

# Expected $R^2$



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@nntaleb

...

PROBABILITY DU JOUR

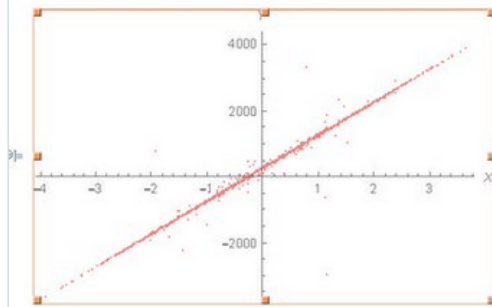
$R^2$  is expected to be 0 but in small samples it shows much higher value, here .98.

Small is anything  $< 10^8$ .

(cont)

```
]:= ta0 = RandomVariate[StudentTDistribution[1], 10^4];
ta1 = RandomVariate[NormalDistribution[], 10^4];
ta2 = (a ta1 + b) + ta0 /. {a -> 10^3, b -> 299};
ta3 = Transpose[{ta1, ta2}];

]:= ListPlot[ta3, PlotStyle -> Pink, AxesLabel -> {X, Y}]
```



```
theme... frame... labels... axes ▾ more... ↻ ⚙️ 💬

]:= lm = LinearModelFit[ta3, X, X]
res = lm["FitResiduals"];
lm["RSquared"]

{1 - Total[res^2] / Total[(ta2 - Mean[ta2])^2], a^2 / (a^2 + Mean[res^2])} /. {a -> 10^3, b -> 299}
(* /. {a -> lm[[1]][[2]][[2]], b -> lm[[1]][[2]][[1]]} *)

]:= FittedModel[298.948 + 1000.75 x]

]:= 0.984507

]:= {0.984507, 0.98486}
```

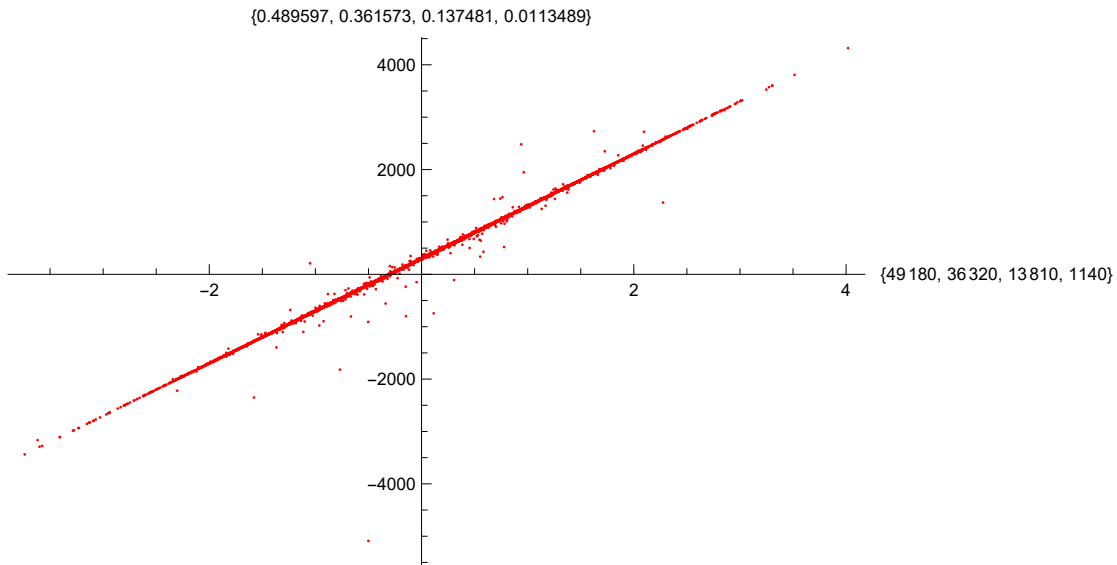
```
In[ ]:= ta0 = RandomVariate[StudentTDistribution[1], 10^4];
```

```
In[ ]:= ta1 = RandomVariate[NormalDistribution[], 10^4];
```

```
In[ ]:= ta2 = (a ta1 + b) + ta0 /. {a -> 10^3, b -> 299};
ta3 = Transpose[{ta1, ta2}];
```

```
In[ ]:= ListPlot[ta3, PlotStyle -> Red, AxesLabel -> {X, Y},
  ImageSize -> Large]
```

```
Out[ ]:=
```



```
In[ ]:= lm = LinearModelFit[ta3, x, x]
```

```
Out[ ]:=
```

FittedModel [ 303.083 + 998.068 x ]

```
In[ ]:= res = lm["FitResiduals"];
```

```
In[ ]:= lm["RSquared"]
```

```
Out[ ]:=
```

0.775144

```
In[ ]:= {1 - Total[res^2] / Total[(ta2 - Mean[ta2])^2], a^2 / (a^2 + Mean[res^2])} /. {a -> 10^3, b -> 299}
```

```
Out[ ]:=
```

{0.775144, 0.780189}