# BUFN 745 Assignments 4

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## Part I Basic Answer

**AR and CAR around announcement**

| Day | # ar obs | Mean ar | tar | par | # car obs | Mean car | tcar |
|---|---|---|---|---|---|---|---|
| -10 | 581 | 0.000909717 | 1.53924 | 0.12429 | 581 | 0.000909717 | 1.53924 |
| -9 | 581 | 0.000531145 | 0.85313 | 0.39394 | 581 | 0.001440863 | 1.65582 |
| -8 | 581 | -.000618534 | -0.95892 | 0.33800 | 581 | 0.000822329 | 0.76753 |
| -7 | 581 | -.001166385 | -1.75938 | 0.07904 | 581 | -.000344056 | -0.28054 |
| -6 | 581 | 0.000060448 | 0.08605 | 0.93146 | 581 | -.000283608 | -0.21198 |
| -5 | 581 | 0.000082683 | 0.11205 | 0.91083 | 581 | -.000200925 | -0.13578 |
| -4 | 581 | -.000693822 | -0.89569 | 0.37079 | 581 | -.000894748 | -0.56570 |
| -3 | 581 | 0.000698847 | 1.05602 | 0.29140 | 581 | -.000195901 | -0.11156 |
| -2 | 581 | 0.000807344 | 0.96527 | 0.33481 | 581 | 0.000611444 | 0.31894 |
| -1 | 581 | 0.001443733 | 1.52020 | 0.12900 | 581 | 0.002055177 | 0.93984 |
| 0 | 581 | 0.000661568 | 0.72950 | 0.46599 | 581 | 0.002716745 | 1.13698 |
| 1 | 581 | -.000065631 | -0.06765 | 0.94609 | 581 | 0.002651114 | 1.10918 |
| 2 | 581 | 0.000548338 | 0.70224 | 0.48281 | 581 | 0.003199452 | 1.29923 |
| 3 | 581 | 0.000146692 | 0.21418 | 0.83048 | 581 | 0.003346144 | 1.29279 |
| 4 | 581 | 0.000904030 | 1.22680 | 0.22039 | 581 | 0.004250174 | 1.58005 |
| 5 | 581 | 0.000738676 | 1.00427 | 0.31567 | 581 | 0.004988850 | 1.82676 |
| 6 | 581 | -.000072889 | -0.11859 | 0.90564 | 581 | 0.004915961 | 1.73851 |
| 7 | 581 | -.000324618 | -0.51513 | 0.60666 | 581 | 0.004591344 | 1.60166 |
| 8 | 581 | 0.000382061 | 0.63561 | 0.52528 | 581 | 0.004973405 | 1.70727 |
| 9 | 581 | 0.000899193 | 1.43014 | 0.15322 | 581 | 0.005872597 | 2.00557 |
| 10 | 581 | 0.000246084 | 0.42542 | 0.67069 | 581 | 0.006118682 | 2.02598 |

**Table 1.**

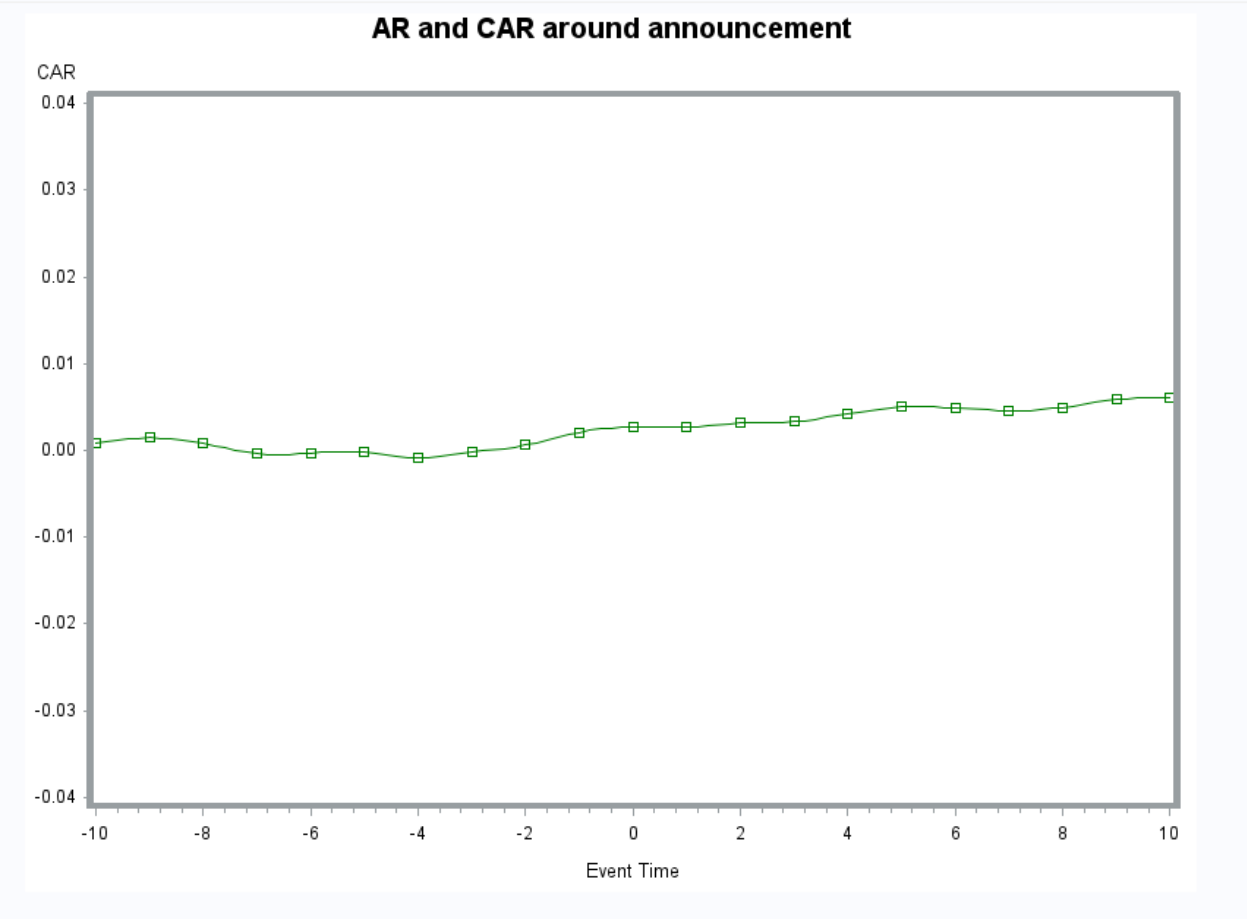


**Chart. 1**

**Interpretation:**

If we set the significance level as 5%, looking at those p-value numbers of abnormal return during the event window, you will be astonished that none of the abnormal returns between -10 and 10 rel_days are statistically significant, which makes the CAR chart very smooth.

From this research, we can get the conclusion that we cannot make any profitable strategy based only on the information that there is announcement of earning of firms because you cannot see any trends in the picture.

| | 3-day | 5-day |
|---|---|---|
| CAR | 0.003346144 | 0.004988850 |
| t-statistic | 1.29279 | 1.82676 |

Table 2.

Table 2 above shows that for the 3 days and 5 days after the announcement of earnings, there are not statistically significant (a t-statistic is statistically significant at the 5% confidence level if it is greater than 1.96 in absolute value) cumulative abnormal returns.

However, we have to understand that behind the announcement of earning reports of the 581 firms, it releases different information to the markets, which includes “higher than expectation”, “lower than expectation” and “just like the expectation”. Although the total information seems neutral to the investors, if we specify the different type of announcement, we may see a totally different picture.

