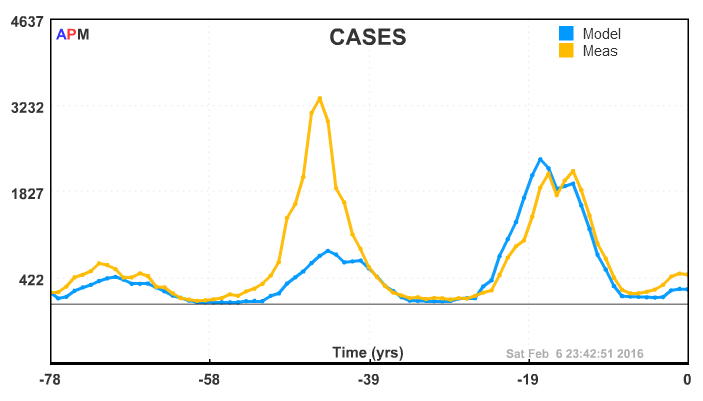
**Problem 3**

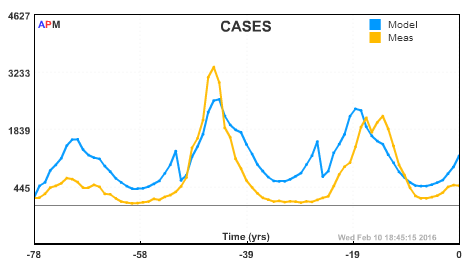
Part A)

Gamma = 0.07



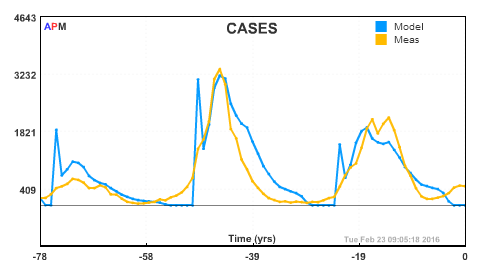
Not optimal, Gamma = 0.558806

Objective = 7.64269857e8



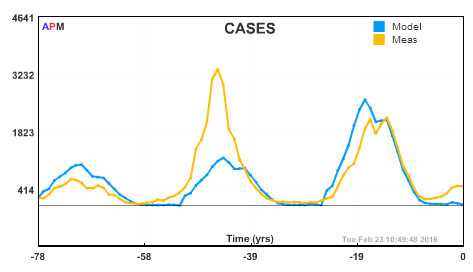
Not optimal, Gamma = 1.0

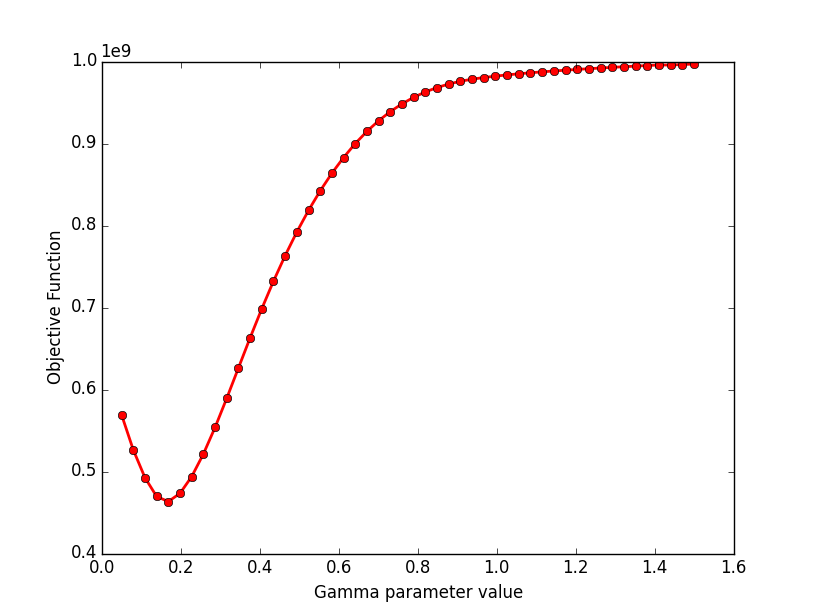
Obejective = 4.99972432e8



Optimal Gamma = 0.163045

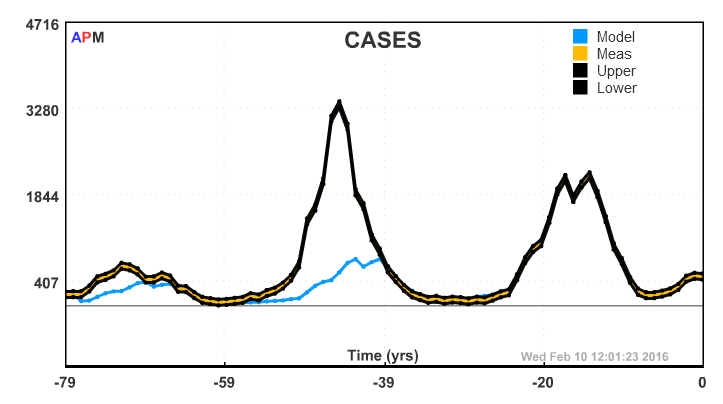
Obejective = 4.63027555e8





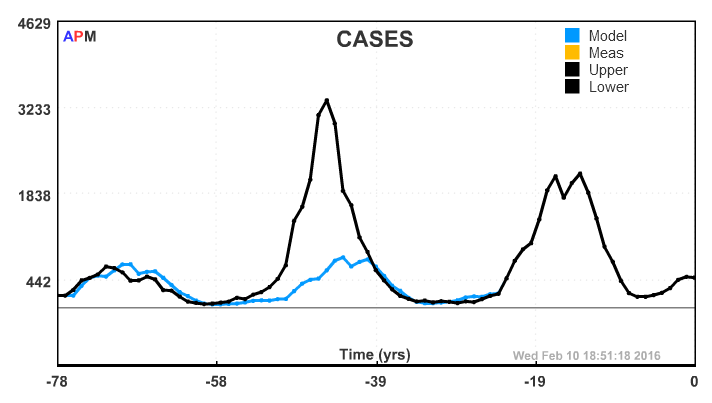
Part B)

Gamma = 0.07



Gamma = 0.181448 with WMODEL =0 and default meas\_gap

Gamma = 0.151772 with WMODEL = 0 and meas\_gap = 100



Part C)

! APMonitor Modeling Language

!

! Publication Source:

!

! Daniel P. Word, George H. Abbott, Derek Cummings, and Carl D. Laird, [2010],

! "Estimating Seasonal Drivers in Childhood Infectious Diseases with Continuous

! Time and Discrete-Time Models", in Proceedings, 2010 American Control Conference,

! Baltimore, MD, June 29 - July 2, 2010, p. 5137-5142.

!

! Data from New York for the years 1947-1965

! Data from Bangkok for the years 1975-1984

! Data from London is 1944-1966?

!

**Constants**

nb **=** **26** ! number of bi-weeks

**End** **Constants**

**Parameters**

N **=** **3.2e6** ! population size (individuals)

mu **=** **7.8e-4** ! scaled birth rate (births/biweek/total population) \* 1e5

gamma **=** **0.07** ! recovery rate (recoveries/biweek/infectives)

rep\_frac **=** **0.45** ! reporting fraction to account for underreporting

biweek[1:nb] **=** **0** ! indicate the particular biweek for each data set

beta[1:nb] **=** **1** , **>** **0.1** , **<** **100** ! transmission parameter (potentially infectious contacts/biweek)

**Vr = 0**

**End** **Parameters**

**Variables**

cases **=** **180** , **>=** **0** ! cases reported (new individuals infected per biweek)

S **=** **0.06** \* N , **>=** 0, **<=** N ! susceptibles (individuals in the total population)

I **=** **0.001** \* N, **>=** 0, **<=** N ! infectives (individuals infected)

**V = 200000 ! vaccine (initial supply = 200,000)**

**End** **Variables**

**Intermediates**

! infection rate per biweek

R[0] **=** **0**

Rs **=** S \* I / N

R[1:nb] **=** biweek[1:nb] \* beta[1:nb] \* Rs + R[0:nb-1]

**End** **Intermediates**

**Equations**

**$S = -R[nb] + mu \* N - Vr**

$I **=** R[nb] - gamma \* I

**$V = -Vr**

cases **=** rep\_frac \* R[nb]

**End** **Equations**

Part D)

