Test Stan for ATS

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```
library (rstan)
```

```
Loading required package: StanHeaders
```

```
Loading required package: ggplot2
```

```
rstan (Version 2.21.7, GitRev: 2e1f913d3ca3)
```

```
For execution on a local, multicore CPU with excess RAM we recommend calling
options(mc.cores = parallel::detectCores()).
To avoid recompilation of unchanged Stan programs, we recommend calling
rstan_options(auto_write = TRUE)
```

```
options(mc.cores = parallel::detectCores())
rstan_options(auto_write = TRUE)
```

First Test

execute simplest model, as supplied by Quarto >File > New File > Stan File

```
print(getwd())
```

```
[1] "/Users/Scott/Documents/Projects/OK SOX 2022/OK SOX Analysis/OSO Stan"
```

```r
file.exists('Stan ATS.stan') # TRUE
```

```
[1] TRUE
```

```r
dat1 = list(
    N= 10,
    y=rnorm(10,5,1)
)

fit1 <- stan(
    file = "Stan ATS.stan", # program, code
    data = dat1,            # data conforming to description in "Stan ATS.stan"
    chains = 4,             # number of Markov chains
    cores = 4,              # number of cores (one per chain)
    warmup = 1000,          # number of warmup iterations per chain
    iter = 2000             # total number of iterations per chain
)
```

```
Trying to compile a simple C file

Running /Library/Frameworks/R.framework/Resources/bin/R CMD SHLIB foo.c
clang -mmacosx-version-min=10.13 -I"/Library/Frameworks/R.framework/Resources/include" -DNDEI
In file included from <built-in>:1:
In file included from /Library/Frameworks/R.framework/Versions/4.2/Resources/library/StanHea
In file included from /Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEig
In file included from /Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEig
/Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEigen/include/Eigen/src/C
namespace Eigen {
^
/Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEigen/include/Eigen/src/C
namespace Eigen {
               ^
               ;
In file included from <built-in>:1:
In file included from /Library/Frameworks/R.framework/Versions/4.2/Resources/library/StanHea
In file included from /Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEig
/Library/Frameworks/R.framework/Versions/4.2/Resources/library/RcppEigen/include/Eigen/Core:
#include <complex>
         ^~~~~~~~~
```

```
3 errors generated.
make: *** [foo.o] Error 1
```

```
print(summary(fit1)$summary[1:2, -2], digits=3) # drop se_mean, drop lp__
```

```
      mean    sd  2.5%   25%   50%  75% 97.5% n_eff Rhat
mu    5.13 0.331 4.499 4.926 5.126 5.33  5.78  2056    1
sigma 1.00 0.312 0.618 0.801 0.938 1.13  1.76  1524    1
```

Second Test

Andrew Gelman's schools example from RStan-Getting-Started saved as file: *schools.stan*

```
schools_dat <- list(
    J = 8,
    y = c(28,  8, -3,  7, -1,  1, 18, 12),
    sigma = c(15, 10, 16, 11,  9, 11, 10, 18)
)
fit2 <- stan(file = 'schools.stan', data = schools_dat)
```

```
Warning: There were 4 divergent transitions after warmup. See
https://mc-stan.org/misc/warnings.html#divergent-transitions-after-warmup
to find out why this is a problem and how to eliminate them.
```

```
Warning: Examine the pairs() plot to diagnose sampling problems
```

```
print(summary(fit2)$summary[ ,-2], digits=3) # drop se_mean
```

```
              mean    sd    2.5%     25%      50%     75%  97.5% n_eff  Rhat
mu         7.79731 5.018  -2.165   4.644   7.89637  10.992  17.63  1736 1.001
tau        6.42991 5.427   0.262   2.414   5.12743   9.056  20.04  1795 1.002
eta[1]     0.39601 0.939  -1.476  -0.215   0.41729   1.031   2.22  3634 1.000
eta[2]     0.00247 0.864  -1.720  -0.550   0.00186   0.573   1.70  3460 1.000
eta[3]    -0.20328 0.913  -1.974  -0.809  -0.21965   0.394   1.61  3848 1.001
eta[4]    -0.02746 0.904  -1.746  -0.619  -0.04906   0.558   1.84  3172 0.999
eta[5]    -0.32995 0.902  -2.095  -0.924  -0.34251   0.270   1.47  3188 1.000
eta[6]    -0.23563 0.878  -1.911  -0.833  -0.23667   0.347   1.48  2965 1.000
```

```
eta[7]      0.35125 0.870  -1.354  -0.213   0.36226   0.919   2.06  3741 1.000
eta[8]      0.06242 0.901  -1.721  -0.562   0.09369   0.685   1.73  3693 1.000
theta[1]   11.27440 8.329  -2.205   5.880  10.31956  15.474  30.81  2958 1.001
theta[2]    7.84600 6.378  -5.190   3.995   7.87037  11.678  20.78  4260 1.000
theta[3]    6.05904 7.625 -10.761   1.988   6.58005  10.779  20.00  3036 1.000
theta[4]    7.54815 6.600  -5.761   3.639   7.49803  11.551  20.86  4289 1.000
theta[5]    5.19144 6.515  -9.564   1.437   5.68832   9.572  16.83  3541 1.000
theta[6]    5.96404 6.816  -9.603   2.027   6.57841  10.443  18.51  3569 1.000
theta[7]   10.63647 6.724  -1.142   6.168  10.06656  14.435  25.97  3642 1.000
theta[8]    8.33987 7.702  -6.909   3.884   8.24269  12.580  24.73  3244 1.000
lp__      -39.54932 2.578 -45.352 -41.047 -39.30772 -37.745 -35.17  1365 1.002
```

```
plot(fit2)
```

```
'pars' not specified. Showing first 10 parameters by default.
```

```
ci_level: 0.8 (80% intervals)
```

```
outer_level: 0.95 (95% intervals)
```