Imagine a world with two individuals, Ann and Bill, and two goods, clothing and food. Each of the individuals has an initial endowment represented as a pair \((c, f)\) the quantities of clothing and food correspondingly. See Edgeworth box, figure 3.1.
Market Equilibrium Allocation Satisfies the Efficiency Criterion

\[ \max_{c_i, f_i} U(c_i, f_i) \]

s.t.

\[ p_i c_i + p_j f_i = p_i c_i' + p_j f_i' \]

Marginal rate of transformation of agent \( i \) (Ann or Bill) is equal to the ratio of prices

Exchange Economy is Efficient

\begin{itemize}
  \item Marginal rate of substitution of Ann is equal to the ratio of prices
  \item The same is true for the marginal rate of substitution of Bill
  \item Thus, the marginal rates of substitution of Ann and Bill are equal to each other!
\end{itemize}

Production Efficiency

\begin{itemize}
  \item Marginal Rate of technical substitution between any two inputs must be the same for all firms
    \begin{itemize}
      \item Satisfied in the competitive markets, as the MRTS is equal to the ratio of prices of inputs
    \end{itemize}
  \item Product mix efficiency: Marginal rate of transformation must equal to the marginal rate of substitution
    \begin{itemize}
      \item Satisfied in the competitive markets, as the MRT is equal to the ratio of prices of outputs.
    \end{itemize}
\end{itemize}

Basic Assumptions for markets to be efficient

\begin{itemize}
  \item All goods are rivalry and excludable
  \item (No externalities)
  \item Both buyers and sellers have complete information
  \item Markets are complete: there is a market for every good
  \item Perfect competition prevails on all markets
\end{itemize}