CH5120 ASSIGNMENT 6

Question-1

Model Equation:

**τ = 0.5**

%% Controller Parameters

ySP=1; % Setpoint

m=4; % Control horizon

p=10; % Prediction horizon

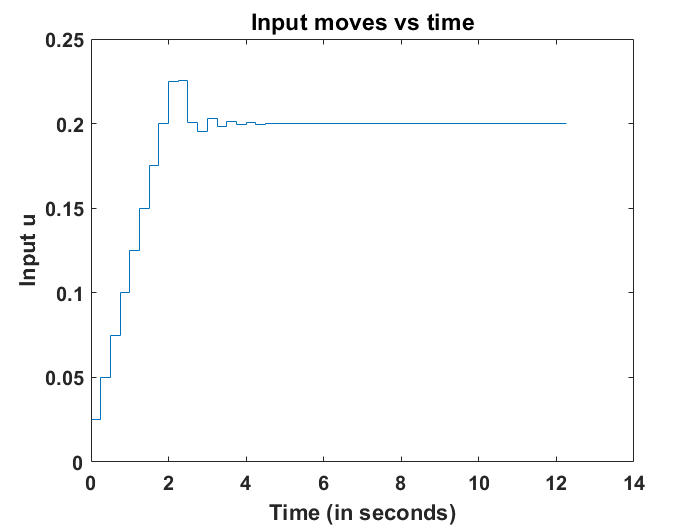
Q=1; % Output weight

R=0.1; % Input weight

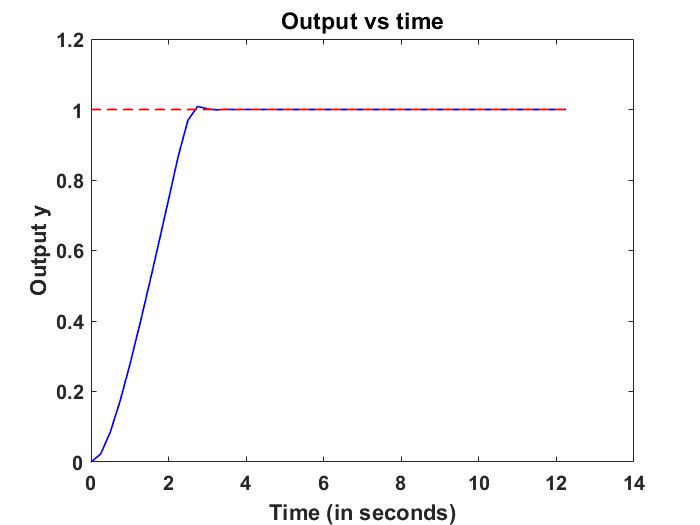
Constraints: and

Initial plant state is set to zero by default.

The measurement errors were set to zero using mpcsimopt



We can visually see that the input moves satisfy the constraint: .



As expected the controller is able to smoothly increase the output the set-point.

# Question-2

Model Equation:

