Dynamics in Time

May 10, 2020

```
[1]: import numpy as np
     import matplotlib.pyplot as plt
     %matplotlib inline
```

```
[2]: def myopic(x,y, alpha1,alpha2, a,b,c, n):
         xs=[x]
         ys=[y]
         for i in range(n):
             xs.append(xs[i] + alpha1*xs[i]*(a-c-2*b*xs[i]-b*ys[i]))
             ys.append(ys[i] + alpha2*ys[i]*(a-c-2*b*ys[i]-b*xs[i]))
         return np.array([xs, ys])
```

```
[3]: x = np.linspace(0, 100, 101)
     a15 = myopic(0.1,0.1,    2,2,    1.5,1,1,    100)
     a20 = myopic(0.1,0.1,    2,2,    2.0,1,1,    100)
     a22 = myopic(0.1,0.1,    2,2,    2.2,1,1,    100)
     a23 = myopic(0.1,0.1,    2,2,    2.3,1,1,    100)
     a25 = myopic(0.1,0.1,    2,2,    2.5,1,1,    100)
     a30 = myopic(0.1,0.1,    2,2,    3.0,1,1,    100)
```

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[4]: plt.plot(x, a15[0], label ="a = 1.5")
     plt.plot(x, a20[0], label ="a = 2")
     plt.xlabel('time')
     plt.ylabel('q1: Firm 1\'s Output')
     plt.legend()
```

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[4]: <matplotlib.legend.Legend at 0x7f072c6d7b70>
```

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[4]:
```
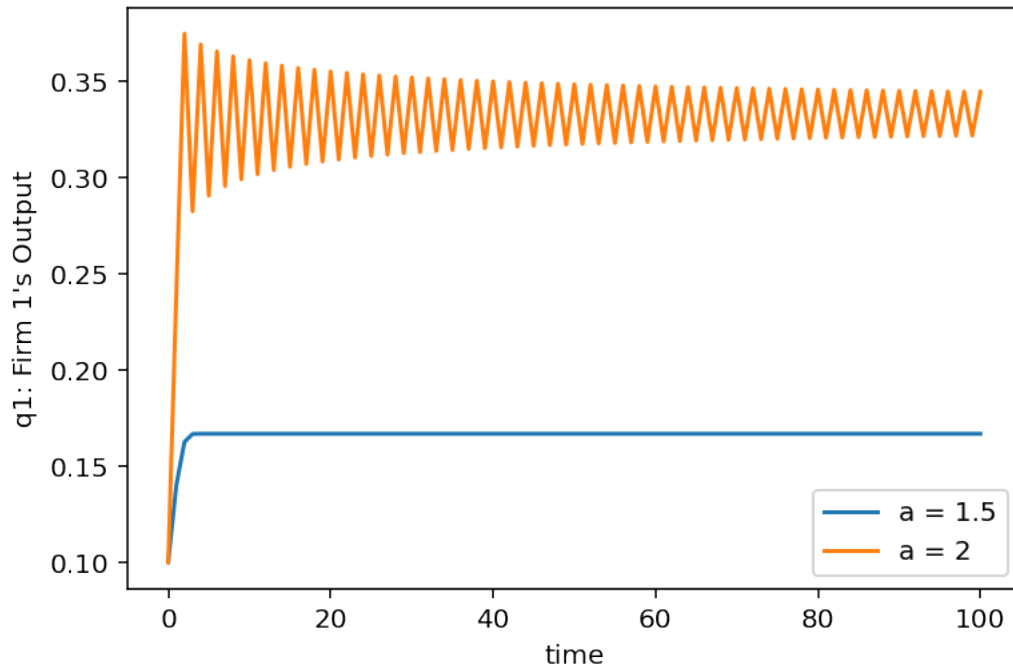
```
[5]: alp25 = myopic(0.1,0.1,    2.0,0.25,    2,1,1,   100)
     alp15 = myopic(0.1,0.1,    1.5,1.0,     2,1,1,   100)


     plt.figure(figsize=(20, 9))


     plt.subplot(121)
     plt.plot(x, alp25[0], label ="alpha = 2")
     plt.plot(x, alp25[1], label ="alpha = 0.25")
     plt.xlabel('time')
     plt.ylabel('Output')
     plt.legend()


