

# Linear OLS Estimation

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## Estimation without an Intercept

Fit a line from the origin through two points, given Equations  $Y = a \cdot X$ , where we have two pairs of points for  $x$  and  $y$ .

```
rng(3);
[x1, x2] = deal(rand(),rand());
[y1, y2] = deal(rand(),rand());
ar_x = [x1,x2]';
ar_y = [y1,y2]';
```

Fit a line through the two points, passing through the x-intercept. Three formulas that provide the same answer.

```
% simple formula
fl_slope_basic = (1/(x1*x1 + x2*x2))*(x1*y1 + x2*y2);
% (X'X)^(-1)(X'Y)
fl_slope_matrix = inv(ar_x'*ar_x)*(ar_x'*ar_y);
% Use matlab function
tb_slope_fitlm = fitlm(ar_x, ar_y, 'Intercept',false);
fl_slope_fitlm = tb_slope_fitlm.Coefficients{1, 1};
```

Visualize results.

```
figure();
hold on;
scatter([x1,x2], [y1,y2]);
xlim([0, 1]);
ylim([0, 1]);
refline(fl_slope_basic, 0);
grid on;
grid minor;
title('Best fit line through origin with two points');
```

