Null hypotheses:

$$\text{Model (A)} \quad y_t = \mu + dD(TB)_t + y_{t-1} + e_t,$$

$$\text{Model (B)} \quad y_t = \mu_1 + y_{t-1} + (\mu_2 - \mu_1) DU_t + e_t,$$

$$\text{Model (C)} \quad y_t = \mu_1 + y_{t-1} + dD(TB)_t + (\mu_2 - \mu_1) DU_t + e_t, \quad \text{where}$$

$$D(TB)_t = 1 \quad \text{if} \quad t = T_B + 1, \quad 0 \text{ otherwise};$$

$$DU_t = 1 \quad \text{if} \quad t > T_B, \quad 0 \text{ otherwise}; \quad \text{and}$$

$$A(L) e_t = B(L) v_t,$$

$v_t \sim$ i.i.d. $(0, \sigma^2)$, with $A(L)$ and $B(L)$ pth and qth order polynomials, respectively, in the lag operator L.

The innovation series $\{e_t\}$ is taken to be of the ARMA(p, q) type with the orders p and q possibly unknown. This postulate allows the series $\{y_t\}$ to represent quite general processes. More general conditions are possible and will be used in subsequent theoretical derivations.

Instead of considering the alternative hypothesis that y_t is a stationary series around a deterministic linear trend with time invariant parameters, we shall analyze the following three possible alternative models:

Alternative hypotheses:

$$\text{Model (A)} \quad y_t = \mu_1 + \beta t + (\mu_2 - \mu_1) DU_t + e_t,$$

$$\text{Model (B)} \quad y_t = \mu + \beta_1 t + (\beta_2 - \beta_1) DT_t^* + e_t,$$

$$\text{Model (C)} \quad y_t = \mu_1 + \beta_1 t + (\mu_2 - \mu_1) DU_t + (\beta_2 - \beta_1) DT_t + e_t$$

where

$$DT_t^* = t - T_B, \quad \text{and} \quad DT_t = t \quad \text{if} \quad t > T_B \quad \text{and 0 otherwise.}$$