

# FIE401 - First assignment M&A and Method of Payment

Group 8

2022-09-21

## Abstract

In this report we intend to answer the research question: “Do mergers destroy value for bidder shareholders depending on the method of payment?” We have used the provided file “CAR\_M&A.Rdata” which contains 5154 deals over a period from 1990 to 2014 to investigate the impact of payment method. Our findings on this topic are that when a bidding company fully uses stocks as currency for acquisitions it receives a negative announcement effect on the wealth if the target company is a public company. In contrast, the effect tends to be the opposite when the target company is private.

## Question 1

Table 1:

Statistic	Min	Pctl(25)	Mean	Pctl(75)	Max	St. Dev.
deal_value	1.000	19.593	835.173	341.445	164,746.900	4,418.937
carbidder	-0.590	-0.042	0.009	0.055	1.368	0.116
bidder_size	400.500	144,881.700	5,154,525.000	2,388,443.000	432,000,000.000	19,739,995.000
sigma_bidder	0.007	0.022	0.037	0.045	0.280	0.023
run_up_bidder	0.238	0.820	1.191	1.332	4.688	0.692
relsize	0.010	0.047	0.373	0.371	12.170	0.850
bidder_mtb	0.324	1.387	2.867	3.070	58.041	3.475
bidder_fcf	-1.193	-0.011	-0.011	0.086	0.253	0.215
bidder_lev	0.000	0.002	0.155	0.260	0.747	0.176

### Comments on the Table 1

**Comments to figure 1** just by looking at the scatterplot we indicate a huge outlier This could be an error but nonetheless should be removed from the dataset

overall there seem to be other “smaller” outliers and we therefore have to winsorize or use log-transformation because of the shape of the histogram we decided to use log-transformations

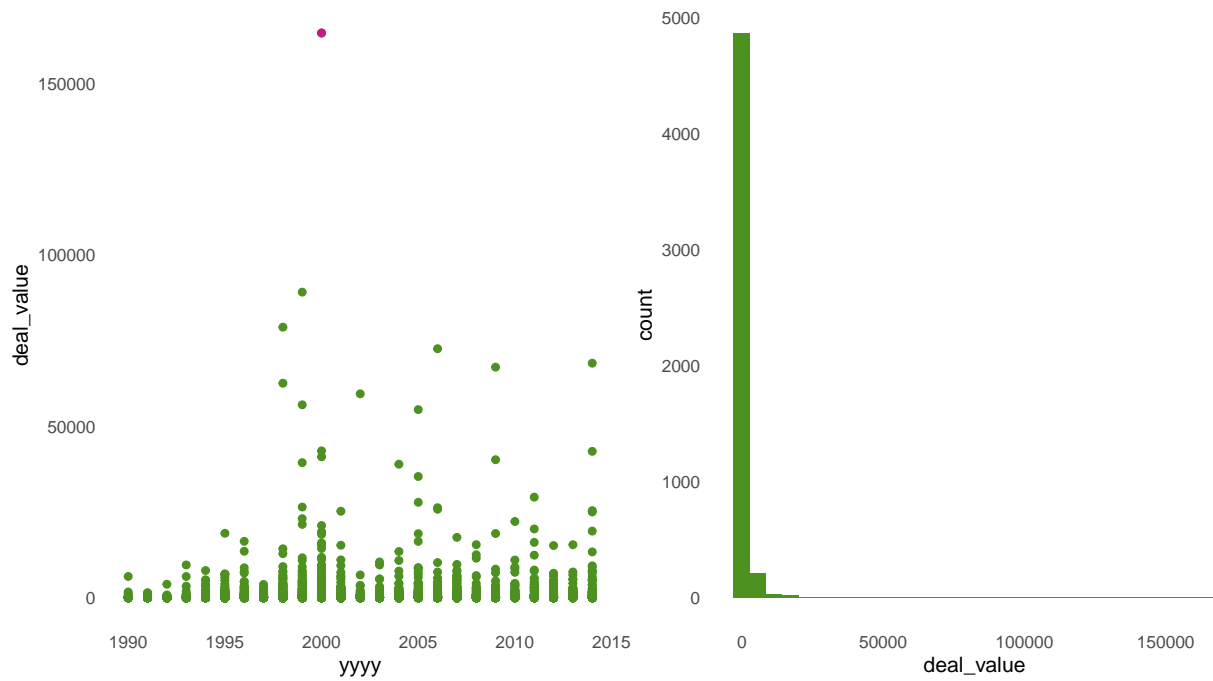


Figure 1: Scatterplot and histogram of deal value

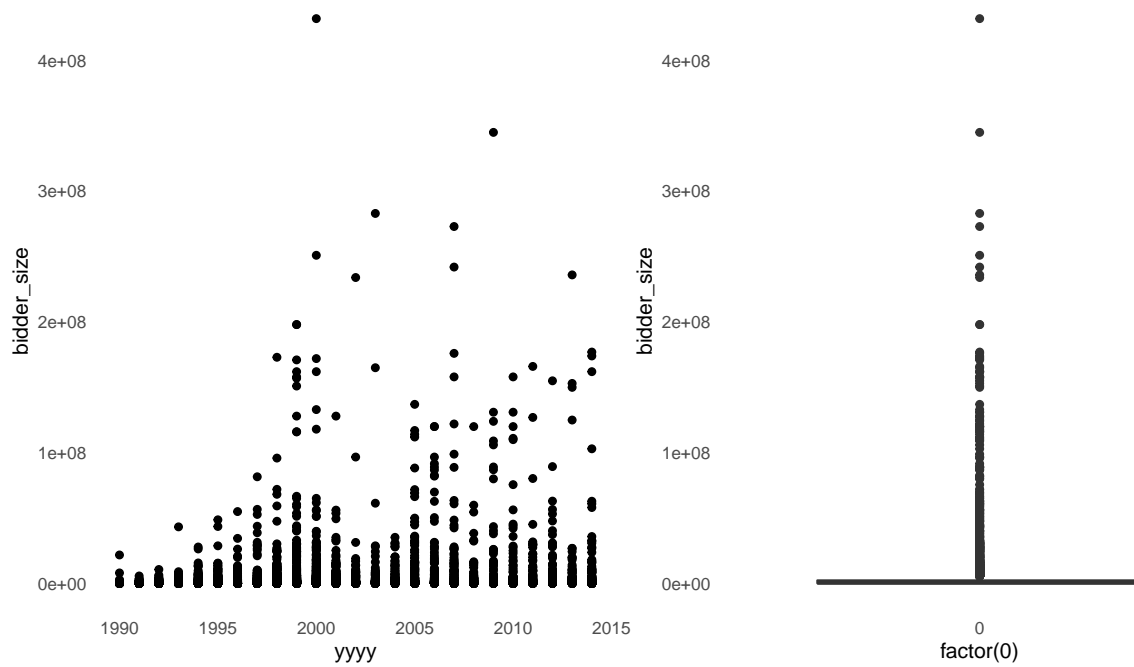
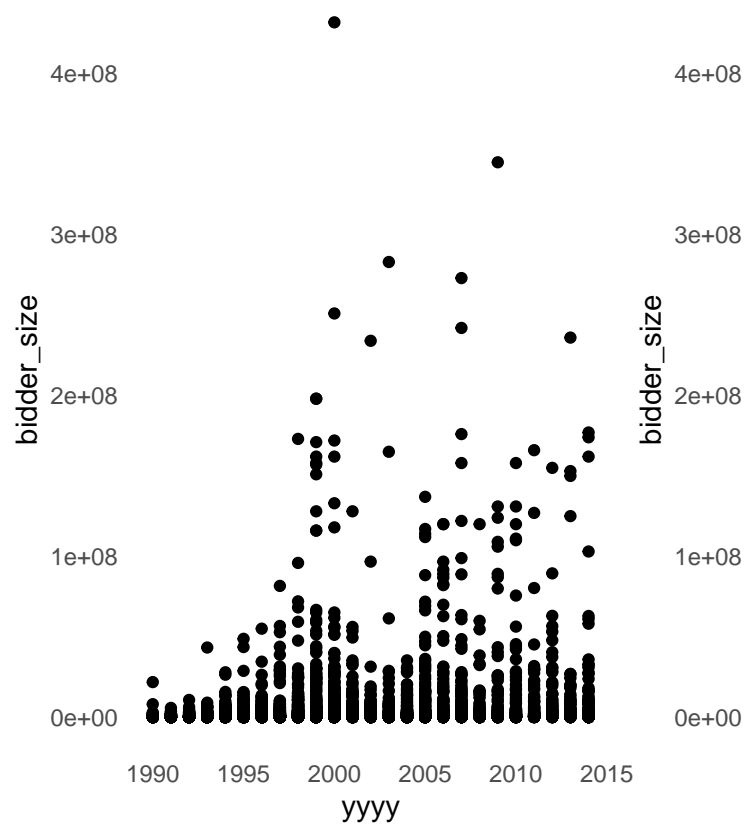
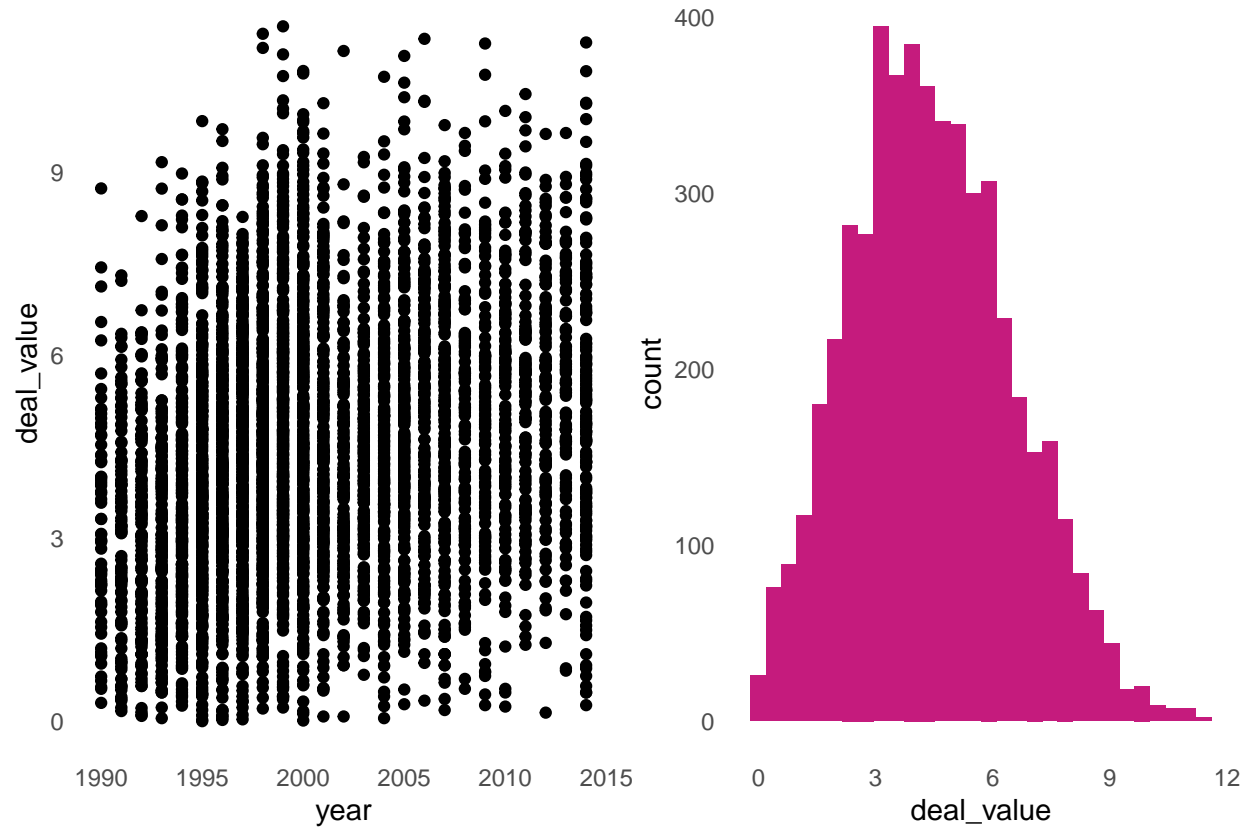


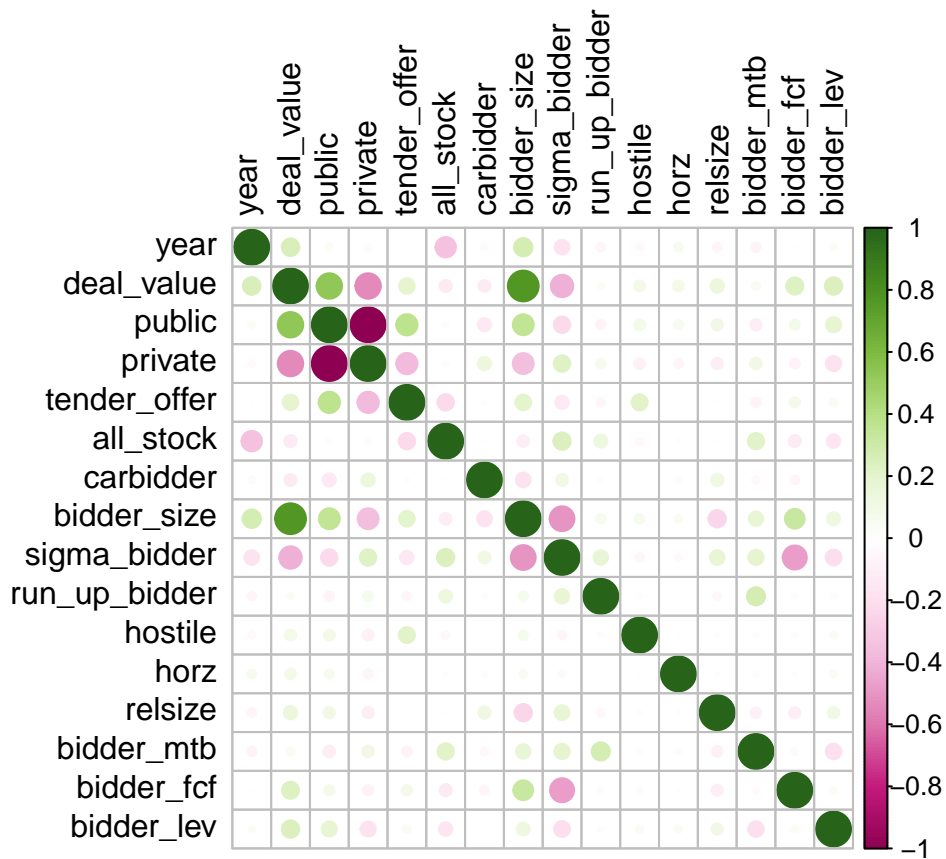
Figure 2: Scatterplot and histogram of bidder size





```
##
## \begin{table}[!htbp] \centering
##   \caption{}
##   \label{}
## \begin{tabular}{@{\extracolsep{5pt}} cccccc}
## \hline \hline \hline
##   & year & avg\_deal\_size & avg\_bidCAR & avg\_share\_private & avg\_share\_stock & \\
## \hline \hline \hline
## 1 & 1990 & 3.303 & -0.009 & 0.448 & 0.478 & \\
## 2 & 1991 & 3.183 & 0.042 & 0.612 & 0.515 & \\
## 3 & 1992 & 3.16 & 0.029 & 0.719 & 0.597 & \\
## 4 & 1993 & 3.146 & 0.042 & 0.673 & 0.491 & \\
## 5 & 1994 & 3.663 & 0.021 & 0.59 & 0.556 & \\
## 6 & 1995 & 3.823 & 0.013 & 0.581 & 0.578 & \\
## 7 & 1996 & 4.057 & 0.021 & 0.58 & 0.589 & \\
## 8 & 1997 & 4.298 & 0.019 & 0.538 & 0.54 & \\
## 9 & 1998 & 4.409 & 0.008 & 0.5 & 0.5 & \\
## 10 & 1999 & 4.797 & 0.013 & 0.468 & 0.522 & \\
## 11 & 2000 & 4.851 & -0.017 & 0.544 & 0.529 & \\
## 12 & 2001 & 4.604 & -0.021 & 0.394 & 0.389 & \\
## 13 & 2002 & 4.082 & -0.012 & 0.503 & 0.284 & \\
## 14 & 2003 & 4.381 & 0.02 & 0.485 & 0.263 & \\
## 15 & 2004 & 4.487 & -0.001 & 0.551 & 0.177 & \\
## 16 & 2005 & 4.892 & -0.004 & 0.571 & 0.171 & \\
## 17 & 2006 & 5.047 & 0.006 & 0.51 & 0.161 & \\
## \end{tabular}
## \end{table}
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## 18 & 2007 & 5.047 & 0 & 0.515 & 0.102 \\
## 19 & 2008 & 4.691 & 0.001 & 0.598 & 0.165 \\
## 20 & 2009 & 4.956 & 0.003 & 0.45 & 0.2 \\
## 21 & 2010 & 5.192 & 0.007 & 0.437 & 0.118 \\
## 22 & 2011 & 5.313 & -0.005 & 0.612 & 0.095 \\
## 23 & 2012 & 5.429 & 0.03 & 0.491 & 0.069 \\
## 24 & 2013 & 5.384 & 0.029 & 0.57 & 0.112 \\
## 25 & 2014 & 5.197 & 0.023 & 0.562 & 0.171 \\
## \hline \\[-1.8ex]
## \end{tabular}
## \end{table}
```



```
##
## Call:
## lm(formula = carbidder ~ all_stock, data = CAR_MA[CAR_MA$public ==
##    0, ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.57238 -0.05567 -0.01062  0.04472  1.34902
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.019232   0.003133   6.139 9.51e-10 ***
## all_stock    0.014310   0.004948   2.892  0.00386 **
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## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1276 on 2767 degrees of freedom
## Multiple R-squared:  0.003013,    Adjusted R-squared:  0.002653
## F-statistic: 8.363 on 1 and 2767 DF,  p-value: 0.003859

##
## Call:
## lm(formula = carbidder ~ all_stock, data = CAR_MA[CAR_MA$public ==
##      1, ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.56704 -0.04668  0.00103  0.04652  0.68748
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.432e-05  2.509e-03   0.014   0.989
## all_stock   -2.301e-02  4.113e-03  -5.595 2.46e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09708 on 2382 degrees of freedom
## Multiple R-squared:  0.01297,    Adjusted R-squared:  0.01256
## F-statistic: 31.3 on 1 and 2382 DF,  p-value: 2.46e-08

##
## Call:
## lm(formula = carbidder ~ all_stock + public + I(all_stock * public),
##      data = CAR_MA)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.57238 -0.05110 -0.00445  0.04555  1.34902
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.019232   0.002811    6.841 8.76e-12 ***
## all_stock         0.014310   0.004440    3.223  0.00128 **
## public           -0.019197   0.004082   -4.703 2.63e-06 ***
## I(all_stock * public) -0.037323   0.006576   -5.675 1.46e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1145 on 5149 degrees of freedom
## Multiple R-squared:  0.02694,    Adjusted R-squared:  0.02637
## F-statistic: 47.51 on 3 and 5149 DF,  p-value: < 2.2e-16

##
## Call:
## lm(formula = carbidder ~ all_stock + deal_value + bidder_size +
##      bidder_mtb + run_up_bidder + bidder_fcf + bidder_lev + sigma_bidder +

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##      relsize + horz + tender_offer + year + hostile, data = CAR_MA[CAR_MA$public ==
##      0, ])
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -0.55951 -0.05425 -0.00226  0.04863  1.13997
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.8537086   0.8770487   0.973   0.3304
## all_stock      0.0118037   0.0054434   2.168   0.0302 *
## deal_value     0.0122211   0.0025146   4.860 1.24e-06 ***
## bidder_size    -0.0152578   0.0024090  -6.334 2.79e-10 ***
## bidder_mtb     -0.0002436   0.0006825  -0.357   0.7212
## run_up_bidder   0.0016094   0.0031352   0.513   0.6078
## bidder_fcf      0.0064620   0.0110858   0.583   0.5600
## bidder_lev     -0.0011874   0.0147676  -0.080   0.9359
## sigma_bidder    0.2686652   0.1251339   2.147   0.0319 *
## relsize         0.0227680   0.0036705   6.203 6.37e-10 ***
## horz           -0.0009869   0.0049447  -0.200   0.8418
## tender_offer    0.0130166   0.0435128   0.299   0.7649
## year           -0.0003507   0.0004400  -0.797   0.4256
## hostile                NA            NA      NA      NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1222 on 2756 degrees of freedom
## Multiple R-squared:  0.08856,    Adjusted R-squared:  0.08459
## F-statistic: 22.32 on 12 and 2756 DF,  p-value: < 2.2e-16

##
## Call:
## lm(formula = carbidder ~ all_stock + deal_value + bidder_size +
##      bidder_mtb + run_up_bidder + bidder_fcf + bidder_lev + sigma_bidder +
##      relsize + horz + tender_offer + year + hostile, data = CAR_MA[CAR_MA$public ==
##      1, ])
##
## Residuals:
##      Min        1Q      Median        3Q        Max
## -0.49087 -0.04635 -0.00045  0.04584  0.68215
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.9747959   0.7291350  -2.708  0.00681 **
## all_stock     -0.0136031   0.0047735  -2.850  0.00441 **
## deal_value    -0.0063813   0.0019436  -3.283  0.00104 **
## bidder_size   -0.0013725   0.0019206  -0.715  0.47490
## bidder_mtb    -0.0016209   0.0008254  -1.964  0.04967 *
## run_up_bidder -0.0081482   0.0037920  -2.149  0.03175 *
## bidder_fcf    -0.0012846   0.0130219  -0.099  0.92143
## bidder_lev     0.0366473   0.0116693   3.140  0.00171 **
## sigma_bidder  -0.2752860   0.1493151  -1.844  0.06536 .
## relsize        0.0006247   0.0027331   0.229  0.81922
## horz          -0.0015383   0.0040493  -0.380  0.70405
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## tender_offer    0.0101115  0.0050969   1.984  0.04739 *
## year            0.0010192  0.0003660   2.785  0.00540 **
## hostile         0.0012731  0.0151391   0.084  0.93299
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09574 on 2370 degrees of freedom
## Multiple R-squared:  0.04477,    Adjusted R-squared:  0.03953
## F-statistic: 8.544 on 13 and 2370 DF,  p-value: < 2.2e-16

##
## Call:
## lm(formula = carbidder ~ all_stock + public + I(all_stock * public) +
##     deal_value + bidder_size + bidder_mtb + run_up_bidder + bidder_fcf +
##     bidder_lev + sigma_bidder + relsize + horz + tender_offer +
##     year + hostile, data = CAR_MA)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54594 -0.05150 -0.00103  0.05018  1.15388
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.3203663   0.5855543   -0.547  0.584323
## all_stock      0.0164656   0.0047460    3.469  0.000526 ***
## public        -0.0181548   0.0050645   -3.585  0.000341 ***
## I(all_stock * public) -0.0400391   0.0067532   -5.929  3.25e-09 ***
## deal_value     0.0035201   0.0016159    2.178  0.029417 *
## bidder_size   -0.0083081   0.0015716   -5.286  1.30e-07 ***
## bidder_mtb    -0.0010973   0.0005196   -2.112  0.034746 *
## run_up_bidder -0.0023422   0.0024094   -0.972  0.331023
## bidder_fcf     0.0039314   0.0084505    0.465  0.641785
## bidder_lev     0.0144748   0.0095996    1.508  0.131654
## sigma_bidder   0.2360305   0.0951459    2.481  0.013143 *
## relsize        0.0111926   0.0023214    4.821  1.47e-06 ***
## horz          -0.0026322   0.0032731   -0.804  0.421326
## tender_offer   0.0140935   0.0058632    2.404  0.016265 *
## year           0.0002118   0.0002936    0.721  0.470669
## hostile        -0.0038835   0.0176975   -0.219  0.826320
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1124 on 5137 degrees of freedom
## Multiple R-squared:  0.06377,    Adjusted R-squared:  0.06103
## F-statistic: 23.32 on 15 and 5137 DF,  p-value: < 2.2e-16

##
## \begin{table}[!htbp] \centering
##   \caption{}
##   \label{}
##   \small
##   \begin{tabular}{@{\extracolsep{5pt}}lcccccc}
##     \ll[-1.8ex]\hline
##     \hline \ll[-1.8ex]

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## & \multicolumn{6}{c}{\textit{Dependent variable:}} \\
## \cline{2-7}
## \[-1.8ex] & \multicolumn{6}{c}{carbidder} \\
## \[-1.8ex] & (1) & (2) & (3) & (4) & (5) & (6) \\
## \hline \[-1.8ex]
## all\_stock & 0.014$^{***}$ & $-0.023$^{***}$ & 0.014$^{***}$ & 0.012$^{**}$ & $-0.014$^{***}$ & 0.012$^{**}$ \\
## & (0.005) & (0.004) & (0.004) & (0.005) & (0.005) & (0.005) \\
## & & & & & & \\
## public & & $-0.019$^{***}$ & & & $-0.018$^{***}$ & \\
## & & (0.004) & & & (0.005) & \\
## & & & & & & \\
## I(all\_stock \textit{tasteriskcentered} public) & & & $-0.037$^{***}$ & & & $-0.040$^{***}$ \\
## & & & (0.007) & & & (0.007) \\
## & & & & & & \\
## deal\_value & & & 0.012$^{***}$ & $-0.006$^{***}$ & 0.004$^{**}$ & \\
## & & & (0.003) & (0.002) & (0.002) & \\
## & & & & & & \\
## bidder\_size & & & $-0.015$^{***}$ & $-0.001$ & $-0.008$^{***}$ & \\
## & & & (0.002) & (0.002) & (0.002) & \\
## & & & & & & \\
## bidder\_mtb & & & $-0.0002$ & $-0.002$^{**}$ & & $-0.001$^{**}$ \\
## & & & (0.001) & (0.001) & (0.001) & \\
## & & & & & & \\
## run\_up\_bidder & & & 0.002 & $-0.008$^{**}$ & & $-0.002$ \\
## & & & (0.003) & (0.004) & (0.002) & \\
## & & & & & & \\
## bidder\_fcf & & & 0.006 & $-0.001$ & 0.004 & \\
## & & & (0.011) & (0.013) & (0.008) & \\
## & & & & & & \\
## bidder\_lev & & & $-0.001$ & 0.037$^{***}$ & & 0.014 \\
## & & & (0.015) & (0.012) & (0.010) & \\
## & & & & & & \\
## sigma\_bidder & & & 0.269$^{**}$ & $-0.275$^{*}$ & & 0.236$^{**}$ \\
## & & & (0.125) & (0.149) & (0.095) & \\
## & & & & & & \\
## relsize & & & 0.023$^{***}$ & 0.001 & 0.011$^{***}$ & \\
## & & & (0.004) & (0.003) & (0.002) & \\
## & & & & & & \\
## horz & & & $-0.001$ & $-0.002$ & $-0.003$ & \\
## & & & (0.005) & (0.004) & (0.003) & \\
## & & & & & & \\
## tender\_offer & & & 0.013 & 0.010$^{**}$ & & 0.014$^{**}$ \\
## & & & (0.044) & (0.005) & (0.006) & \\
## & & & & & & \\
## year & & & $-0.0004$ & 0.001$^{***}$ & & 0.0002 \\
## & & & (0.0004) & (0.0004) & (0.0003) & \\
## & & & & & & \\
## hostile & & & & 0.001 & $-0.004$ & \\
## & & & & (0.015) & (0.018) & \\
## & & & & & & \\
## Constant & 0.019$^{***}$ & & 0.00003 & 0.019$^{***}$ & 0.854 & $-1.975$^{***}$ & $-0.320$ \\
## & (0.003) & (0.003) & (0.003) & (0.877) & (0.729) & (0.586) & \\
## & & & & & & & \\
## \hline \[-1.8ex]

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## Observations & 2,769 & 2,384 & 5,153 & 2,769 & 2,384 & 5,153 \\
## Adjusted R2 & 0.003 & 0.013 & 0.026 & 0.085 & 0.040 & 0.061 \\
## \hline
## \hline \\[ -1.8ex]
## \textit{Note:} & \multicolumn{6}{l}{ $\text{\textasciitilde{*}}p < 0.1$ ;  $\text{\textasciitilde{**}}p < 0.05$ ;  $\text{\textasciitilde{***}}p < 0.01$ } \\
## & \multicolumn{6}{l}{Notes with explanations?} \\
## \end{tabular}
## \end{table}

```