In [1]:
```
using Plots
```

In [2]:
```
using CSV, DataFrames
using StatsPlots
using Colors, ColorSchemes
using Random, Distributions
```

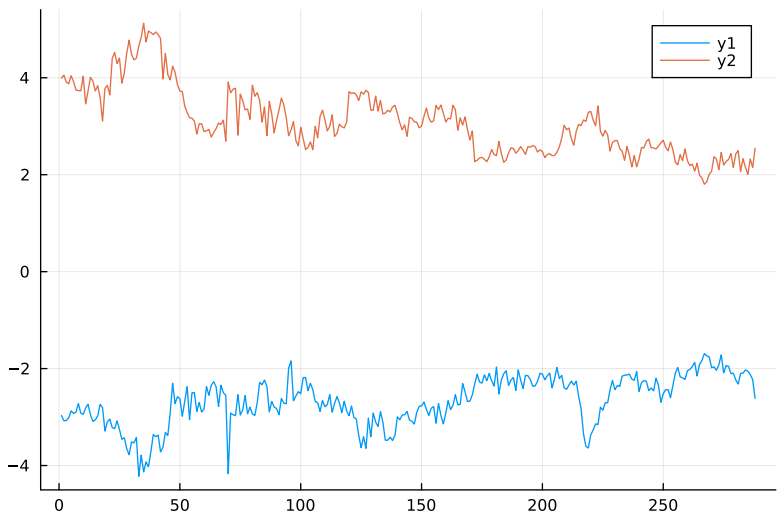
In [3]:
```
function simgarch(N, alpha0, alpha1, beta1)

    w = randn(N + 500)
    a = ones(N + 500) * 0.2
    h = ones(N + 500) * 0.2

    for i in collect(2:(N + 500))
      h[i] = alpha0 + alpha1*(a[i-1]^2.0) + beta1*h[i-1]
      a[i] = w[i]*sqrt(h[i])
    end

    return hcat([a[501:(N+500)] h[501:(N+500)]])
end
```

Out [3]: simgarch (generic function with 1 method)

In [4]:
```
dataX=CSV.File("ApplePredictionsOverTime.csv",header=true) |> DataFrame;
```

In [5]:
```
plot([dataX."pred_0.005" dataX."pred_0.995"])
```

Out [5]:



In [6]:
```
data=CSV.File("AppleDistOverTime.csv",header=true) |> DataFrame;
```

In [7]:
```
le=length(unique(data.date))
```

Out [7]: 288

In [8]:
```
#mycol=palette(:twelvebitrainbow, le)
#mycol=palette(:rainbow_bgyrm_35_85_c69_n256, le)
mycol=palette(:tableau_colorblind, le)
```

Out [8]:

In [9]:
```
#mycol=palette(["#c6dbef","#9ecae1","#6baed6","#4292c6","#2171b5","#084594"],le)
mycol=palette(["#c7e9b4","#7fcdbb","#41b6c4","#1d91c0","#225ea8","#0c2c84"],le)
```

Out [9]:

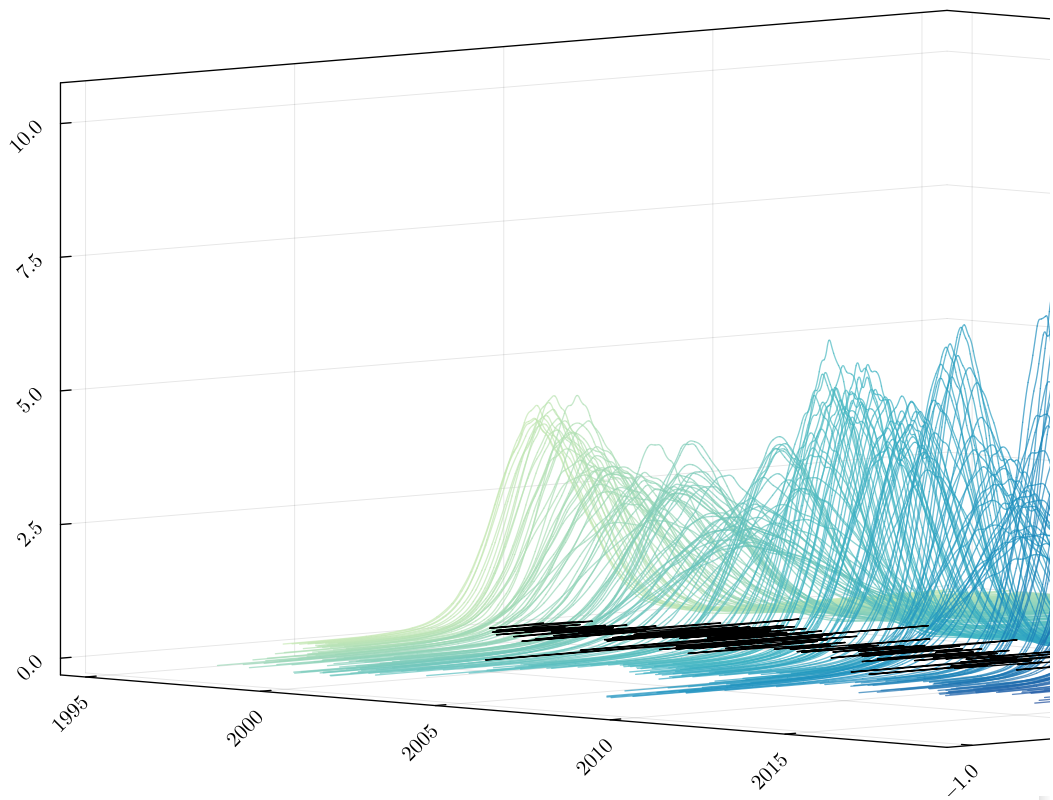
In [10]:
```
pos=[12*(i-1)+1 for i=1:24][[1 6 11 16 21]]
unique(data.date)[pos]
```

Out [10]:
```
1×5 Matrix{Dates.Date}:
 1995-01-01  2000-01-01  …  2015-01-01
```

In [11]:
```
returnsx=vcat([k for k in 1:le]...);
returnsy=vcat([dataX[dataX.date.==unique(data.date)[k],:].r_raw for k in 1:le]...);
```

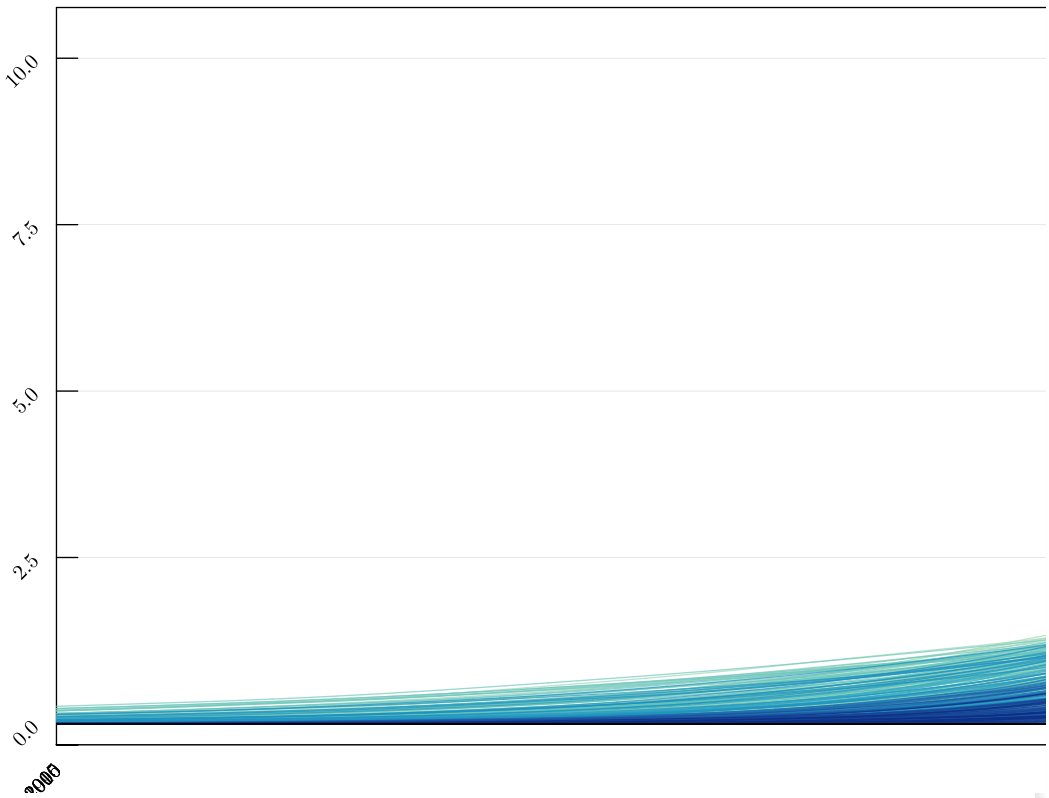
In [12]:
```
#k=plot(legend=false, xtick=1:1:le, ytick=-3:0.5:3,camera=(30, 65),ylim=[-1,1],size=(1000,600),frame=:box
k=plot(legend=false, xtick=1:1:le, ytick=-3:0.5:3,camera=(45, 25),ylim=[-1,1],size=(1400,600),frame=:box)

for xs in 1:le
    ys = data[data.date.==unique(data.date)[xs],:].x
    zs = data[data.date.==unique(data.date)[xs],:].density
    #k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs],grid=false)
    k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs],alpha=0.7)
    #k=plot3d!(fill(xs, length(ys)), ys, zs,color = :Spectral_11,line_z=ys)
end
#k=scatter3d!(returnsx, returnsy, zeros(le); ms=3, msc=:auto, color=:red)
k=plot!(returnsx, returnsy, zeros(le); ms=2, msc=:auto, color=:black,linestyle=:solid)
k=plot!(xticks=(pos,["1995" "2000" "2005" "2010" "2015"]),rotation = 45)
plot!(fontfamily="serif-roman",titlefontsize=10, xtickfontsize=10,ytickfontsize=10,ztickfontsize=10,ylabe
```

Out [12]:



In [13]:
```
k=plot!(ylim=[-0.4,0.0],camera=(90, 0))
```

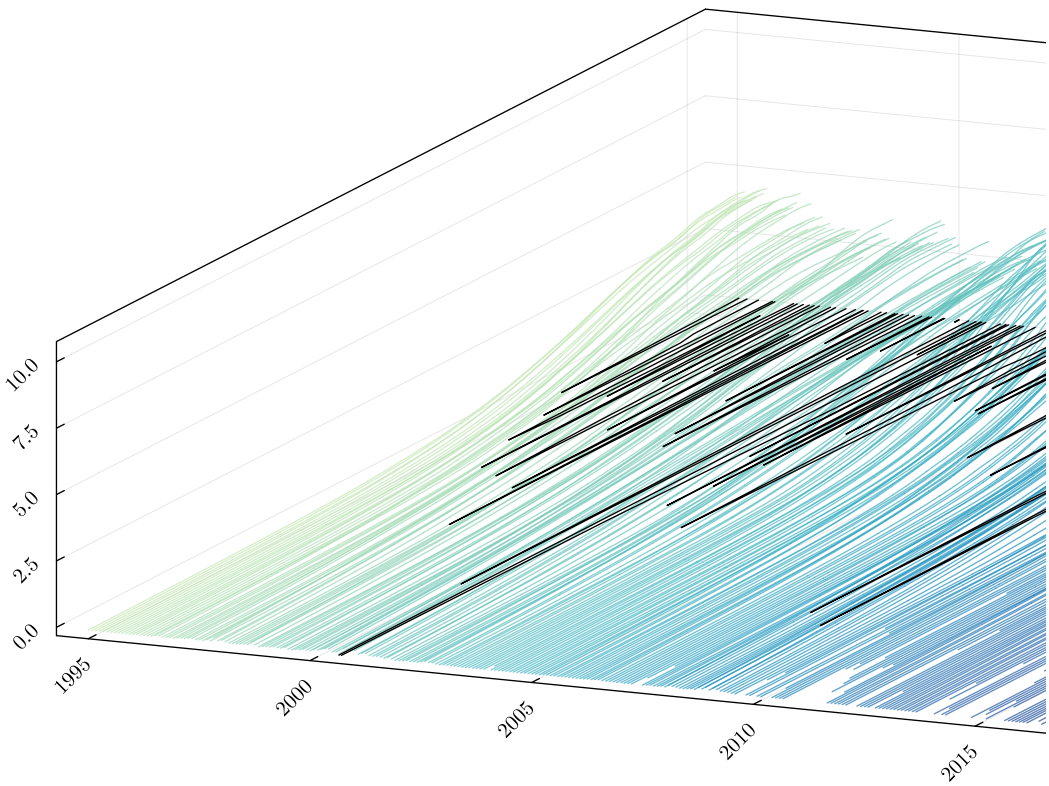
Out [13]:



In [14]:
```
savefig("Fig_plot3d_1_2.pdf")
```

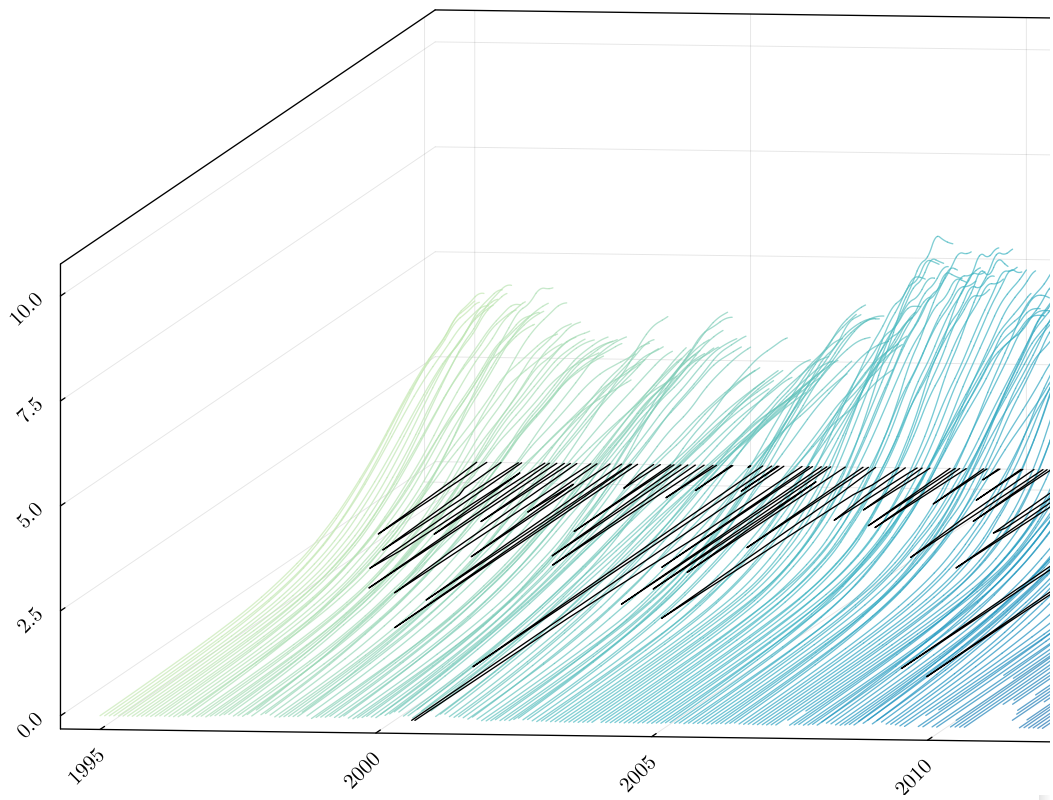
In [15]:
```
k=plot!(camera=(30, 65))
```

Out [15]:



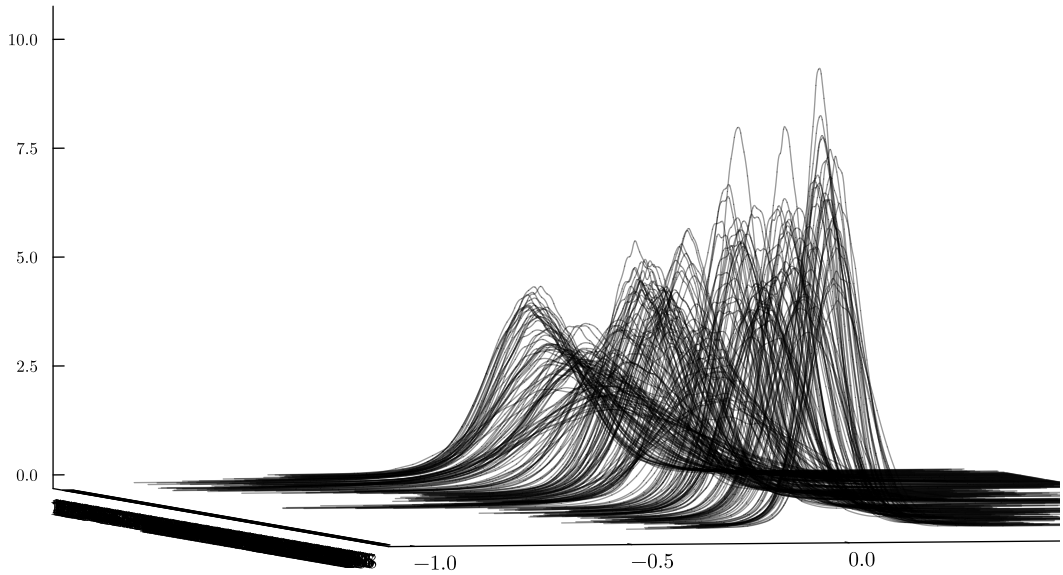
In [16]:
```
k=plot!(camera=(15, 45))
```

Out [16]:



In [49]:
```
k=plot(legend=false, xtick=1:1:le, ytick=-3:0.5:3,camera=(70, 15),ylim=[-1,1],size=(1000,450))

for xs in 1:le
    ys = data[data.date.==unique(data.date)[xs],:].x
    zs = data[data.date.==unique(data.date)[xs],:].density
    #k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs],grid=false)
    k=plot3d!(fill(xs, length(ys)), ys,zs,color=:black,grid=false,alpha=0.4)
end
#k=scatter3d!(returnsx, returnsy, zeros(le); ms=3, msc=:auto, color=:red)
#k=plot!(returnsx, returnsy, zeros(le); ms=2, msc=:auto, color=:black,linestyle=:solid)
#k=plot!(xticks=(1:50:le,unique(data.date)[1:50:le]),rotation = 45)
plot!(fontfamily="serif-roman",titlefontsize=10, xtickfontsize=10,ytickfontsize=10,ylabelfontsize=10)
```

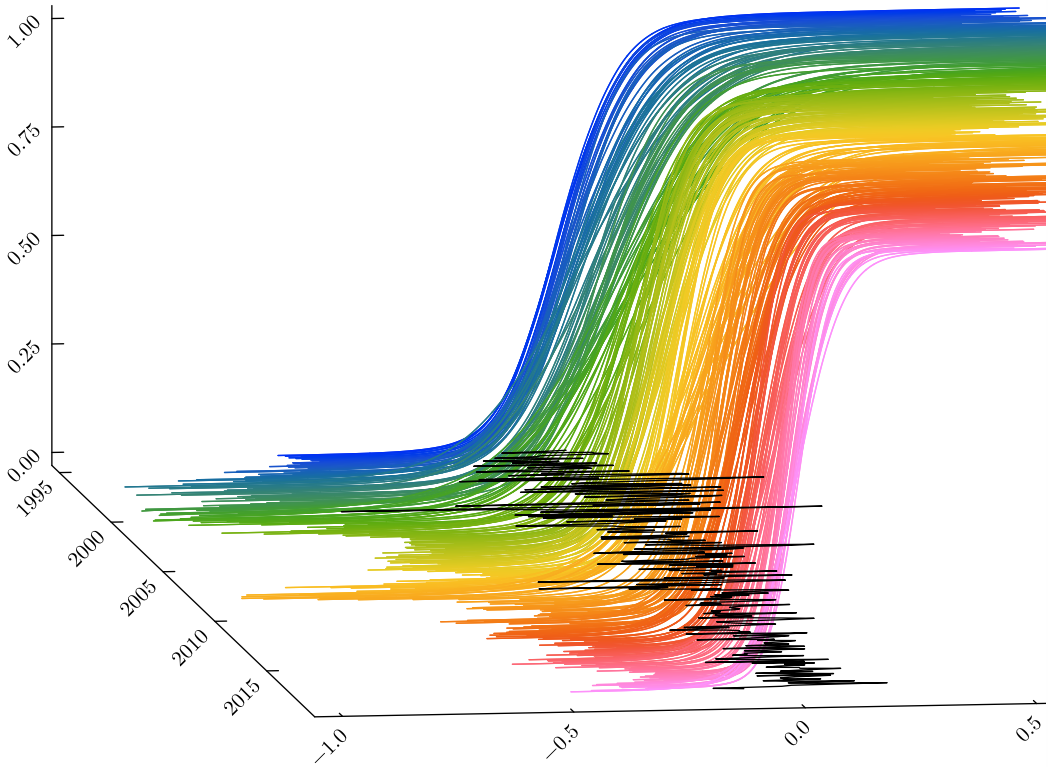
Out [49]:



In [50]:

```
k=plot(legend=false, xtick=1:1:le, ytick=-3:0.5:3,camera=(75, 45),ylim=[-1,1],size=(1000,600))

for xs in 1:le
    ys = data[data.date.==unique(data.date)[xs],:].x
    zs = data[data.date.==unique(data.date)[xs],:].cdf
    k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs],grid=false)
    k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs])
end
#k=scatter3d!(returnsx, returnsy, zeros(le); ms=3, msc=:auto, color=:red)
k=plot!(returnsx, returnsy, zeros(le); ms=2, msc=:auto, color=:black,linestyle=:solid)
k=plot!(xticks=(pos,["1995" "2000" "2005" "2010" "2015"]),rotation = 45)
plot!(fontfamily="serif-roman",titlefontsize=10, xtickfontsize=10,ytickfontsize=10,ztickfontsize=10,ylabe
```

Out [50]:

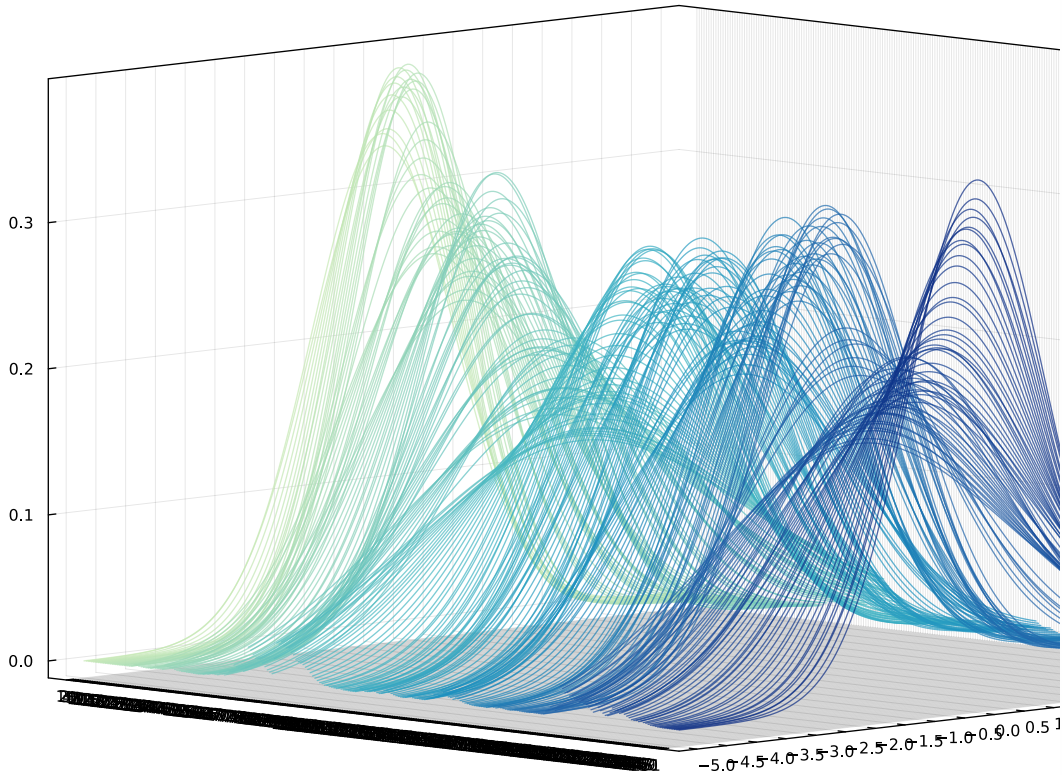


Simulated GARCH

In [60]:

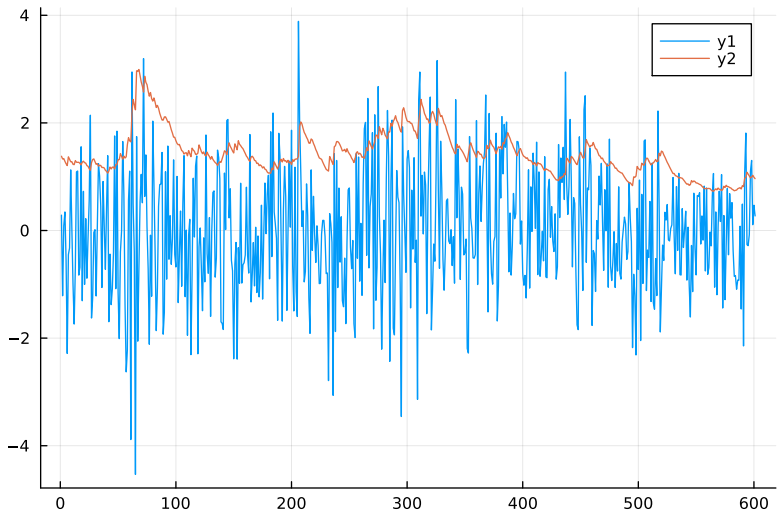
```
sim=[k for k=-5:0.04:5]
xx=simgarch(length(sim),0.015,0.04,0.95)
mycol=palette(["#c7e9b4","#7fcdbb","#41b6c4","#1d91c0","#225ea8","#0c2c84"],length(sim))

k=plot(legend=false, xtick=1:1:length(sim), ytick=-5:0.5:5,camera=(45, 25),ylim=[-5,5],size=(1000,600),fr

for xs in 1:length(sim)
    ys = sim
    zs = pdf(Normal(0.0,xx[xs,2]),sim)
    k=plot3d!(fill(xs, length(ys)), ys,zs,color=mycol[xs],alpha=0.7)
end
k
```

Out [60]:



In [53]:
```
plot(xx)
```

Out [53]:



In [ ]: