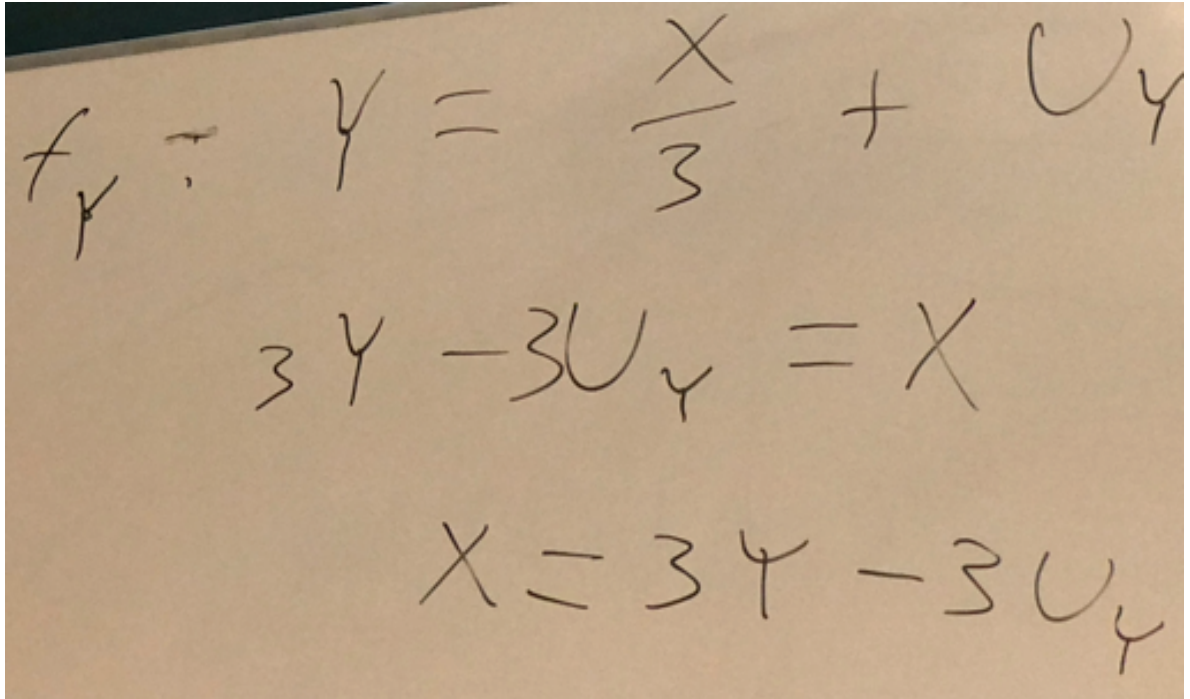


## L2 Graph theory

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Rewriting an equation example:

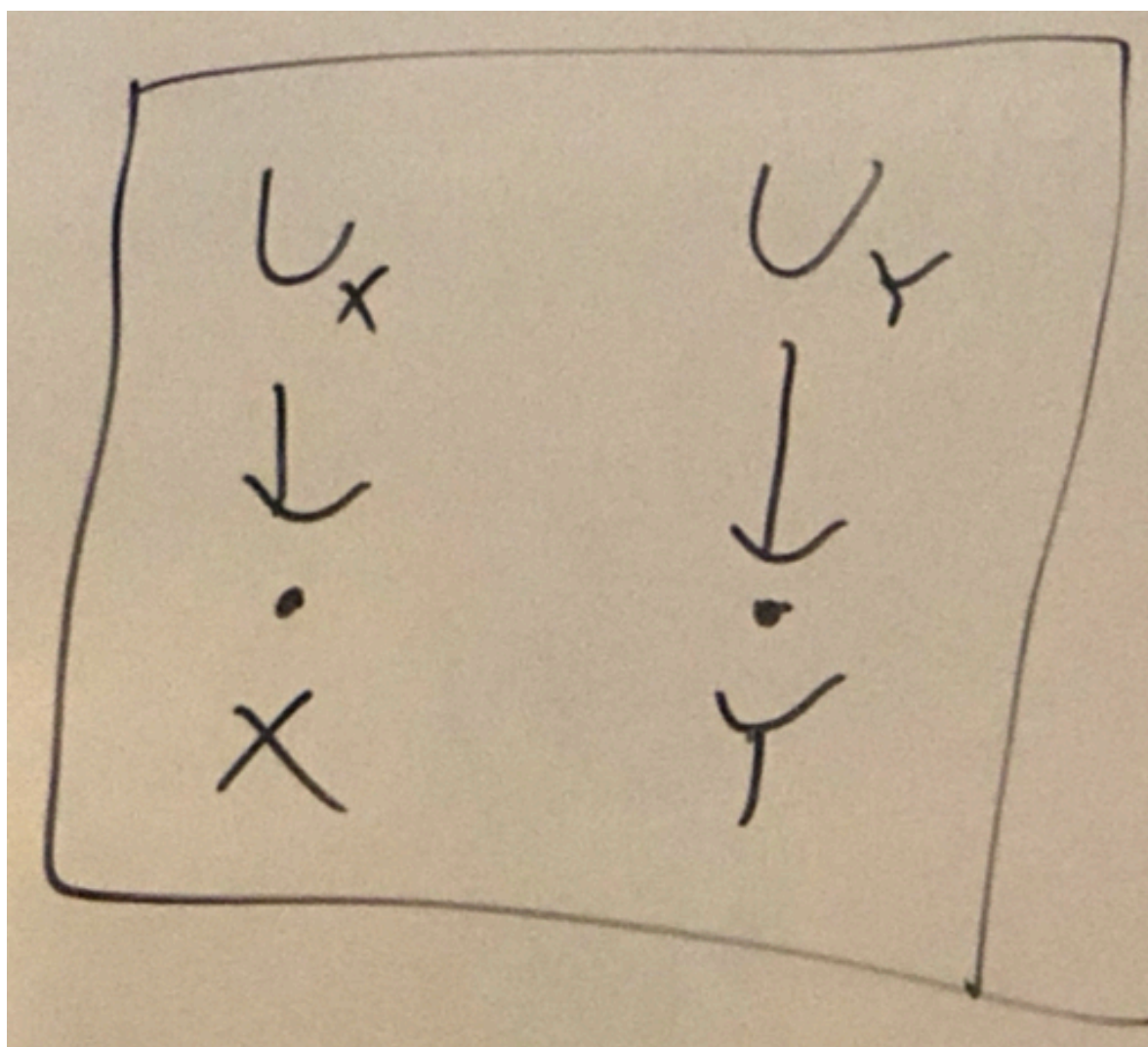


The image shows three lines of handwritten equations on a piece of paper. The first line is  $f_y: y = \frac{x}{3} + u_y$ . The second line is  $3y - 3u_y = x$ . The third line is  $x = 3y - 3u_y$ .

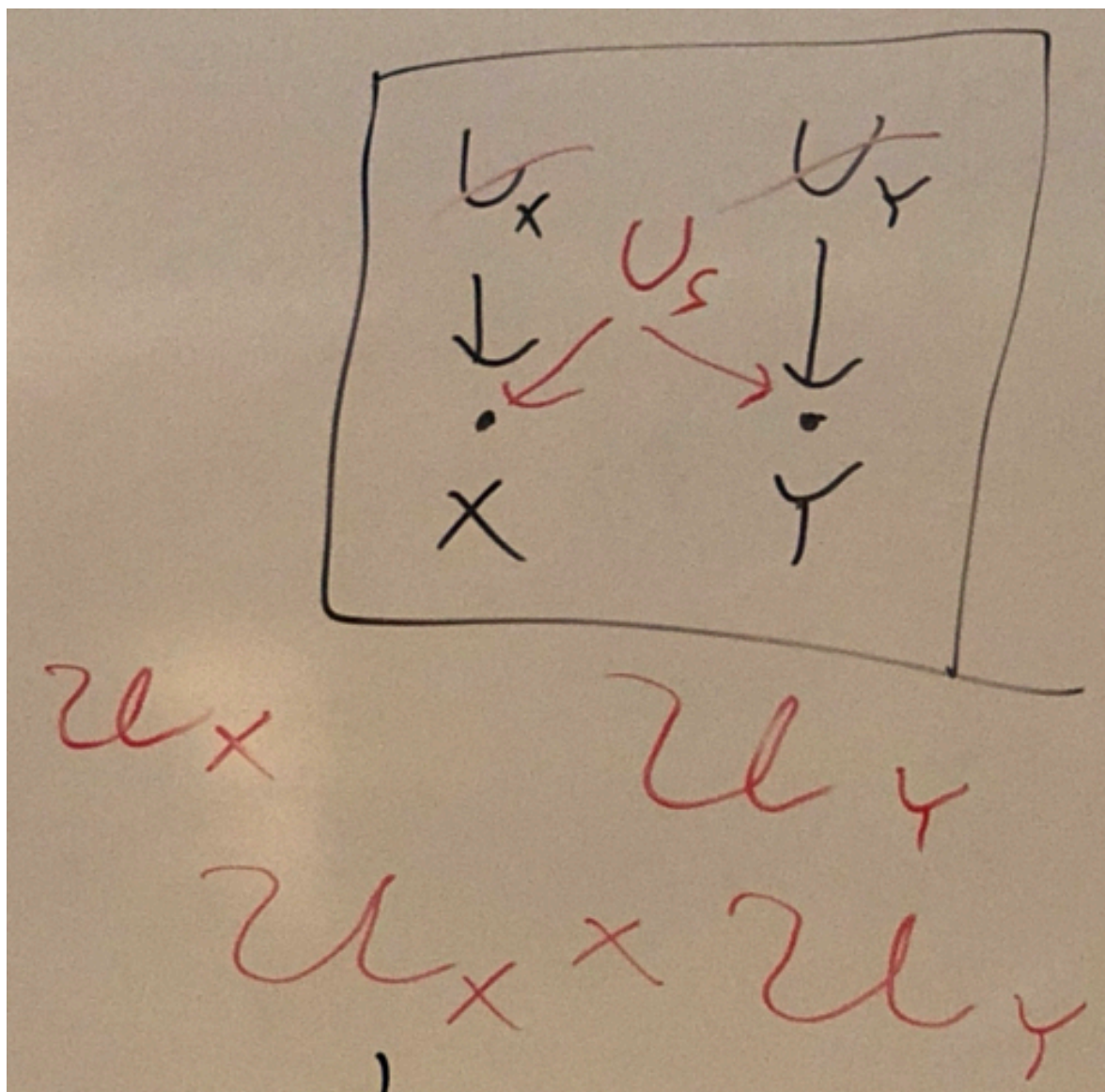
$$f_y: y = \frac{x}{3} + u_y$$
$$3y - 3u_y = x$$
$$x = 3y - 3u_y$$

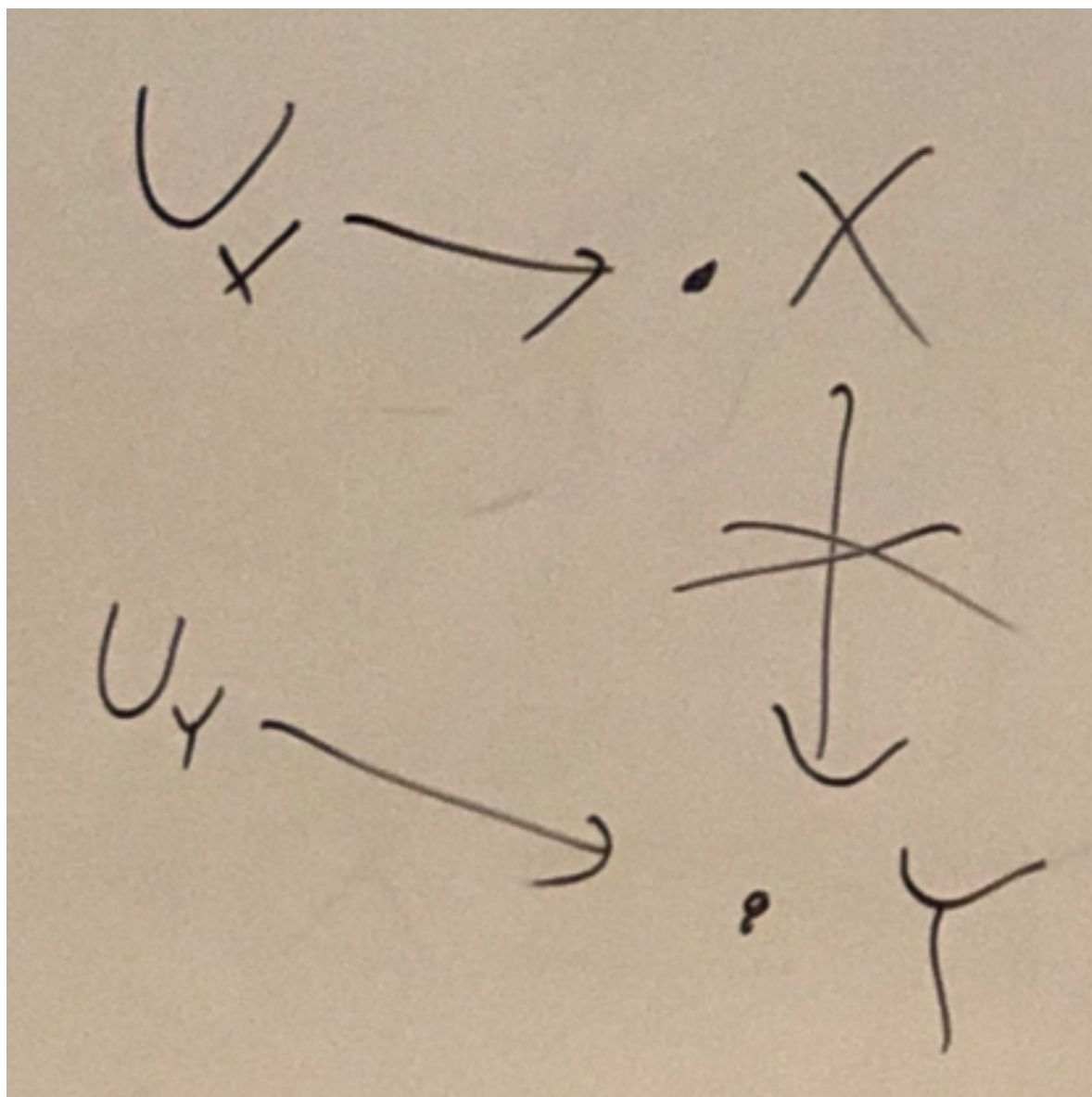
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Independent variables

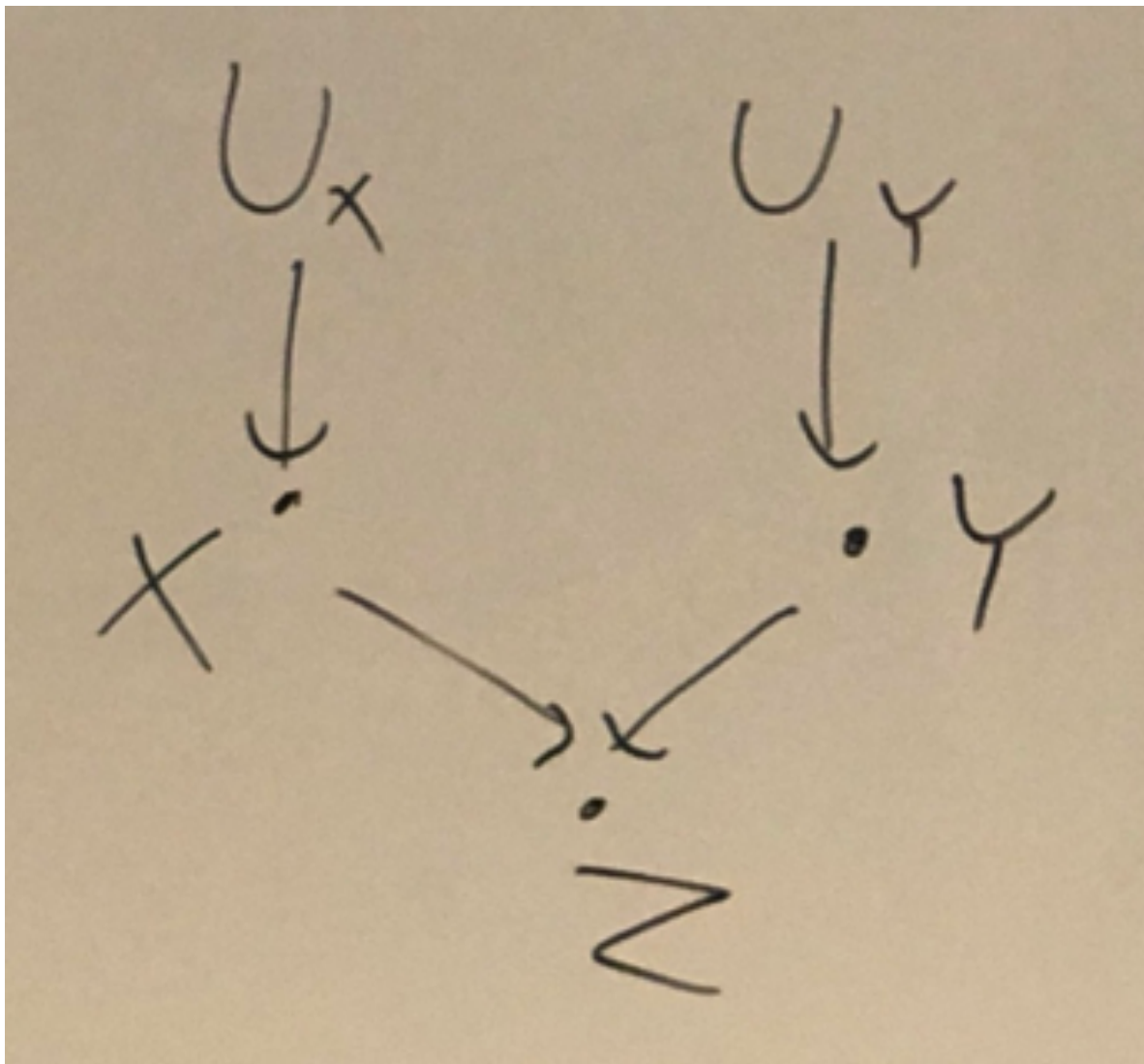


Added exogenous variable:









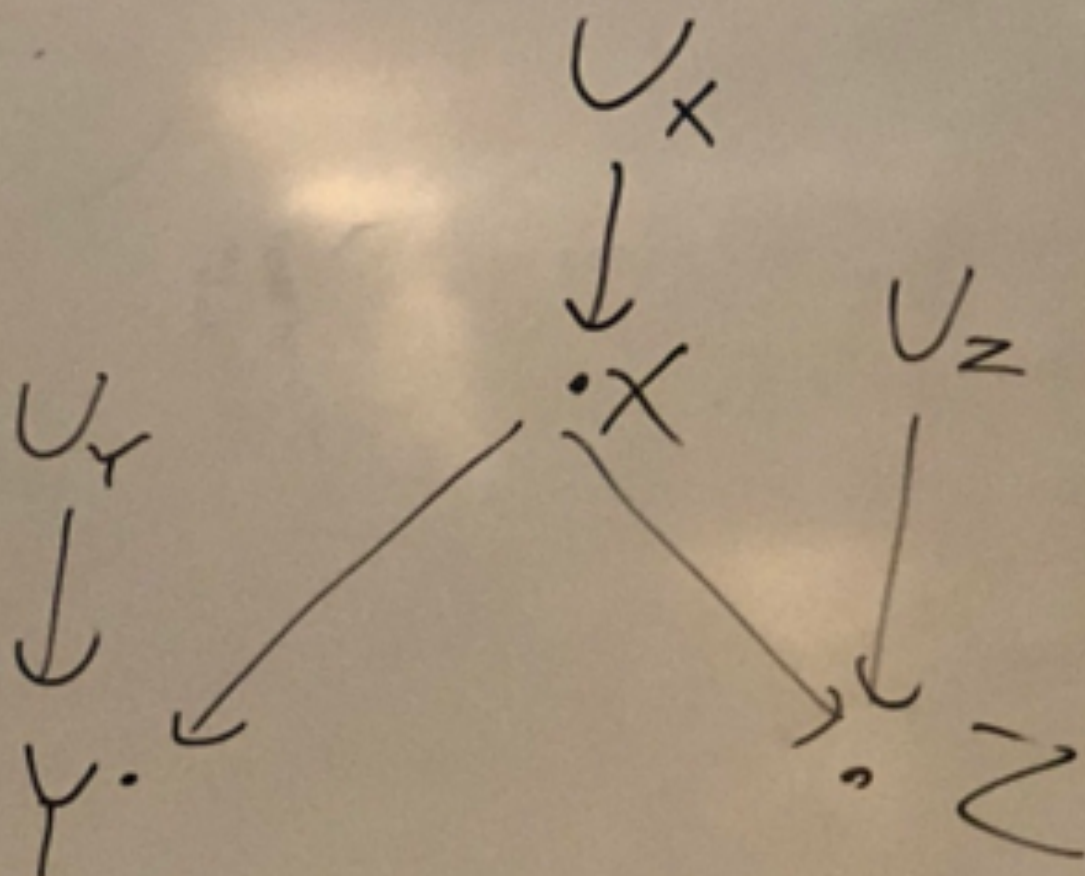
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Rules where the conditional independence follows

$X$  indep. of  $Y$  given  $S$   
 $|$   
 set  
 $X \neq Y, \quad X \notin S, \quad Y \notin S$

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$Y$  and  $Z$  are independent given  $X$

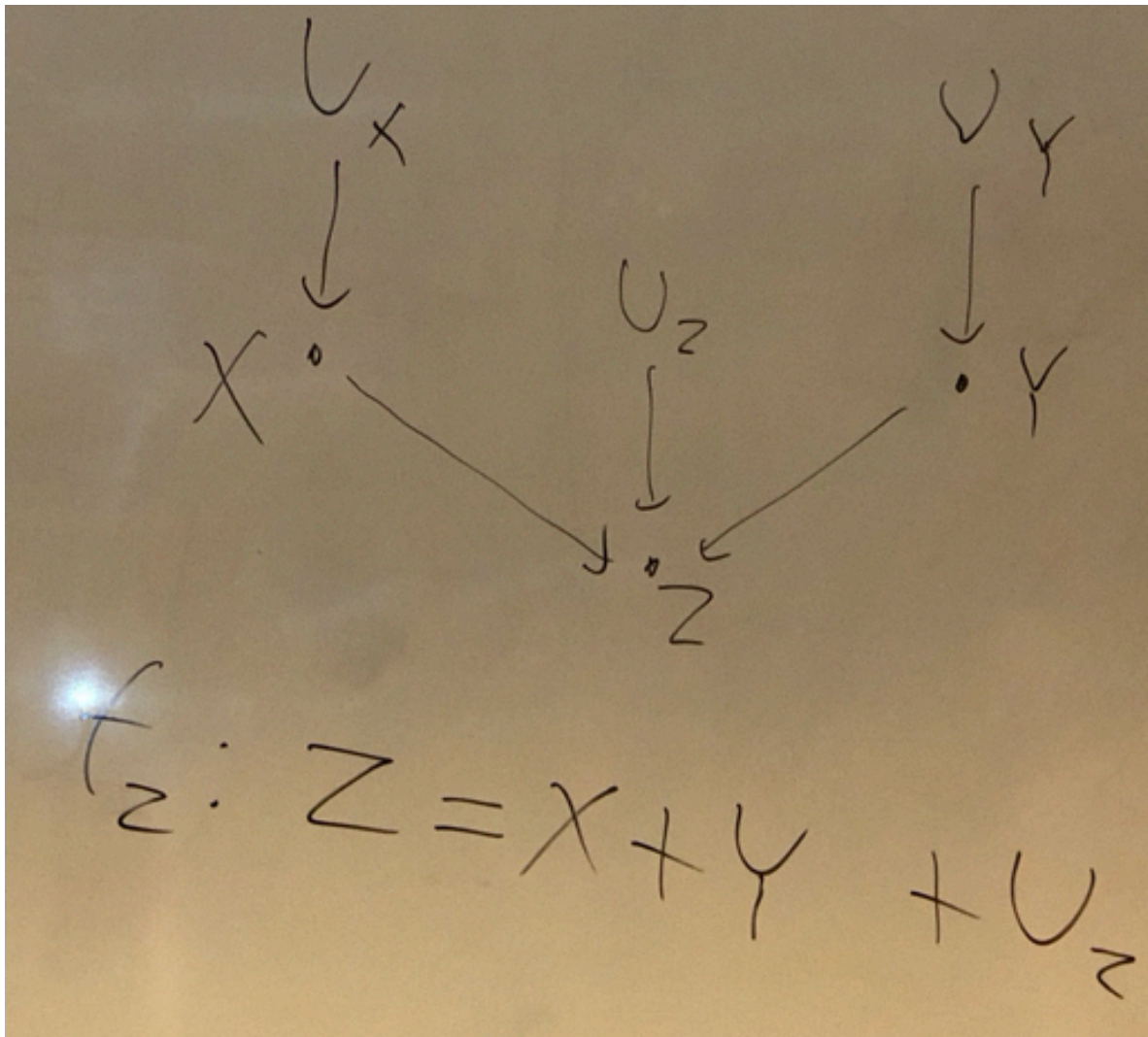


$$\dot{Y} = \dot{X} + U_Y$$

$$\dot{Z} = \dot{X} + U_Z$$

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X and Y are likely dependent when we condition on Z. So value of X starts telling us something about value of Y.



X and Y are still dependent if we introduce a new variable W