Actually, some papers (Ball and Brown, 1986; Watts, 1978; Foster et al., 1984; Bernard and Thomas, 1989) show that we can in a way predict stock returns after the earnings announcements. Bernard and Thomas (1990) analyze the earning announcements in 1970s and 1980s. Chan et al. (1996) further reckon that post-earning announcement drift is distinct from price momentum; it puts that “The drift in future returns is economically meaningful and lasts for at least six months ”.

```
/***Assignment 4
Luhao Wang
116089876
3/1/2019***/
options ls=72 MAUTOSOURCE SASAUTOS='C:\Users\lhwang94\Desktop\SAS_A4\macros';
*this is the code after the professor made her requirements clear, so I named it the macro event_study_new;
%event_study_new(inforelease,permno,anndats, -10,10,1,AR and CAR around announcement);
```

```
%macro event_study_new(d_p, permno_p, date_p, lwindow, rwindow, graph_p, title_p);
libname worklib 'C:\Users\lhwang94\Desktop\SAS_A4\lib';
*create a temporary dataset, and change the name of variables;
data d;
set worklib.&d_p;
permno = &permno_p;
edate = &date_p;
run;
*define lwindow and rwindow in unix;
%syslput u_lwindow=&lwindow;
%syslput u_rwindow=&rwindow;
*connect to wrds servers;
%let wrds=wrds.wharton.upenn.edu 4016;
options comamid=TCP remote=WRDS;
signon username=_prompt_;
*submit program in unix;
rsubmit;
libname crspsd '/wrds/crsp/sasdata/a_stock';
libname crspix '/wrds/crsp/sasdata/a_indexes';
libname worklib './data';
*upload the temporary data set to unix;
proc upload data=d out=worklib.d_unix;
run;
*download stock returns;
proc sql;
create table d_ret as
select distinct
dsf.ret,
dsf.date,
d_unix.*
from
crspsd.dsf,worklib.d_unix
where
d_unix.permno=dsf.permno and
d_unix.edate+2*&u_lwindow<=dsf.date<=d_unix.edate+2*&u_rwindow;
proc download data=d_ret out=worklib.d_ret;
run;
*downlad index data;
proc sql;
create table d_mkt as
select
dsix.caldt,
dsix.vwretd
from
crspix.dsix, worklib.d_unix
where
d_unix.edate+2*&u_lwindow<=dsix.caldt<=d_unix.edate+2*&u_rwindow;
run;
proc download data=d_mkt out=worklib.d_mkt(rename=(caldt=date));
run;
endrsubmit;
```

```
*get abnormal returns;
proc sort data=worklib.d_ret out=d_ret;
by date;
proc sort data=worklib.d_mkt out=d_mkt;
by date;
data d1;
merge d_ret d_mkt;
by date;
ar=ret-vwretd;
run;
*merge the dataset containing abnormal returns and the dataset containing event information;
proc sql;
create table d2 as
select distinct
d1.ar,
d1.date,
d1.permno,
d.*
from
d1,d
where
d1.permno=d.permno and
d.edate+2*&lwindow<=d1.date<=d.edate+2*&rwindow
order by
permno,edate,date;
proc print data=d2 (obs=120);
var permno edate date ar;
format edate date date9.;
run;
* get relative days data;
proc means data=d2 noprint;
var permno;
by permno edate;
output out=d2_stats
n=num_before;
where date<edate;
data d3;
merge d2 d2_stats(keep=permno edate num_before);
by permno edate;
if first.edate then
rel_day=-num_before;
else
rel_day=rel_day+1;
retain rel_day;
*get the dataset only including the returns in our window;
data d4;
set d3;
if &lwindow<=rel_day<=&rwindow;
*get ar and car;
data d4;
set d4;
```

```
by permno edate;
if first.edate then
car=ar;
else
car=car+ar;
retain car;
*calculate statistics;
proc sort data=d4;
by rel_day;
proc means data=d4 noprint;
var car ar;
output out=d4_stats
n(car)=ncar
mean(car)=acar
t(car)=tcar
probt(car)=pcar
n(ar)=nar
mean(ar)=aar
t(ar)=tar
probt(ar)=par;
by rel_day;
*based on the graph_p, get the table and draw the picture;
%if &graph_p=0 %then
%do;
proc print data=d4_stats noobs label;
title "&title_p";
var rel_day nar aar tar ncar acar tcar;
where &lwindow<=rel_day<=&rwindow;
label

rel_day="Day"
nar="# ar obs"
aar="Mean ar"
tar="tar"
par="par"
ncar="# car obs"
acar="Mean car"
tcar="tcar"
pcar="pcar";
run;
%end;
%else
%do;
proc print data=d4_stats noobs label;
title "&title_p";
var rel_day nar aar tar par ncar acar tcar;
where &lwindow<=rel_day<=&rwindow;
label

rel_day="Day"
nar="# ar obs"
```

```
aar="Mean ar"
tar="tar"
par="par"
ncar="# car obs"
acar="Mean car"
tcar="tcar"
pcar="pcar";
symbol1
color=green interpol=spline width=1 value=square;
symbol2
color=red interpol=spline width=1 value=triangle;
symbol3
color=blue interpol=spline width=1 value=circle;
axis1
label=('Event Time')
order=&lwindow to &rwindow by 2
width=3;
axis2
label=('CAR')
order=-0.04 to 0.04 by 0.01
width=3;
proc gplot data=d4_stats;
plot acar*rel_day/haxis=axis1 vaxis=axis2;
run;
quit;
%end;
run;
%mend event_study;
```

## Part II Further explorations

If we set samples as “Bad-News Firms”, “Good-News Firms”, and “No-News” Firms, the further researches are as follows:

**AR and CAR around announcement**

| Sample | Day | # ar obs | Mean ar | tar | par | # car obs | Mean car | tcar |
|---|---|---|---|---|---|---|---|---|
| Bad-News Firms | -10 | 217 | -.000196825 | -0.17487 | 0.86135 | 217 | -0.000197 | -0.17487 |
| Bad-News Firms | -9 | 217 | 0.000380868 | 0.30615 | 0.75979 | 217 | 0.000184 | 0.10718 |
| Bad-News Firms | -8 | 217 | -.002147894 | -1.75646 | 0.08043 | 217 | -0.001964 | -0.92648 |
| Bad-News Firms | -7 | 217 | -.001488835 | -1.13950 | 0.25576 | 217 | -0.003453 | -1.43626 |
| Bad-News Firms | -6 | 217 | -.000306080 | -0.23455 | 0.81478 | 217 | -0.003759 | -1.45171 |
| Bad-News Firms | -5 | 217 | 0.000585646 | 0.40658 | 0.68472 | 217 | -0.003173 | -1.13157 |
| Bad-News Firms | -4 | 217 | -.002299630 | -1.93385 | 0.05444 | 217 | -0.005473 | -1.82205 |
| Bad-News Firms | -3 | 217 | -.001627840 | -1.33203 | 0.18425 | 217 | -0.007101 | -2.10062 |
| Bad-News Firms | -2 | 217 | -.001567991 | -1.11503 | 0.26608 | 217 | -0.008669 | -2.40731 |
| Bad-News Firms | -1 | 217 | -.003251178 | -1.84494 | 0.06641 | 217 | -0.011920 | -2.70097 |
| Bad-News Firms | 0 | 217 | -.003805657 | -2.53184 | 0.01206 | 217 | -0.015725 | -3.29978 |
| Bad-News Firms | 1 | 217 | 0.000016039 | 0.01166 | 0.99071 | 217 | -0.015709 | -3.41541 |
| Bad-News Firms | 2 | 217 | 0.001674058 | 1.33499 | 0.18329 | 217 | -0.014035 | -3.00042 |
| Bad-News Firms | 3 | 217 | 0.001336278 | 1.29537 | 0.19658 | 217 | -0.012699 | -2.67391 |
| Bad-News Firms | 4 | 217 | 0.000292288 | 0.24956 | 0.80316 | 217 | -0.012407 | -2.59636 |
| Bad-News Firms | 5 | 217 | 0.001720523 | 1.35971 | 0.17534 | 217 | -0.010686 | -2.19360 |
| Bad-News Firms | 6 | 217 | -.000271908 | -0.26064 | 0.79462 | 217 | -0.010958 | -2.21103 |
| Bad-News Firms | 7 | 217 | -.002180891 | -1.93803 | 0.05392 | 217 | -0.013139 | -2.60262 |
| Bad-News Firms | 8 | 217 | -.000091704 | -0.08788 | 0.93006 | 217 | -0.013231 | -2.54714 |
| Bad-News Firms | 9 | 217 | 0.000433341 | 0.38644 | 0.69955 | 217 | -0.012797 | -2.41725 |
| Bad-News Firms | 10 | 217 | -.000444833 | -0.44137 | 0.65938 | 217 | -0.013242 | -2.39596 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Good-News Firms | -10 | 219 | 0.001398239 | 1.53241 | 0.12687 | 219 | 0.001398 | 1.53241 |
| Good-News Firms | -9 | 219 | 0.000443630 | 0.51219 | 0.60904 | 219 | 0.001842 | 1.49269 |
| Good-News Firms | -8 | 219 | -.000819394 | -0.86732 | 0.38672 | 219 | 0.001022 | 0.69087 |
| Good-News Firms | -7 | 219 | -.001270518 | -1.27734 | 0.20284 | 219 | -0.000248 | -0.14190 |
| Good-News Firms | -6 | 219 | 0.000832500 | 0.72779 | 0.46752 | 219 | 0.000584 | 0.28634 |
| Good-News Firms | -5 | 219 | -.001423179 | -1.41960 | 0.15715 | 219 | -0.000839 | -0.37317 |
| Good-News Firms | -4 | 219 | -.000955005 | -0.63592 | 0.52549 | 219 | -0.001794 | -0.72860 |
| Good-News Firms | -3 | 219 | 0.002326940 | 2.25305 | 0.02525 | 219 | 0.000533 | 0.19497 |
| Good-News Firms | -2 | 219 | 0.002591662 | 1.77055 | 0.07803 | 219 | 0.003125 | 1.04104 |
| Good-News Firms | -1 | 219 | 0.005535158 | 3.76577 | 0.00021 | 219 | 0.008660 | 2.82043 |
| Good-News Firms | 0 | 219 | 0.005343083 | 3.29340 | 0.00115 | 219 | 0.014003 | 4.30672 |
| Good-News Firms | 1 | 219 | 0.000330729 | 0.16887 | 0.86606 | 219 | 0.014334 | 4.29532 |
| Good-News Firms | 2 | 219 | -.000216839 | -0.14766 | 0.88274 | 219 | 0.014117 | 3.96500 |
| Good-News Firms | 3 | 219 | -.001122022 | -1.07402 | 0.28400 | 219 | 0.012995 | 3.33978 |
| Good-News Firms | 4 | 219 | 0.002403337 | 2.16248 | 0.03167 | 219 | 0.015398 | 3.71196 |
| Good-News Firms | 5 | 219 | 0.000777868 | 0.74298 | 0.45829 | 219 | 0.016176 | 3.71280 |
| Good-News Firms | 6 | 219 | 0.000489660 | 0.47532 | 0.63504 | 219 | 0.016666 | 3.65741 |
| Good-News Firms | 7 | 219 | 0.002114664 | 2.01419 | 0.04522 | 219 | 0.018781 | 4.20792 |
| Good-News Firms | 8 | 219 | 0.000490585 | 0.53245 | 0.59496 | 219 | 0.019271 | 4.33133 |
| Good-News Firms | 9 | 219 | 0.001971452 | 2.06212 | 0.04038 | 219 | 0.021243 | 4.78068 |
| Good-News Firms | 10 | 219 | 0.000551732 | 0.63378 | 0.52689 | 219 | 0.021794 | 4.74008 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No-News Firms | -10 | 145 | 0.001827879 | 1.96120 | 0.05178 | 145 | 0.001828 | 1.96120 |
| No-News Firms | -9 | 145 | 0.000888222 | 0.86079 | 0.39079 | 145 | 0.002716 | 1.87828 |
| No-News Firms | -8 | 145 | 0.001973598 | 1.76822 | 0.07914 | 145 | 0.004690 | 2.60295 |
| No-News Firms | -7 | 145 | -.000526544 | -0.52794 | 0.59835 | 145 | 0.004163 | 2.06309 |
| No-News Firms | -6 | 145 | -.000557088 | -0.52182 | 0.60260 | 145 | 0.003606 | 1.78642 |
| No-News Firms | -5 | 145 | 0.001604344 | 1.19906 | 0.23247 | 145 | 0.005210 | 2.15655 |
| No-News Firms | -4 | 145 | 0.002103828 | 1.86601 | 0.06407 | 145 | 0.007314 | 3.09911 |
| No-News Firms | -3 | 145 | 0.001721872 | 1.58167 | 0.11592 | 145 | 0.009036 | 3.71274 |
| No-News Firms | -2 | 145 | 0.001667223 | 1.22423 | 0.22286 | 145 | 0.010703 | 3.79869 |
| No-News Firms | -1 | 145 | 0.002290447 | 1.53194 | 0.12773 | 145 | 0.012994 | 4.43627 |
| No-News Firms | 0 | 145 | 0.000276301 | 0.20918 | 0.83460 | 145 | 0.013270 | 3.93975 |
| No-News Firms | 1 | 145 | -.000786496 | -0.53409 | 0.59411 | 145 | 0.012484 | 3.38038 |
| No-News Firms | 2 | 145 | 0.000019323 | 0.01658 | 0.98680 | 145 | 0.012503 | 3.24698 |
| No-News Firms | 3 | 145 | 0.000282611 | 0.17346 | 0.86253 | 145 | 0.012786 | 2.96462 |
| No-News Firms | 4 | 145 | -.000444938 | -0.26495 | 0.79143 | 145 | 0.012341 | 2.65982 |
| No-News Firms | 5 | 145 | -.000789901 | -0.48945 | 0.62527 | 145 | 0.011551 | 2.61398 |
| No-News Firms | 6 | 145 | -.000624692 | -0.56524 | 0.57279 | 145 | 0.010926 | 2.32363 |
| No-News Firms | 7 | 145 | -.001230766 | -1.26811 | 0.20681 | 145 | 0.009695 | 1.96667 |
| No-News Firms | 8 | 145 | 0.000927166 | 0.77238 | 0.44115 | 145 | 0.010622 | 2.11127 |
| No-News Firms | 9 | 145 | -.000023116 | -0.01922 | 0.98470 | 145 | 0.010599 | 2.16108 |
| No-News Firms | 10 | 145 | 0.000818446 | 0.69698 | 0.48694 | 145 | 0.011418 | 2.34896 |