     plt.subplot(122)
     plt.plot(x, alp15[0], label ="alpha = 1.5")
     plt.plot(x, alp15[1], label ="alpha = 1")
     plt.xlabel('time')
     plt.ylabel('Output')
     plt.legend()
```
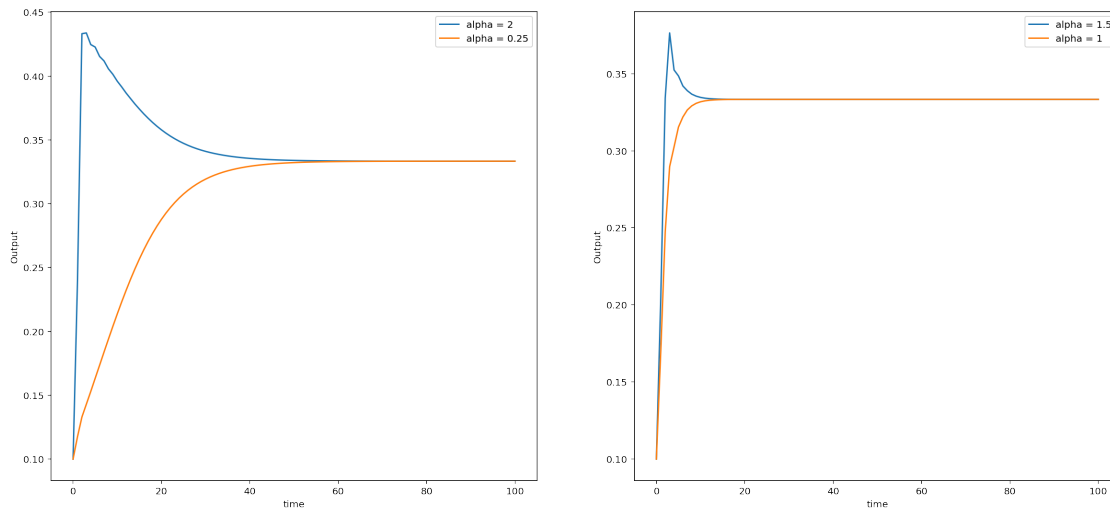
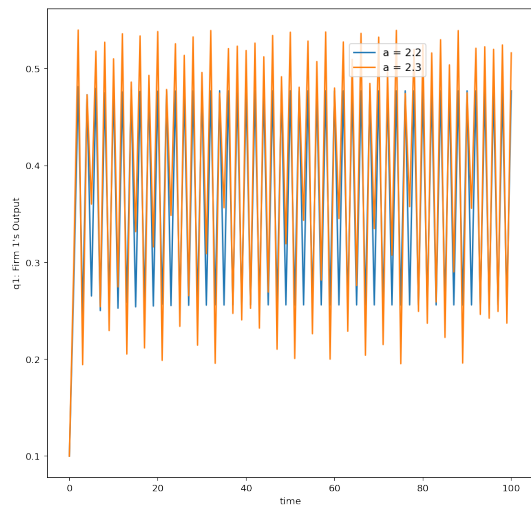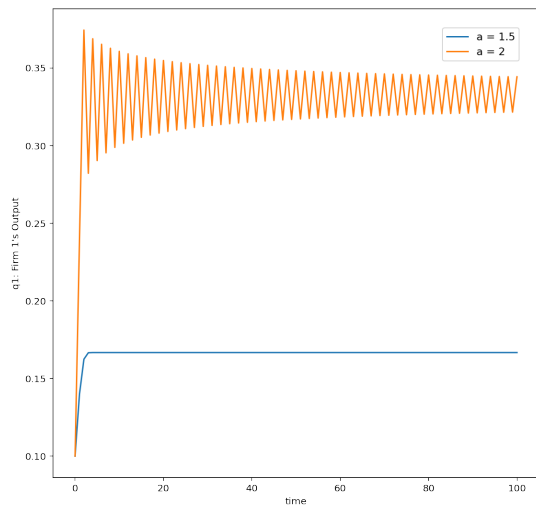[5]: <matplotlib.legend.Legend at 0x7f072c1d1208>

[5]:

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[6]: plt.figure(figsize=(20, 9))

     plt.subplot(121)
     plt.plot(x, a15[0], label ="a = 1.5")
     plt.plot(x, a20[0], label ="a = 2")
     plt.xlabel('time')
     plt.ylabel('q1: Firm 1\'s Output')
     plt.legend(bbox_to_anchor=(0.97, 0.97), prop={'size': 11})

     plt.subplot(122)
     plt.plot(x, a22[0], label ="a = 2.2")
     plt.plot(x, a23[0], label ="a = 2.3")
     plt.xlabel('time')
     plt.ylabel('q1: Firm 1\'s Output')
     plt.legend(bbox_to_anchor=(0.79, 0.89), prop={'size': 11})
```

[6]: <matplotlib.legend.Legend at 0x7f072c0b3cc0>

[6]:

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[0]:

[0]: