

exploration

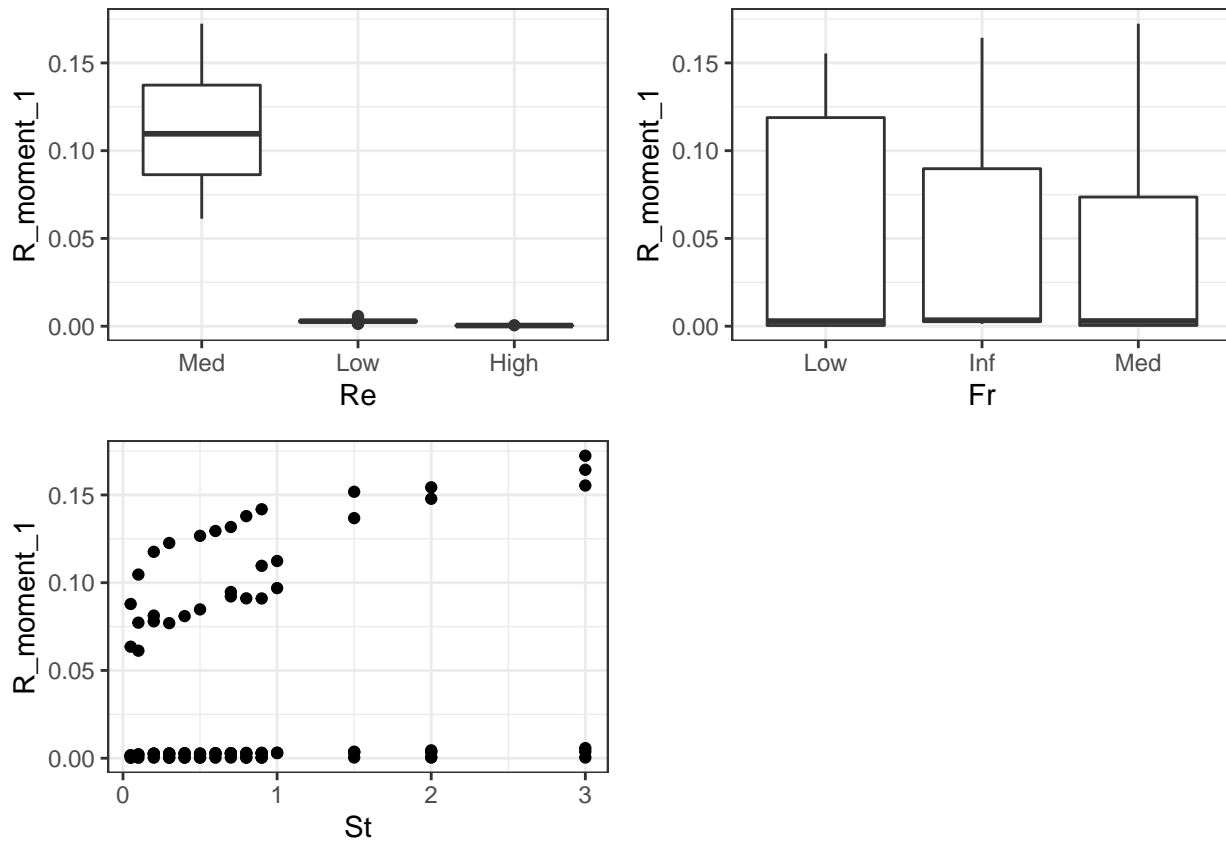
Anna Darwish

10/12/2020

Exploratory Data Analysis

Moment 1

Initial Plots



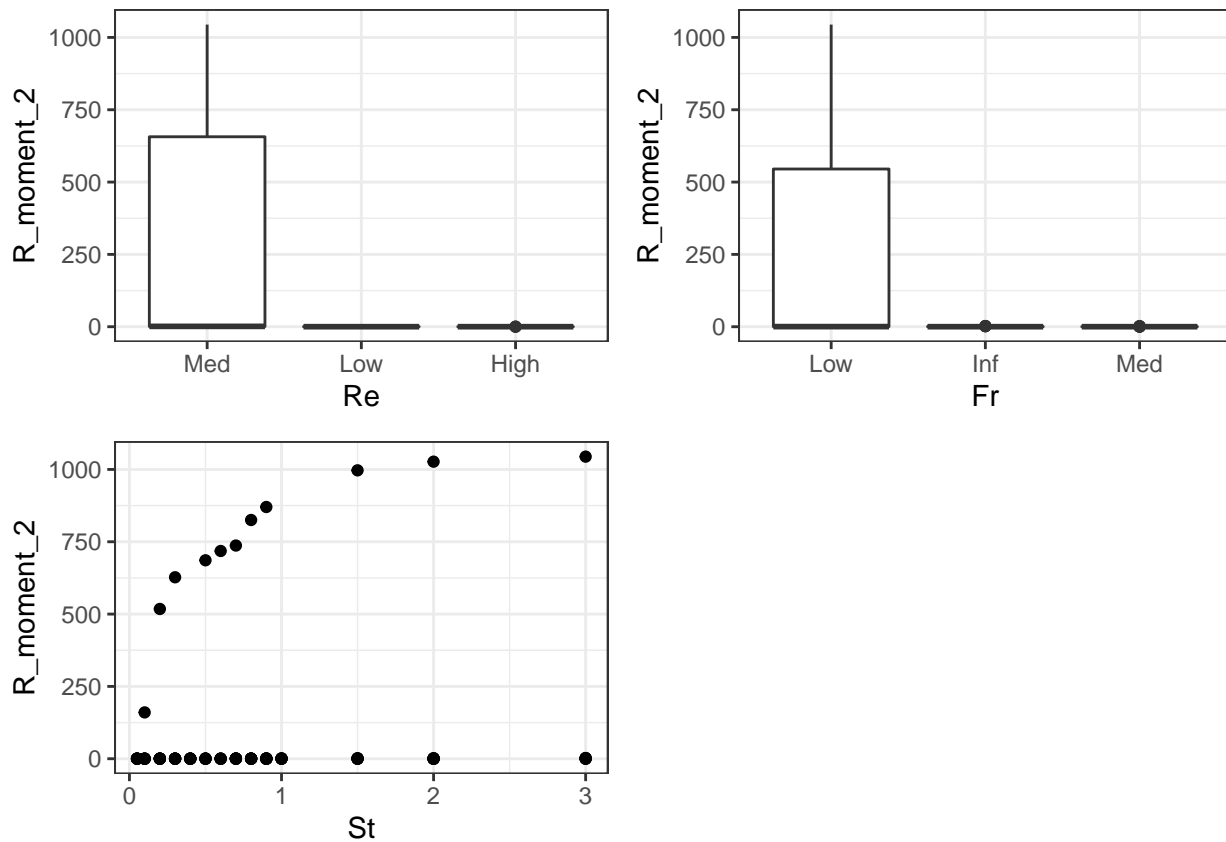
Naive Model

```
##  
## Call:  
## lm(formula = R_moment_1 ~ Re + Fr + St, data = turbulence)  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -0.038834 -0.008614  0.001702  0.009854  0.039423   
##
```

```
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.106488   0.003971  26.818 < 2e-16 ***
## ReLow       -0.108091   0.003682 -29.353 < 2e-16 ***
## ReHigh      -0.111553   0.004632 -24.081 < 2e-16 ***
## FrInf       -0.007623   0.004245  -1.796  0.07618 .
## FrMed       -0.010210   0.003787  -2.696  0.00849 **
## St          0.012213   0.002078   5.877 8.42e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01529 on 83 degrees of freedom
## Multiple R-squared:  0.9293, Adjusted R-squared:  0.9251
## F-statistic: 218.2 on 5 and 83 DF,  p-value: < 2.2e-16
```

Moment 2

Initial Plots



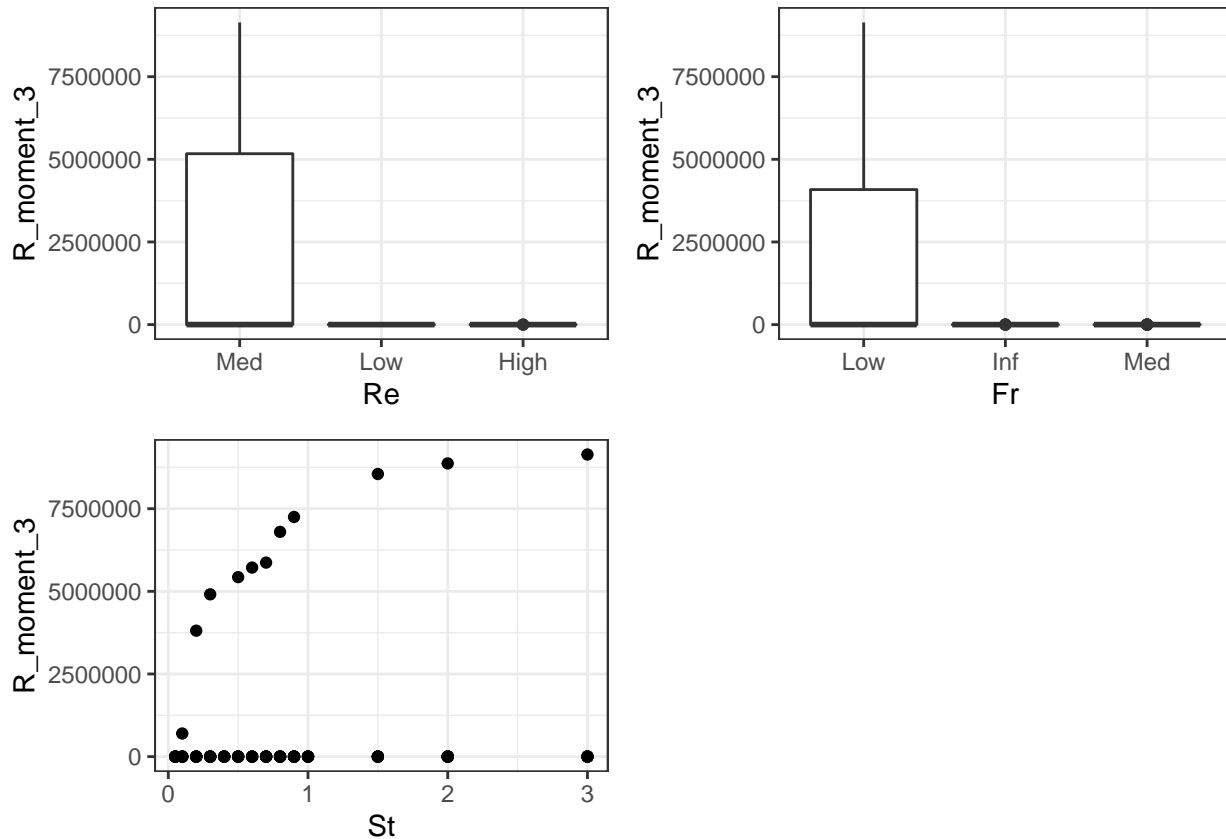
Naive Model

```
##
## Call:
## lm(formula = R_moment_2 ~ Re + Fr + St, data = turbulence)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -383.34 -149.69  -76.02  117.90  575.19
```

```
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)   382.14     51.90   7.363 1.19e-10 ***
## ReLow        -256.24     48.13  -5.324 8.51e-07 ***
## ReHigh       -309.59     60.55  -5.113 2.00e-06 ***
## FrInf        -266.10     55.49  -4.796 7.04e-06 ***
## FrMed        -214.79     49.50  -4.339 4.00e-05 ***
## St           34.79      27.16   1.281  0.204
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 199.8 on 83 degrees of freedom
## Multiple R-squared:  0.4506, Adjusted R-squared:  0.4175
## F-statistic: 13.61 on 5 and 83 DF,  p-value: 1.068e-09
```

Moment 3

Initial Plots



Naive Model

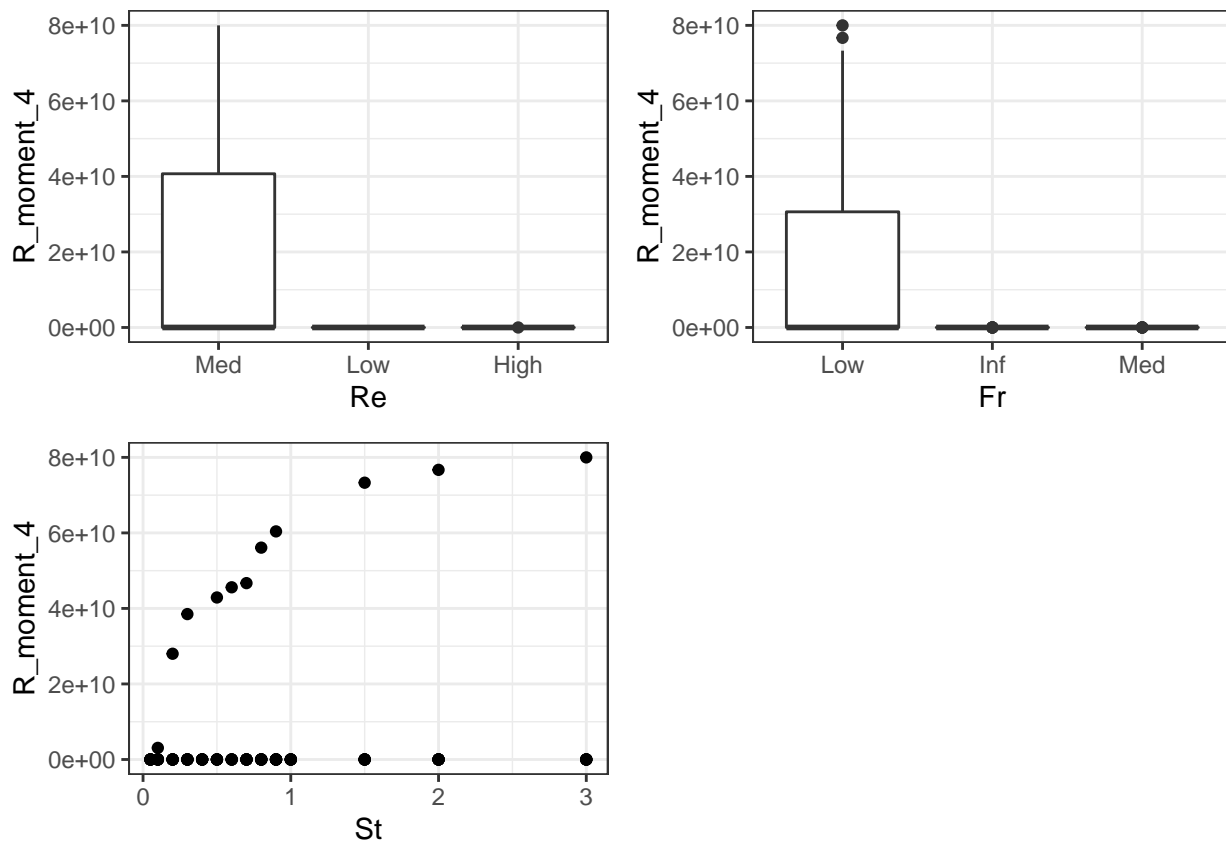
```
##
## Call:
## lm(formula = R_moment_3 ~ Re + Fr + St, data = turbulence)
##
## Residuals:
```

##	Min	1Q	Median	3Q	Max
----	-----	----	--------	----	-----

```
## -3081459 -1222787 -577630 954857 5126384
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3064503    438332   6.991 6.35e-10 ***
## ReLow        -2085831    406507  -5.131 1.86e-06 ***
## ReHigh       -2520829    511384  -4.929 4.16e-06 ***
## FrInf        -2171218    468626  -4.633 1.32e-05 ***
## FrMed        -1749526    418032  -4.185 7.05e-05 ***
## St           339556     229418   1.480  0.143
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1688000 on 83 degrees of freedom
## Multiple R-squared:  0.4363, Adjusted R-squared:  0.4023
## F-statistic: 12.85 on 5 and 83 DF,  p-value: 2.955e-09
```

Moment 4

Initial Plots



Naive Model

```
##
## Call:
## lm(formula = R_moment_4 ~ Re + Fr + St, data = turbulence)
##
## Residuals:
```

```

##           Min           1Q           Median           3Q           Max
## -2.495e+10 -1.019e+10 -4.413e+09  7.899e+09  4.555e+10
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.479e+10  3.707e+09   6.687 2.47e-09 ***
## ReLow       -1.712e+10  3.438e+09  -4.981 3.40e-06 ***
## ReHigh      -2.070e+10  4.324e+09  -4.786 7.32e-06 ***
## FrInf       -1.782e+10  3.963e+09  -4.496 2.22e-05 ***
## FrMed       -1.434e+10  3.535e+09  -4.057 0.000112 ***
## St          3.220e+09  1.940e+09   1.660 0.100777
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.427e+10 on 83 degrees of freedom
## Multiple R-squared:  0.4253, Adjusted R-squared:  0.3906
## F-statistic: 12.28 on 5 and 83 DF,  p-value: 6.371e-09

```