1)

$Y\left(t\right)=Y\left(t-1\right)+f\left(t\right)\left[a\_{1 }d\left(t-1\right)- a\_{2}d^{2}\left(t-1\right)\right]∙\left[N-Y\left(t-1\right)\right]+ a\_{3}\left[Y\left(t-1\right)-Y\left(t-2\right)\right]∙\left[N-Y\left(t-1\right)\right]-a\_{4}\overbar{d}$(t-1)Y(t-1)

Where

Y*(t*) is the number of prescriptions written at time *t*,

*d(t)* is the firms detailing effort at time *t*,

$\overbar{d}$*(t)* is the competitive detailing effort at time *t*,

*f(t)* is the decay rate, i.e. early prescribers tend to prescribe the most and *f(t)* will decline as *t* increases.

*N* is the total potential number of prescribers multiplied by the average prescription rate.

Ai *i* = 1,…4 are constants.

2)

$$Y^{'}=\left(Y\left(3\right),Y\left(4\right),…,Y\left(T\right)\right)given Y\left(1\right)and Y\left(2\right): $$

$$Y\left(t\right)-Y\left(t-1\right)=\left[a\_{1}d\left(t-1\right)-a\_{2}d^{2}\left(t-1\right)\right]∙\left[N-Y\left(t-1\right)\right]+a\_{3}\left[Y\left(t-1\right)-Y\left(t-2\right)\right]∙\left[N-Y\left(t-1\right)\right]-a\_{4}\overbar{d}\left(t-1\right)∙Y\left(t-1\right)+u\left(t\right)$$

$$t=3, 4,…,T,$$

Rao and Yamada (1988) found that the LRK model provides the best fit for pharmaceutical data when the decay factor was removed. For this reason in the Rao and Yamada (1988) version *f(t)* is set to 1. Also in the Rao and Yamada (1988) version the parameters *N* and *a1, a2, a3, a4* are all unknown; u(t) is also included as a disturbance term. It is assumed that the disturbances are all independently and normally distributed, with a zero mean and a common variance $σ^{2}$. A number of basic bench mark models will also be used including a naïve model, exponential smoothing and moving average techniques.