Part G: The ggplot() Command

- The command `ggplot()` initializes a ggplot object. It can be used to declare the input data frame for a graphic.
- It can also be used to specify the set of plot aesthetics intended to be common throughout all subsequent layers (unless specifically overridden).
- Important: The actual plots are built with subsequent commands.
- `ggplot()` is typically used to construct a plot incrementally, using the + operator to add layers to the existing `ggplot` object.
- This is advantageous in that the code is explicit about which layers are added and the order in which they are added.
- We can define common aesthetics using the `aes` argument for this command.

Aesthetics

- Aesthetics are attributes that can be perceived on the graphic.
- Size, shape and colour are all examples of aesthetics.
- Each aesthetic can be mapped to a variable, or set to a constant value.

Geoms

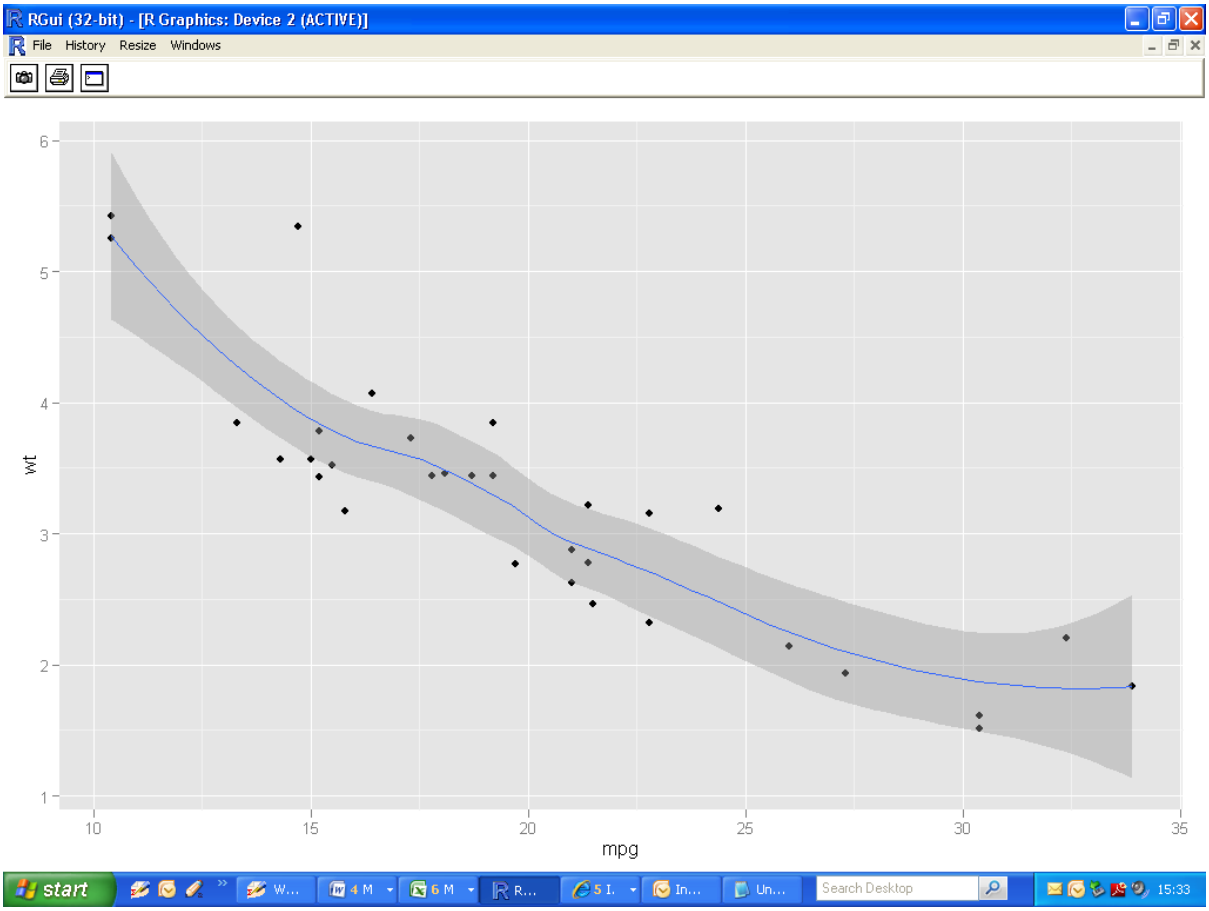
Points, lines and bars are all examples of ***geoms*** (geometric objects)

Geom	Named Plot	
point	Scatter plot	
point	Bubble chart	(relationship of size to variable)
bar	Bar chart	
boxplot	Box-whisker plot	
line	Line chart	

Geom_smooth

- Basic scatterplot seen previously. Add a "smooth" `geom` to the plot
- The "smooth" layer fits a smooth trend line through the data.
- The stat fits the data to a *loess smoother*, with semi-transparent ribbon for representing standard error.
- We will use `qplot()` for the time being.

```
>
> qplot(mpg,wt,data=mtcars)+geom_smooth()
>
```

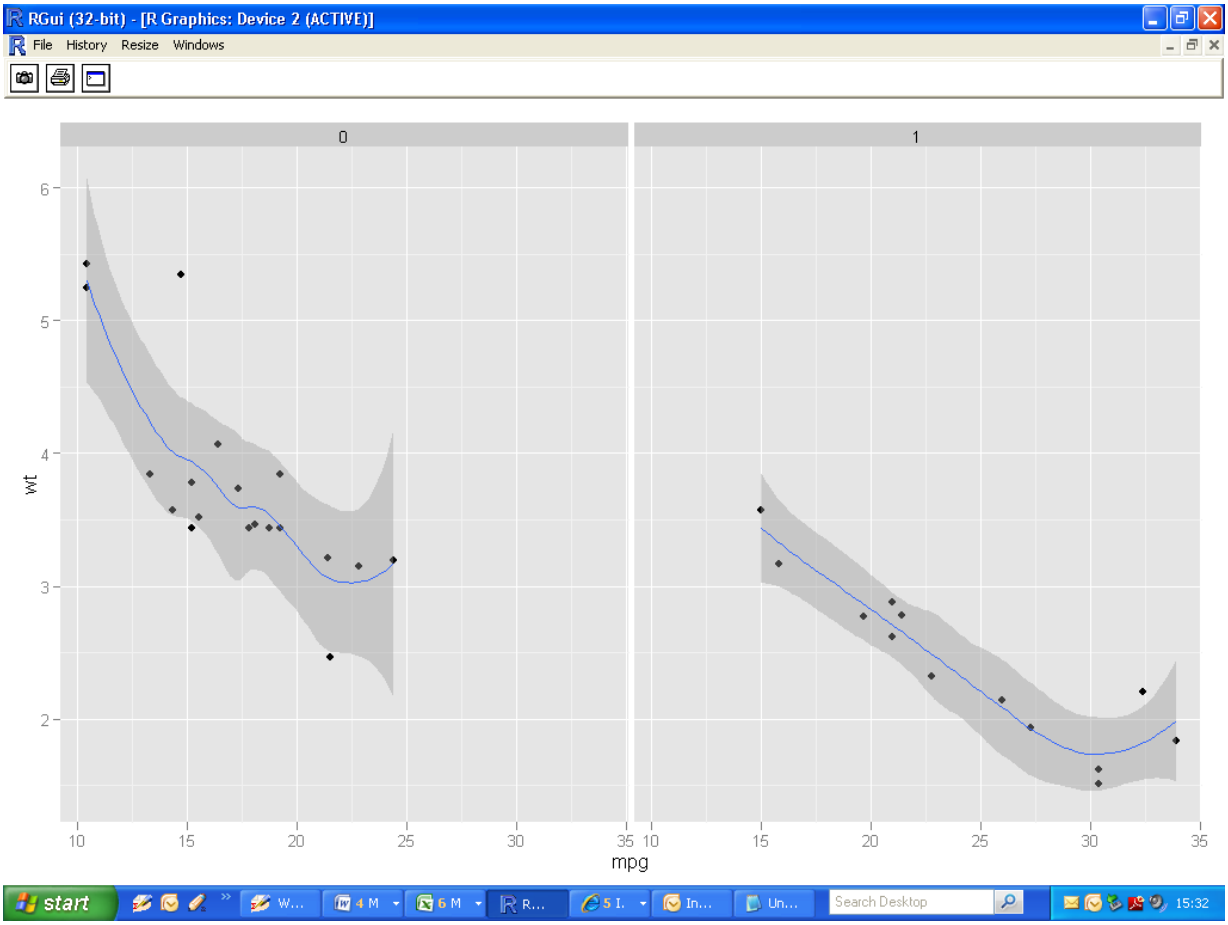


Warning Message

```
geom_smooth: method="auto" and size of largest group
is <1000, so using loess. Use 'method = x' to change
the smoothing method.
```

Additional Example (using faceting)

```
>
>qplot(mpg,wt,data=mtcars, facets = .~am)
+geom_smooth()
>
```



(Notice the range of x-values on both subplots are the same)

Using ggplot()

- Start off in similar manner to `qplot()`.
- The function `ggplot()` only creates a data object. Let us call it P.
- There is no graphic yet. Try out `summary()` on the object.
- Add layers to the data object to build up plot.
- We specify the data set and using the aes argument, the variables and a subcategorization by cylinder.

```
P = ggplot(mtcars, aes(mpg, wt, colour=factor(cyl)))
summary(P)
```

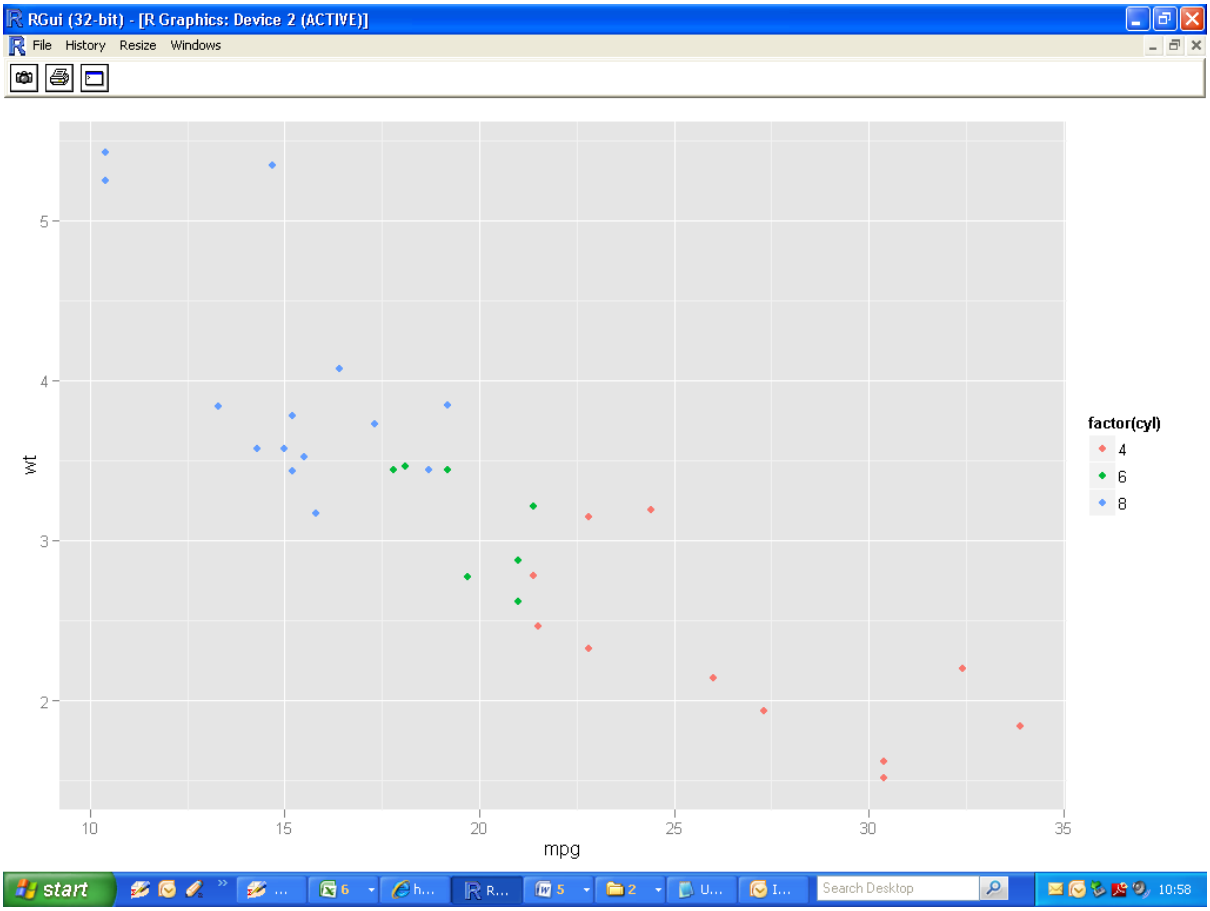
Summary output of P

```
data: mpg, cyl, disp, …… vs, am, gear, carb [32x11]
mapping:  x = mpg, y = wt, colour = factor(cyl)
faceting: facet_null()
```

Add the first layer

- Both of the following commands are equivalent.

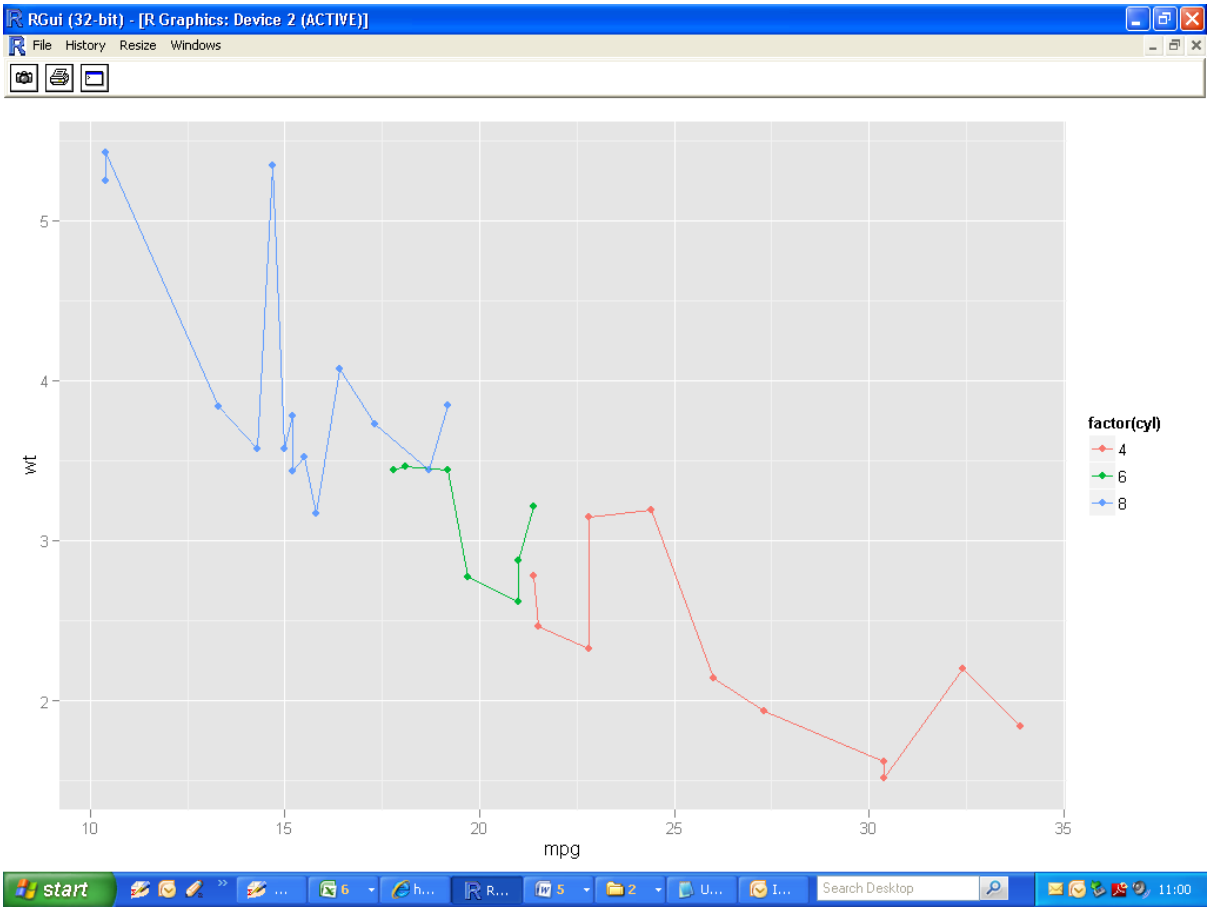
```
>P + geom_point()
>P + layer(geom="point")
```



Add a second layer

Lets join the dots (probably not useful in this particular case)

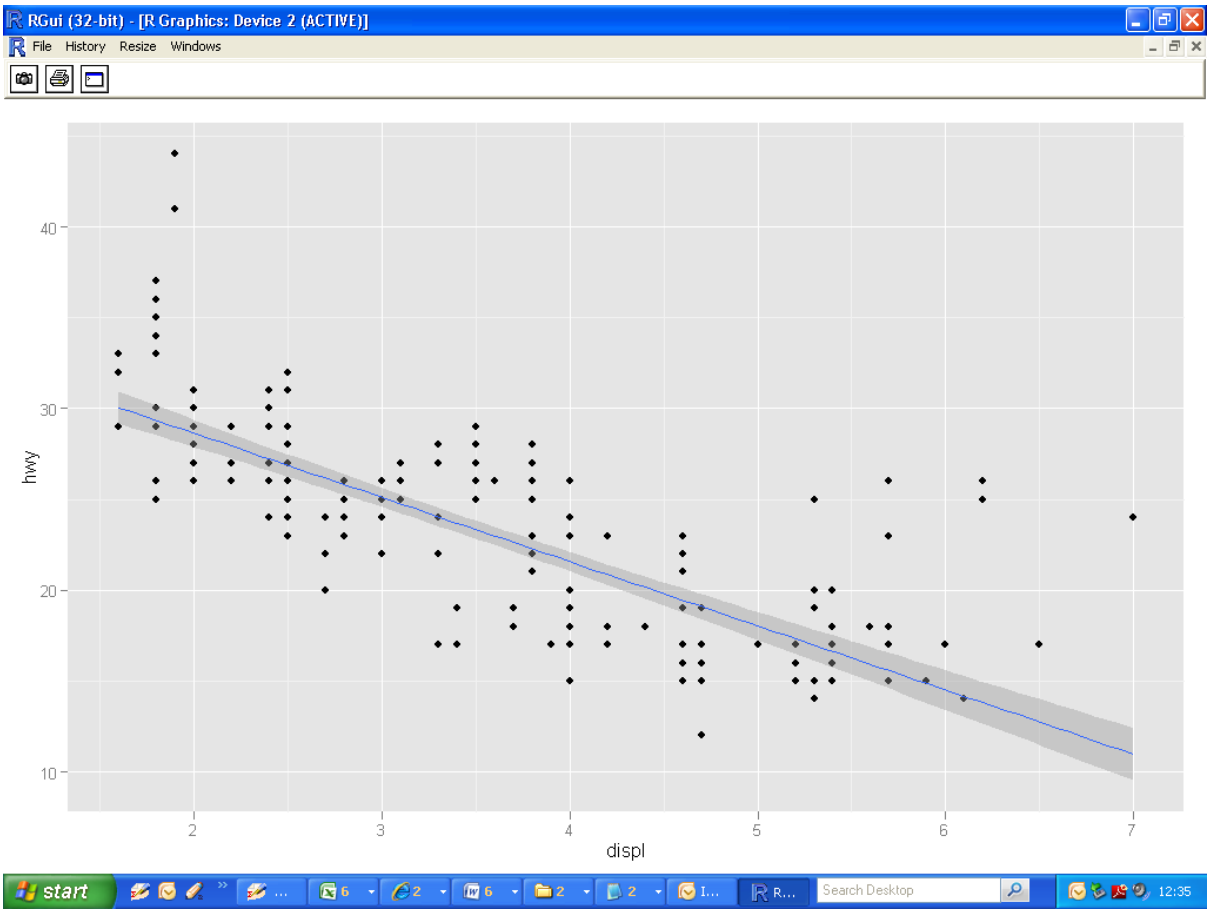
```
>P + geom_point()+ geom_line()
>P + layer(geom="point") + layer(geom="line")
```


RGui (32-bit) - [R Graphics: Device 2 (ACTIVE)]
File History Resize Windows
wt
mpg
factor(cyl)
4
6
8
start
Search Desktop
11:00

Linear Regression (entire data set)

- Let's use two different variables, with no sub-setting.
- Apply a simple linear regression model fit to the data.

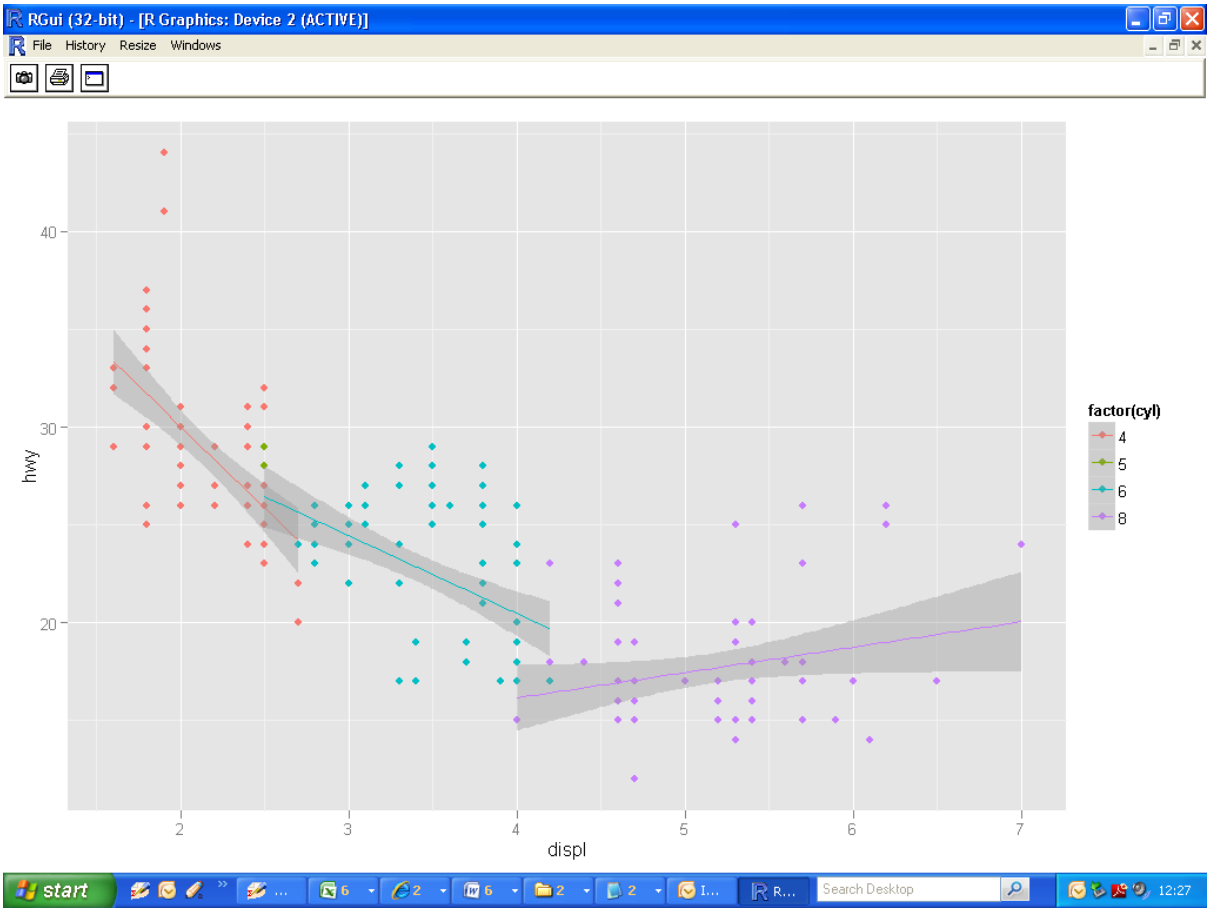
```
> ggplot(mpg,aes(displ,hwy))
+ geom_point()
+ geom_smooth(method="lm")
```



Linear Regression (using grouping)

Use a *stat* instead of *geom* (equivalent) in this case.

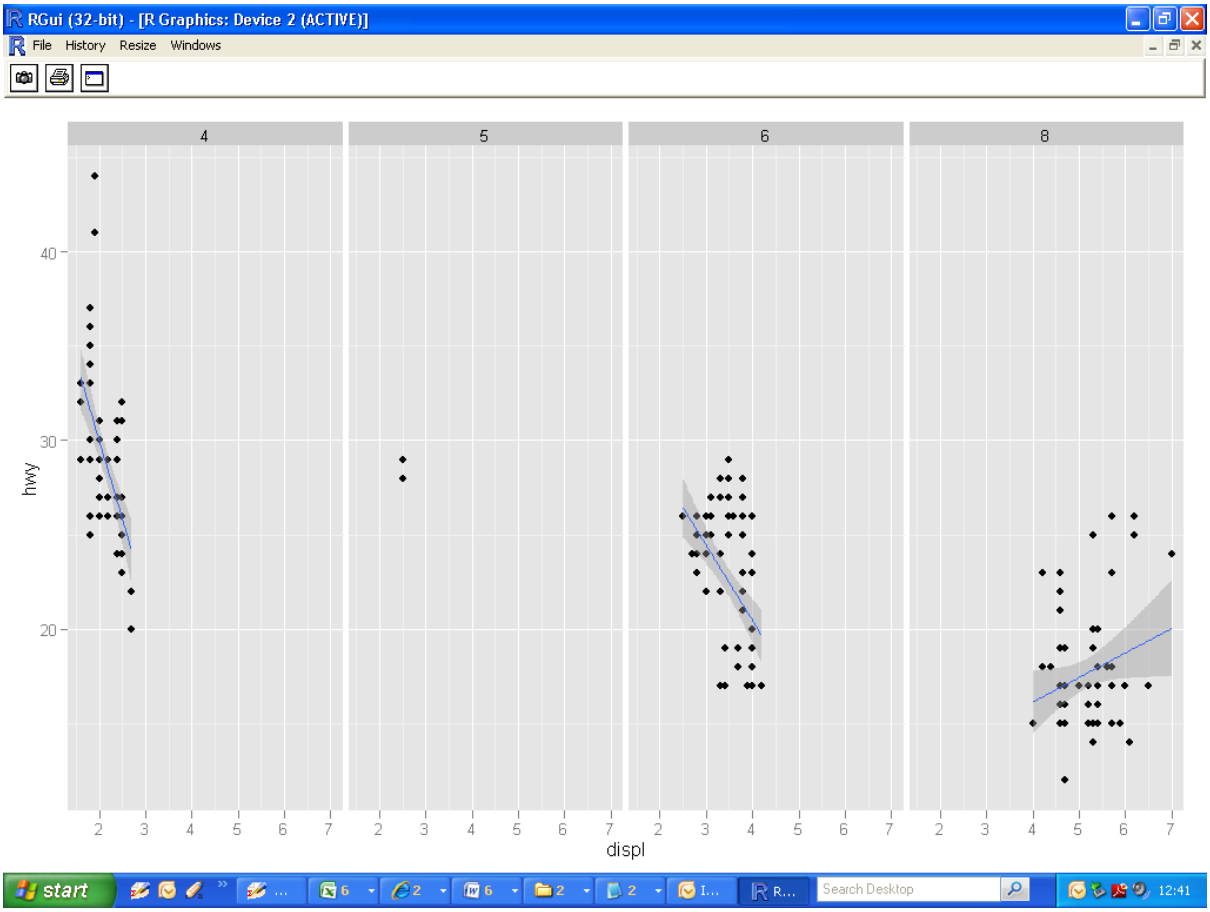
```
> ggplot(mpg,aes(displ,hwy,colour=factor(cyl)))
+ geom_point()
+ stat_smooth(method="lm")
```



Linear Regression (using faceting)

```
> P = ggplot(mpg,aes(displ,hwy))+ geom_point()
+ stat_smooth(method="lm")
> P+ facet_grid(.~cyl)
```

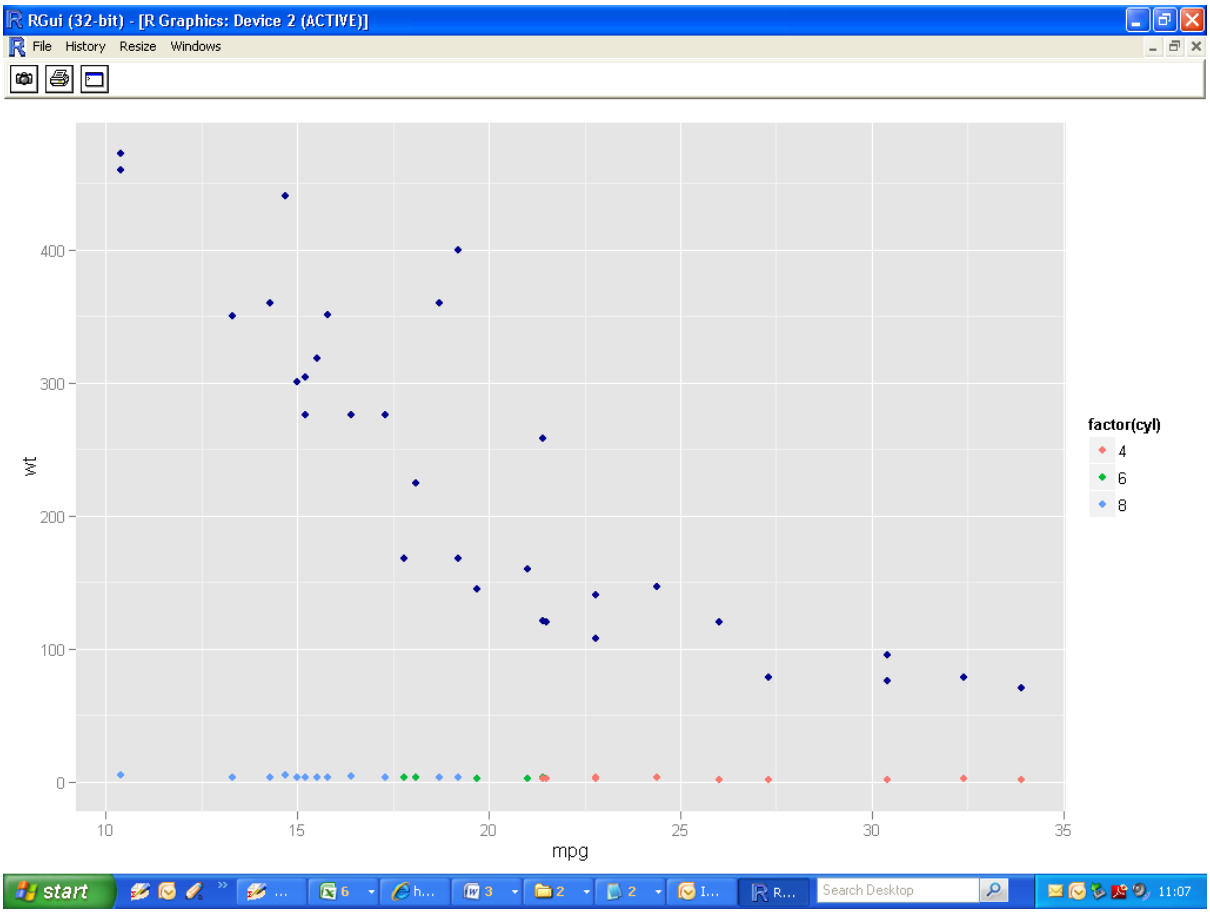
- `facet_grid(cyl ~ .)`
- More or less the same graph, but on top of each other.
- Can adjust scales!



Add an additional layer with different mapping

```
P + geom_point() +
geom_point(aes(y=disp),colour="darkblue")
```

- Strange plot: Faceting is useful for situations like this

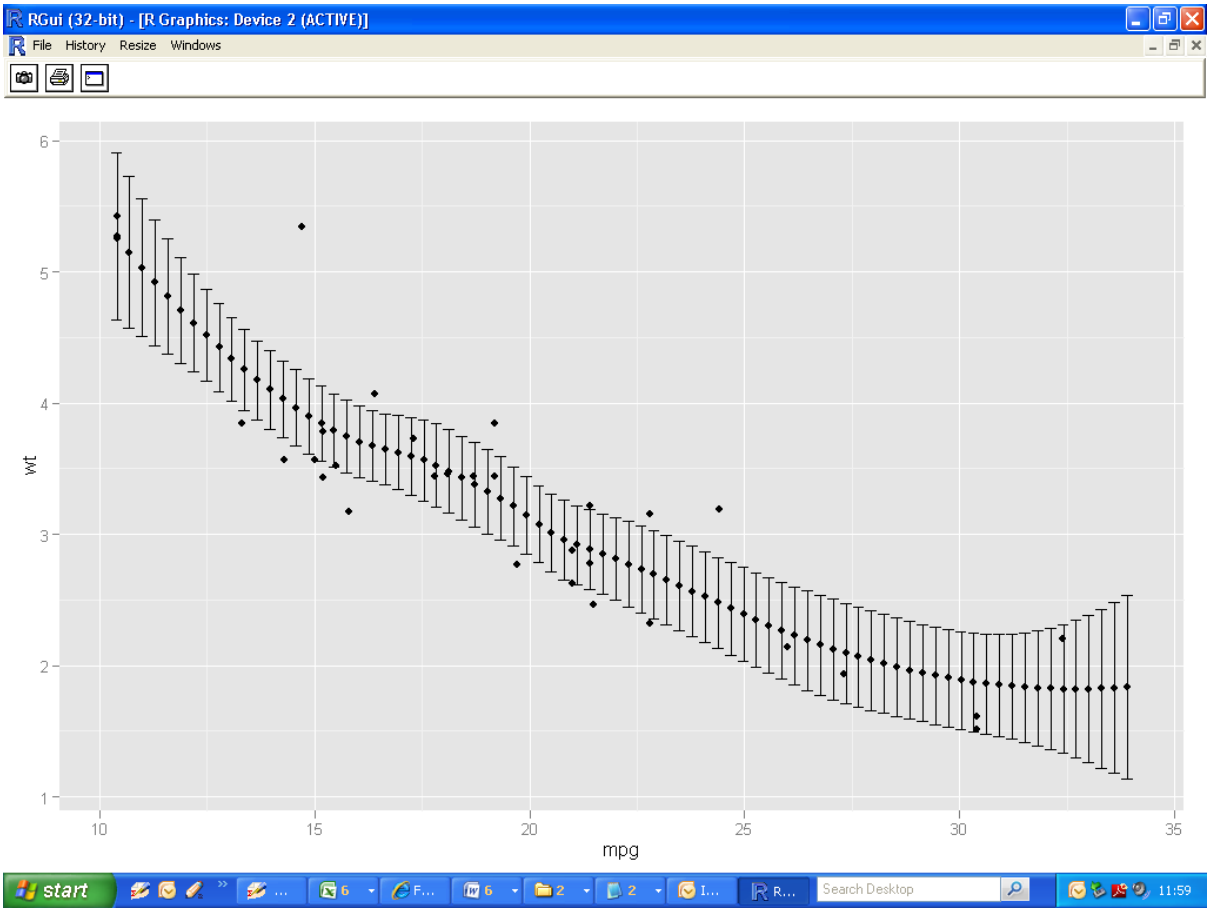


Adding statistics to your plot

```
>
>qplot(mpg,wt,data=mtcars)+stat_smooth()
>
```

- Same plot as before.
- `stat_smooth()` equivalent to `geom_smooth()` and `geom_ribbon()` by default
- Use different geoms: Points and Error bars(probably bad idea)

```
>
>qplot(mpg,wt,data=mtcars)+
stat_smooth(geom="point") +
stat_smooth(geom="errorbar")
>
```



Geoms and Stats

- Geoms always have default statistics associated with them.
- Stats always have default geoms associated with them.
- Many are interchangeable (e.g. smooth and boxplot)

Boxplots

```
>ggplot(mpg,aes(class,hwy))+ stat_boxplot()
>ggplot(mpg,aes(class,hwy))+ geom_boxplot()
>
```