good available at the beginning of that period in which techniques $T_2$ may be used the first time. Let this time be period $P_1$. For a model with an economic horizon of two periods we obtain:

\[
(4.2) \quad M \cdot [x, z]^T = \begin{bmatrix}
    x_{11} & x_{12} & x_{13} \\
    x_{21} & x_{22} & x_{23} \\
    x_{31} & x_{32} & x_{33}
\end{bmatrix} \begin{bmatrix}
    y_{1C} \\
    y_{1L} \\
    y_{1K} \\
    y_{2C} \\
    y_{2L} \\
    y_{2K}
\end{bmatrix}.
\]

\[^1\text{In contrast to our approach Bernholz [1971, 1972] does not consider depreciation. In [1971] he uses the capital good also as an input in $R_3$.}\]