Test Thing

October 4, 2021

1 Test Notebook

1.1 Some LaTeX

1.1.1 Problem: Being unemployed with a chance of an offer

An unemployed worker samples wage offers on the following terms: each period, with probability $\phi, 1 > \phi > 0$, she receives no offer (we may regard this as a wage offer of zero forever). With probability $(1-\phi)$ she receives an offer to work for w forever, where w is drawn from a cumulative distribution function $F(w)$. Assume that $F(0) = 0, F(B) = 1$ for some $B > 0$. Successive draws across periods are independently and identically distributed. The worker chooses a strategy to maximize

$$E\sum_{t=0}^{\infty}\beta^t y_t, \quad \text{where} \quad 0 < \beta < 1$$

$y_t = w$ if the worker is employed, and $y_t = c$ if the worker is unemployed. Here c is unemployment compensation, and w is the wage at which the worker is employed. Assume that, having once accepted a job offer at wage w, the worker stays in the job forever.

Let $v(w)$ be the expected value of $\sum_{t=0}^{\infty}\beta^t y_t$ for an unemployed worker who has offer w in hand and who behaves optimally. Write the Bellman equation for the worker's problem. \end{exercise}

Answer Assume that the worker have an offer of w, if not then the worker makes no decision. The Bellman equation for this problem is:

$$\begin{aligned} v(w) &= \max_{\text{accept, reject}}\left\{\frac{w}{1-\beta}, \quad c + \beta\mathbb{E}[v(w')]\right\} \\ &= \max_{\text{accept, reject}}\left\{\frac{w}{1-\beta}, \quad c + \beta\phi c + \beta(1-\phi)\int_0^B w' dF(w')\right\} \end{aligned}$$

1.2 Some Code

[1]:
```
# we calculate the n-th Fibonacci number
function fib(n)
  x,y = (0,1)
  for i = 1:n x,y = (y, x+y) end
  x
end
```

[1]:
```
fib (generic function with 1 method)
```

[2]:
```
# Here we print it
fib(20)
```

[2]:
```
6765
```

[3]:
```
# This is a more elegant recursive way to do it
fib_rec(n) = n < 2 ? n : fib(n-1) + fib(n-2)
```

[3]:
```
fib_rec (generic function with 1 method)
```

[4]:
```
# we get an array of the first 10
fib10 = [fib_rec(n) for n   1:10]
```

[4]:
```
10-element Vector{Int64}:
  1
  1
  2
  3
  5
  8
 13
 21
 34
 55
```

If we want to print this in a more sophisticated and good looking way we can do:

[7]:
```
using Latexify

display(latexify(fib10))
```

$$\begin{bmatrix} 1 \\ 1 \\ 2 \\ 3 \\ 5 \\ 8 \\ 13 \\ 21 \\ 34 \\ 55 \end{bmatrix} \tag{1}$$

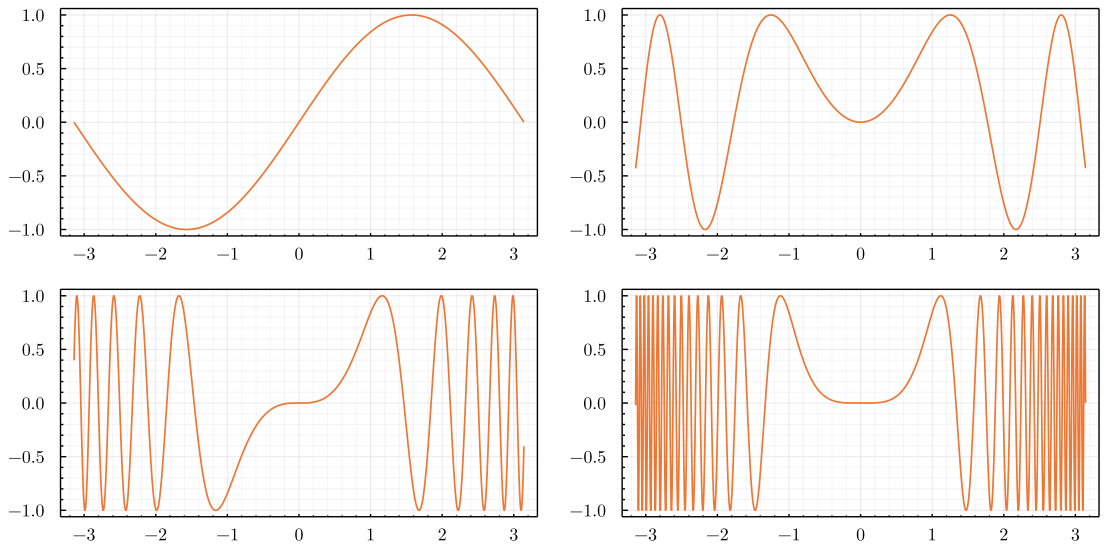
1.3 Some Figures

[35]:
```
using Plots, LaTeXStrings
theme(:vibrant) # un-coment for final version
default(fontfamily="Computer Modern", framestyle=:box) # LaTex-style
```