Table 3.

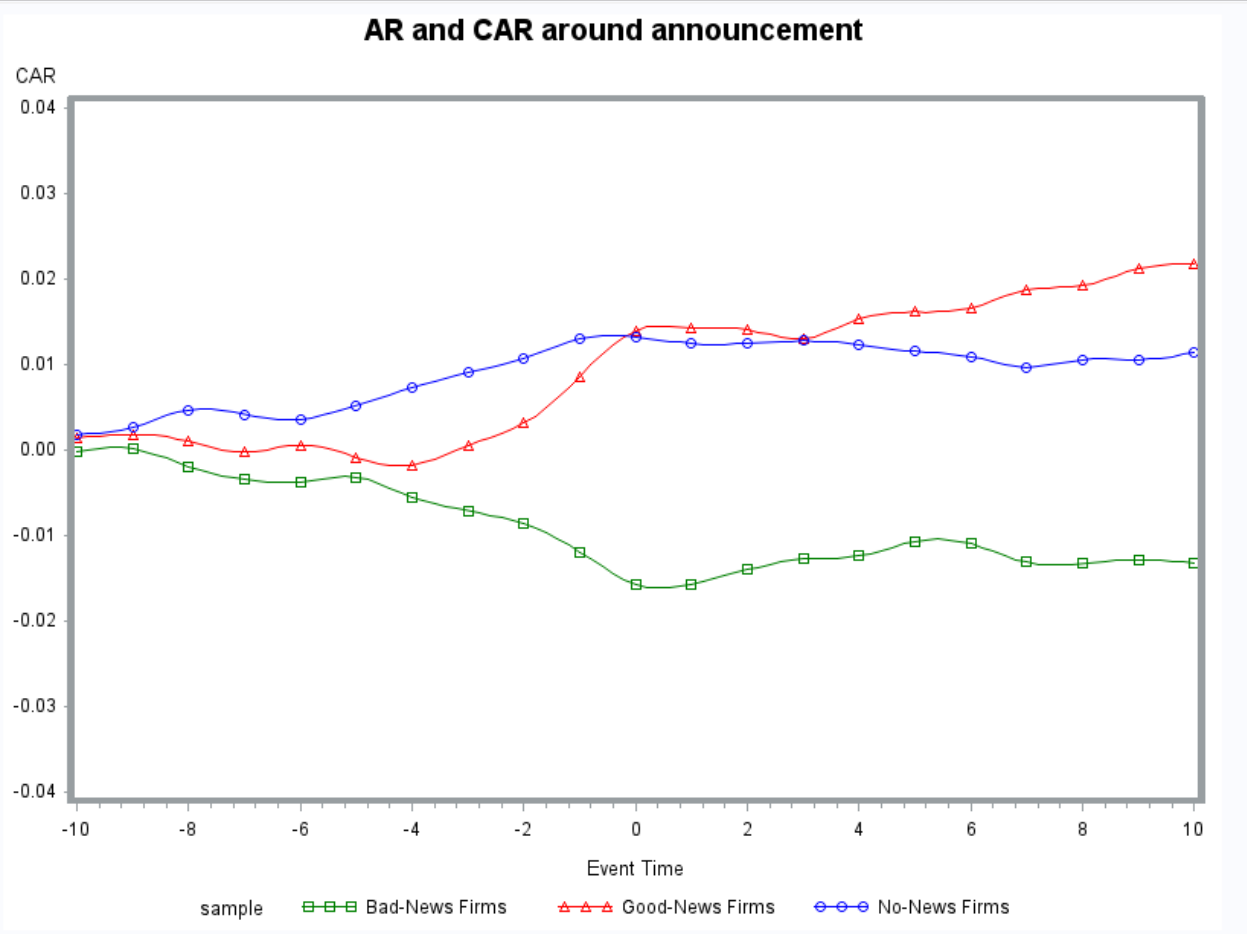


Chart 2.

If we set the significance level at 0.05, all the abnormal return of No-News Firms is not significant, although at day -10 the p value is 0.052, very close to 0.05. Therefore, if the announcement does not significantly differ from earlier expectation, it will not affect the stock market.

Both good news and bad news have effect on stock market on day 0, which is consist with Michael Firth(1976), that investors use the financial results of a company to reappraise the share price of that company (and of competing companies).

For those Good-News Firms, there is significant abnormal return as 0.002326940 in day -3; there is significant abnormal return as 0.005535158 in day -1; there is significant abnormal return as 0.005343083 in day 0; there is significant abnormal return as 002403337 in day 4; there is significant abnormal return as 0.002114664 in day 7; there is significant abnormal return as 001971452 in day 9. The abnormal returns in day -3 and day -1 shows there is leakage of good news in the financial market. And the abnormal returns in day 4, day 7 and day 9 shows the short-term momentum. Some economists and psychologists in the fields of behavioral finance recon that it is because individuals see a stock price rising and are drawn into the market in a kind of “bandwagon effect”; another explanation is that there is a tendency for investors to underreact to new information (Burton G Malkiel, 2003).

For those Bad-News Firms, on day 0, abnormal return is -0. 003805657, and is significant. I am surprised that this is the only day that the p value is less than 0.05, which means for bad news, there is not significant leakage or short-term momentum. The disappear of momentum is consistent with the survey of Eugene Fama (1998) which shows that many of the return “anomalies” arise only in the context of some very particular model, and tend to disappear when conditions change. Burton G. Malkiel(2003) argues that such apparent patterns were never sufficiently large or stable; our stock market are far more efficient and far less predictable than some recent academic papers would have us believe.

```
/***Assignment 4
Luhao Wang
116089876
3/1/2019***/
options ls=72 MAUTOSOURCE SASAUTOS='C:\Users\lhwang94\Desktop\SAS_A4\macros';

%event_study(inforelease,permno,anndats, -10,10,1,AR and CAR around announcement);
```

```
%macro event_study(d_p, permno_p, date_p, lwindow, rwindow, graph_p, title_p);
libname worklib 'C:\Users\lhwang94\Desktop\SAS_A4\lib';
*create a temporary dataset, and change the name of variables;
data d;
set worklib.&d_p;
permno = &permno_p;
edate = &date_p;
run;
*define lwindow and rwindow in unix;
%syslput u_lwindow=&lwindow;
%syslput u_rwindow=&rwindow;
*connect to wrds servers;
%let wrds=wrds.wharton.upenn.edu 4016;
options comamid=TCP remote=WRDS;
signon username=_prompt_;
*submit program in unix;
rsubmit;
libname crspsd '/wrds/crsp/sasdata/a_stock';
libname crspix '/wrds/crsp/sasdata/a_indexes';
libname worklib './data';
*upload the temporary data set to unix;
proc upload data=d out=worklib.d_unix;
run;
*download stock returns;
proc sql;
create table d_ret as
select distinct
dsf.ret,
dsf.date,
d_unix.*
from
crspsd.dsf,worklib.d_unix
where
d_unix.permno=dsf.permno and
d_unix.edate+2*&u_lwindow<=dsf.date<=d_unix.edate+2*&u_rwindow;
proc download data=d_ret out=worklib.d_ret;
run;
*downlad index data;
proc sql;
create table d_mkt as
select
dsix.caldt,
dsix.vwretd
from
crspix.dsix, worklib.d_unix
where
d_unix.edate+2*&u_lwindow<=dsix.caldt<=d_unix.edate+2*&u_rwindow;
run;
proc download data=d_mkt out=worklib.d_mkt(rename=(caldt=date));
run;
endrsubmit;
*get abnormal returns;
proc sort data=worklib.d_ret out=d_ret;
by date;
```

```
proc sort data=worklib.d_mkt out=d_mkt;
by date;
data d1;
merge d_ret d_mkt;
by date;
ar=ret-vwretd;
run;
*merge the dataset containing abnormal returns and the dataset containing event information;
proc sql;
create table d2 as
select distinct
d1.ar,
d1.date,
d1.permno,
d.*
from
d1,d
where
d1.permno=d.permno and
d.edate+2*&lwindow<=d1.date<=d.edate+2*&rwindow
order by
permno,edate,date;
proc print data=d2 (obs=120);
var permno edate date ar;
format edate date date9.;
run;
* get relative days data;
proc means data=d2 noprint;
var permno;
by permno edate;
output out=d2_stats
n=num_before;
where date<edate;
data d3;
merge d2 d2_stats(keep=permno edate num_before);
by permno edate;
if first.edate then
rel_day=-num_before;
else
rel_day=rel_day+1;
retain rel_day;
*get the dataset only including the returns in our window;
data d4;
set d3;
if &lwindow<=rel_day<=&rwindow;
*get ar and car;
data d4;
set d4;
by permno edate;
if first.edate then
car=ar;
else
car=car+ar;
retain car;
```

```
*get samples;
data d4;
set d4;
if value>meanest+.025*abs(meanest) then
sample="Good-News Firms";
else
if value<meanest-0.025*abs(meanest) then
sample="Bad-News Firms";
else
sample="No-News Firms";
proc sort data=d4;
by sample rel_day;
proc means data=d4 noprint;
var car ar;
output out=d4_stats
n(car)=ncar
mean(car)=acar
t(car)=tcar
probt(car)=pcar
n(ar)=nar
mean(ar)=aar
t(ar)=tar
probt(ar)=par;
by sample rel_day;
*based on the graph_p, get the table and draw the picture;
%if &graph_p=0 %then
%do;
proc print data=d4_stats noobs label;
title "&title_p";
var sample rel_day nar aar tar ncar acar tcar;
where &lwindow<=rel_day<=&rwindow;
label
sample="Sample"
rel_day="Day"
nar="# ar obs"
aar="Mean ar"
tar="tar"
par="par"
ncar="# car obs"
acar="Mean car"
tcar="tcar"
pcar="pcar";
run;
%end;
%else
%do;
proc print data=d4_stats noobs label;
title "&title_p";
var sample rel_day nar aar tar par ncar acar tcar;
where &lwindow<=rel_day<=&rwindow;
label
sample="Sample"
rel_day="Day"
nar="# ar obs"
```

```
aar="Mean ar"
tar="tar"
par="par"
ncar="# car obs"
acar="Mean car"
tcar="tcar"
pcar="pcar";
symbol1
color=green interpol=spline width=1 value=square;
symbol2
color=red interpol=spline width=1 value=triangle;
symbol3
color=blue interpol=spline width=1 value=circle;
axis1
label=('Event Time')
order=&lwindow to &rwindow by 2
width=3;
axis2
label=('CAR')
order=-0.04 to 0.04 by 0.01
width=3;
proc gplot data=d4_stats;
plot acar*rel_day=sample/haxis=axis1 vaxis=axis2;
run;
quit;
%end;
run;
%mend event_study;
```