%% Controller Parameters

ySP=1; % Setpoint

m=4; % Control horizon

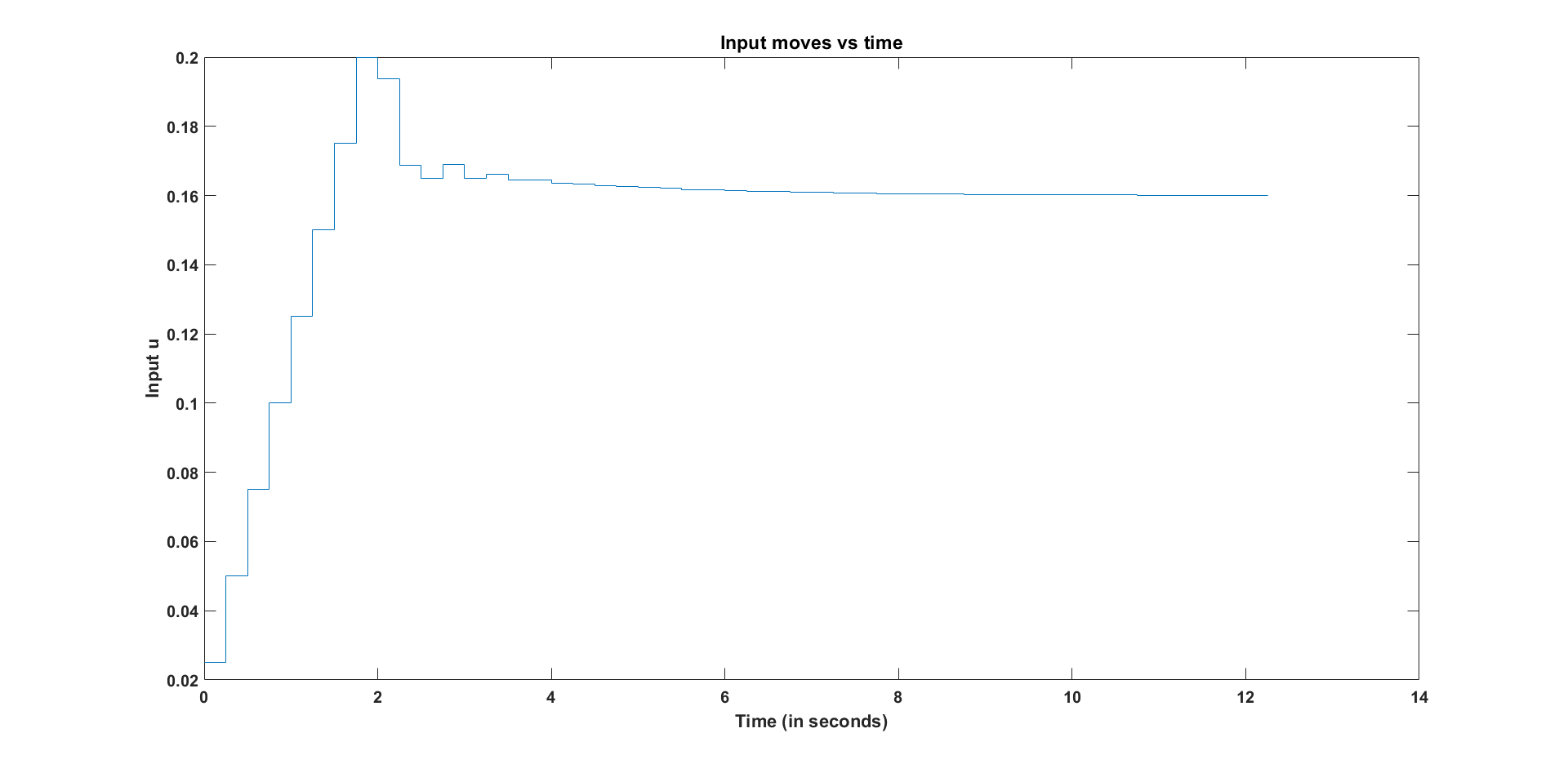
p=10; % Prediction horizon

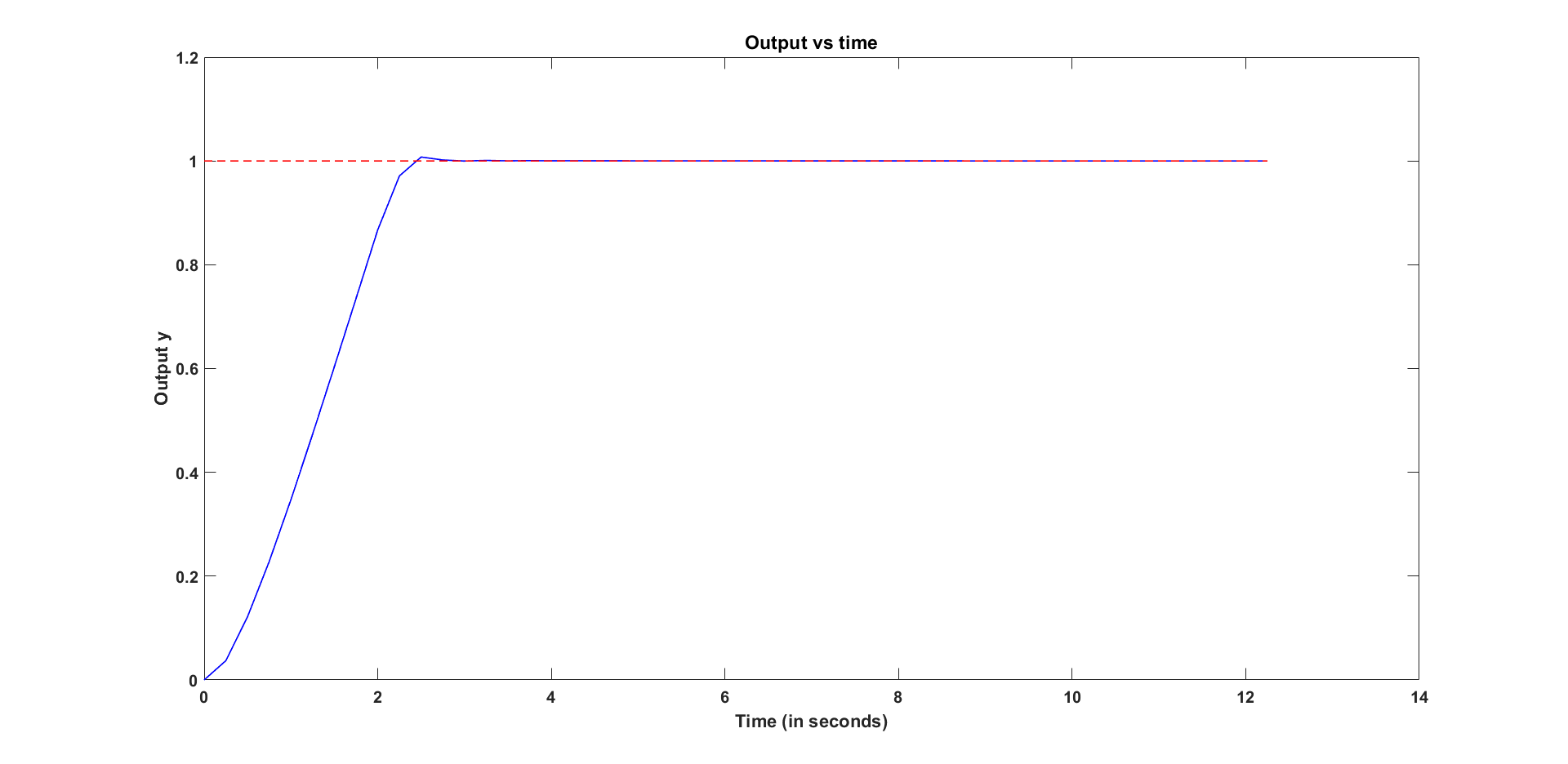
Q=1; % Output weight

R=0.04; % Input weight

Constraints: and

Disturbance is simply a step change given at t=0.





This is done in MATLAB by declaring the model incorporating the measured disturbance as a **2-input 1-output** model. Then using **setmpcsignals**, the input corresponding to the transfer function of the disturbance model, is termed as the ‘Measured Disturbance’.

The value of the disturbance is given as a vector to the **sim** function. (d(k) = 0.5)

Once again, the measurement errors are set to zero.

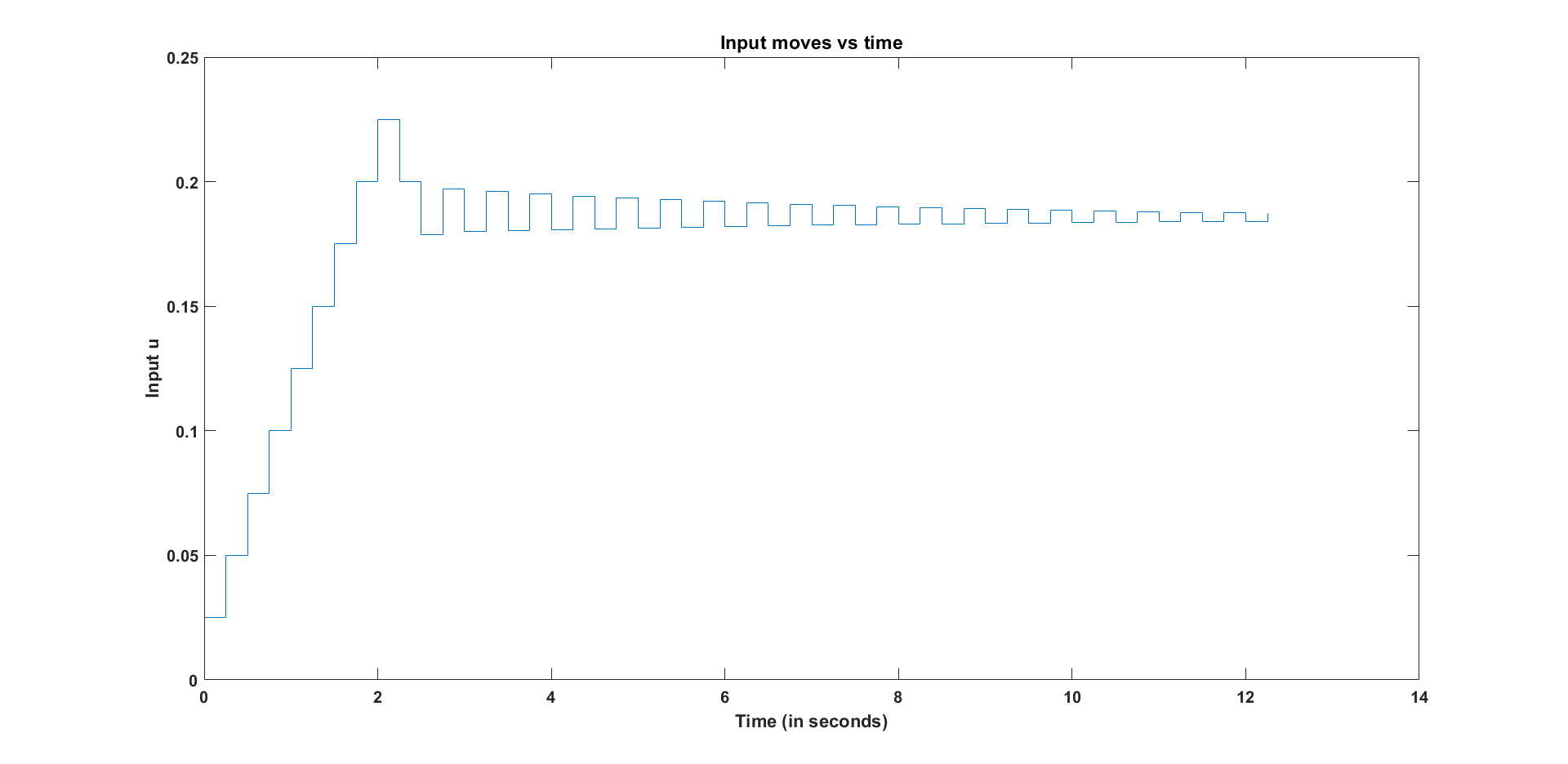
# Question-3

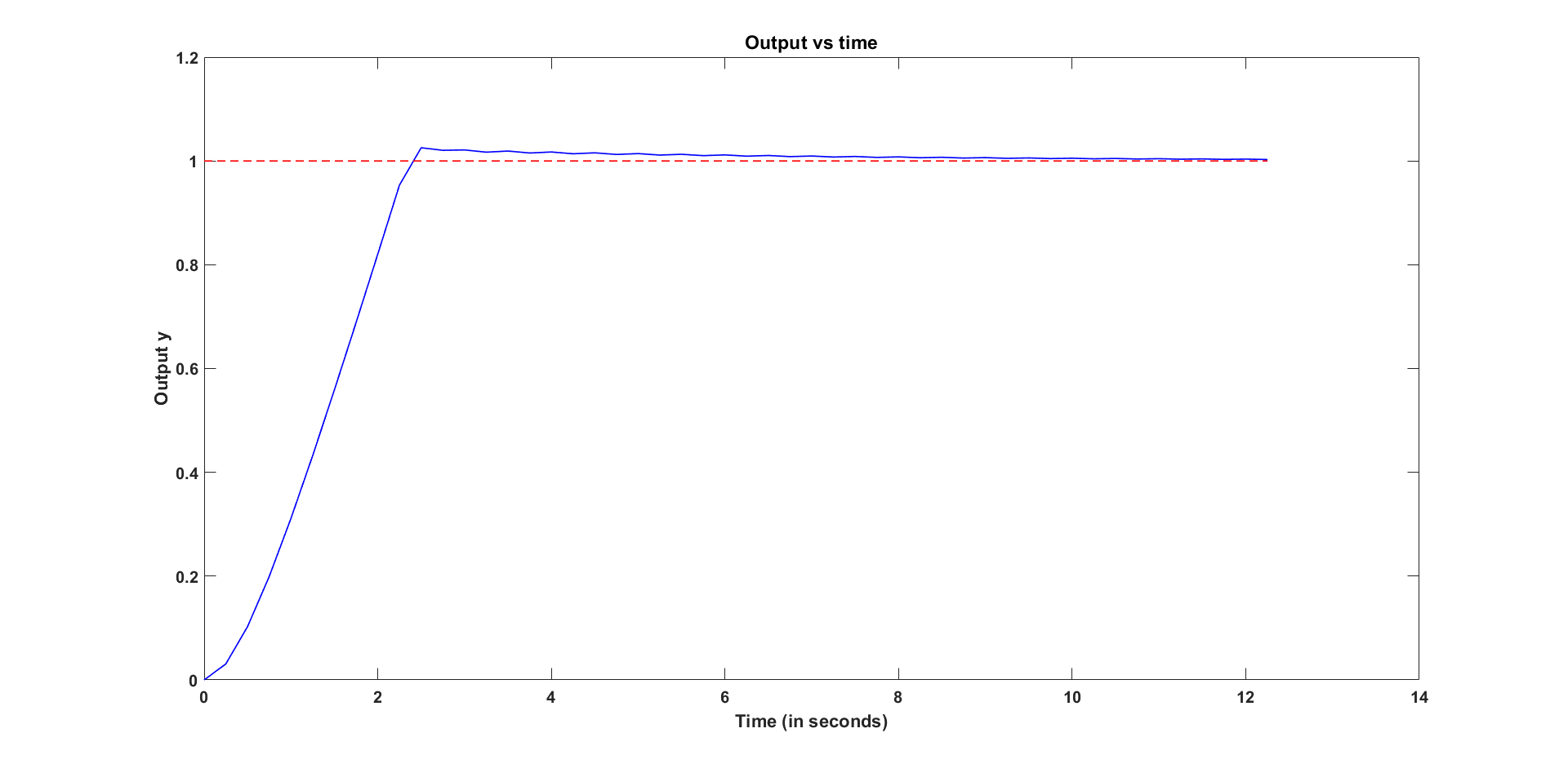
Here the tuning parameters remain the same and we remove the disturbance effects. Instead, this question deals with **model-plant mismatch**.

Model:

True Plant:

The time taken to get reasonably close to the set-point value (~0 error) is more for the case with mismatch. This extra time is needed to incorporate the effects of the mismatch (bias in the model).

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The mismatch effect was incorporating by updating the plant model in the options structure created using mpcsimopt().

The measurement errors were set to zero.