1.3.1 Simple Figure

[67]:
```
x = -:0.001:
y(n) = sin.(x.^n)

plot(x, y.(1:4), layout=(2,2), label="" , size = (800, 400))
```

[67]:

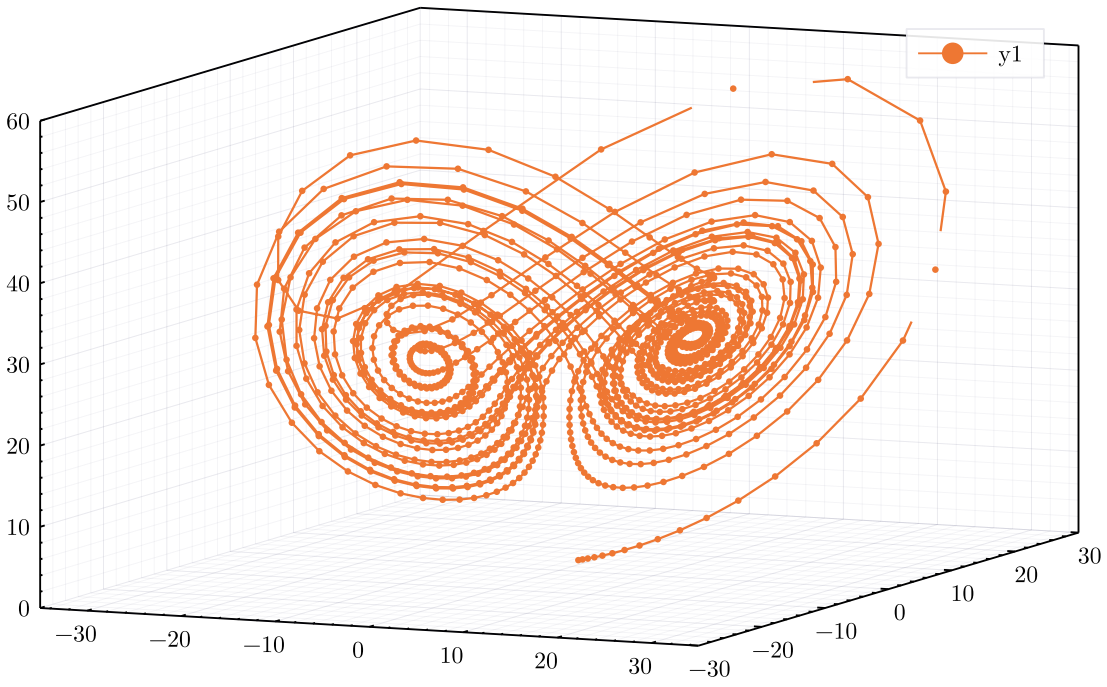


1.3.2 A more complicated one

[13]:
```
# define the Lorenz attractor
Base.@kwdef mutable struct Lorenz
    dt::Float64 = 0.02
     ::Float64 = 10
     ::Float64 = 28
     ::Float64 = 8/3
    x::Float64 = 1
    y::Float64 = 1
    z::Float64 = 1
end

function step!(l::Lorenz)
    dx = l.  * (l.y - l.x)
```

```
    dy = l.x * (l.  - l.z) - l.y
    dz = l.x * l.y - l.  * l.z
    l.x += l.dt * dx
    l.y += l.dt * dy
    l.z += l.dt * dz
end

attractor = Lorenz()


# initialize a 3D plot with 1 empty series
plt = plot3d(
    1,
    xlim = (-35, 35),
    ylim = (-30, 30),
    zlim = (0, 60),
    title = "Lorenz Attractor",
    marker = 2,
)

for i=1:1500
    step!(attractor)
    push!(plt, attractor.x, attractor.y, attractor.z)
end

plt
```

[13]:


Lorenz Attractor
y1
60
50
40
30
20
10
0
−30
−20
−10
0
10
20
30
−30
−20
−10
0
10
20
30

[ ]: