



Figure A:

Both y_1 and y_2 are linear functions of x with positive slopes equal to 2. In other words, y_1 increases with x at the same rate as y_2 . However, the correlation between y_1 and x is higher than it is between y_2 and x .

Figure B:

Both y_3 and y_4 are linear functions of x with positive slopes. However, y_3 increases with x faster than y_4 . **The correlation between y_3 and x is the same as it is between y_4 and x ; the increased slope of y_3 is counterbalanced by the increased variance around the regression line.**

APPENDIX: STATA CODE

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* FIGURE A:
*=====;
* corr(y1,x)=0.9; corr(y3,x)=0.3;
* y1=2x+e; y2=2x*e ;
*=====;

clear

matrix c=(1, .9 \ .9, 1)
corr2data x y, n(200) corr(c)
gen y1=2/.9*y

matrix d=(1, 0.3 \ 0.3, 1)
corr2data x2 y2, n(200) corr(d)
gen y3=2/0.3*y2

tway (scatter y3 x2,mcolor(green)) ///
      (scatter y1 x,mcolor(purple)) || lfit y3 x2 || lfit y1 x , ///
title("Figure A: Different correlation, Same slope") ///
legend(label(1 "y1") label(2 "y2") order(1 2) ring(0) position(11)) ///
xtitle("x") ytitle("") ///
graphregion(lcolor(white) lwidth(vthick) margin(3 3 2 2)) ///
plotregion(style(outline) fcolor(white) icolor(white)) ///
name(graph1,replace)
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* FIGURE B:
*=====;
* corr(y1,x)=0.9; corr(y3,x)=0.9;
* y3=5x+e; y4=2x*e ;
*=====;

capture drop x y y1 y2
matrix c=(1, .9 \ .9, 1)
corr2data x y, n(200) corr(c)
gen y1=2/.9*y
gen y2=5/.9*y

twoway (scatter y1 x) ///
      (scatter y x) || lfit y1 x,lcolor(dknavy) || lfit y x,lcolor(maroon) , ///
      title(`"Figure B: "SAME" Correlation, Different Slope"') ///
      legend(label(1 "y3") label(2 "y4") order(1 2) ring(0) position(11)) ///
      xtitle("x") ytitle("") ///
      graphregion(lcolor(white) lwidth(vthick) margin(3 3 2 2)) ///
      plotregion(style(outline) fcolor(white) icolor(white)) ///
      name(graph2,replace)

graph combine graph1 graph2,scheme(s1color) altshrink

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