A pedagogical Excel application of cumulative abnormal returns to Hewlett-Packard Company's takeover of 3Com Corporation

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Abstract

This paper uses Excel spreadsheets to introduce event study methods to both senior undergraduate and MBA students. The Hewlett-Packard Company's takeover of 3Com Corporation is analyzed during 2009. First, two common event study methods of the cumulative abnormal returns (CARs) is explained. Second, a lesson plan for faculty is introduced to make business students to calculate the CARs for the event of HP's takeover of 3Com. Finally, Excel graphs of the CARs illustrate the event study findings for business students.

Keywords: Cumulative Abnormal Returns (CARs), Event Study, Excel spreadsheet.
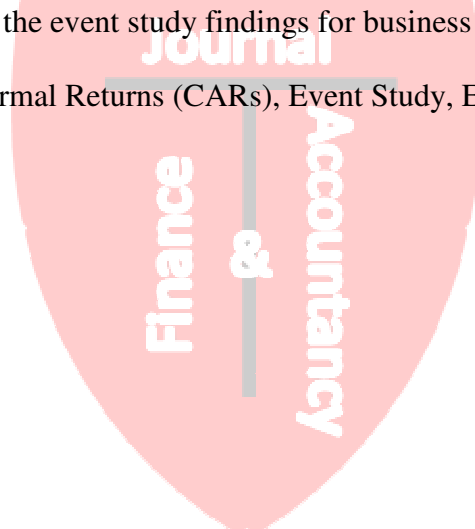
1. Introduction

The announcements of corporate earnings and mergers have significant consequences for the financial health of firms and financial markets, and therefore financial researchers analyze these events using the cumulative abnormal returns (CARs). Even though the majority of managerial finance and investment textbooks provide a graphical illustration of the CARs [see the examples at Ross et al. (2008), Bodie et al. (2010) and Jones (2010)], the textbooks of managerial finance with Excel present limited details for business faculty and students to apply independently. For example, the most common managerial finance Excel textbooks such as Holden (2005), Mayes and Shank (2010), and Adair (2005) do not introduce the CARs methodology at all. Even though Benninga (2006) uses the technique in a chapter-end problem set, there are not enough application details for business faculty and students to follow through independently.

This paper fills this gap by introducing an Excel spreadsheet application of CARs to a takeover announcement. The event takes place on Nov. 11, 2009 with the announcement of Hewlett Packard Corporation to purchase 3Com Corporation for a price of $7.90 per share in cash or for a total firm value of approximately $2.7 billion.

The first goal of this paper is to provide an Excel spreadsheet treatment of the event studies. The second goal is to simplify the CARs for faculty and intermediate business students using a lesson plan. Finally, the Excel graphs illustrate the return reactions of acquiring and target firms at and around the event date to improve the students' understanding.

2. Cumulative Abnormal Returns (CARs) Methodology

In the event study literature, the abnormal returns (ARs) are commonly defined as:

Abnormal Returns = Actual Returns – Normal Returns

For example, Brown (1985) introduces normal returns as either the required return from the Capital Asset Pricing Model (CAPM), $E(R_{it}) = \alpha_i + \beta_i R_{Mt}$ (Method 1) or as an arithmetic average of historical returns, $\left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$ (Method 2).

Method 1 is called Market Adjusted Returns and defines the cumulative abnormal returns as $CAR_{it} = R_{it} - \left[\alpha_i + \beta_i R_{Mt} \right]$, where R_{it} is the daily stock return and R_{Mt} is the daily market index return and can be approximated by the S&P500 index at time t, and α is the intercept and β_i is the slope of the characteristic line from the CAPM.

Method 2 is called Mean Adjusted Returns, and defines CARs as

$CAR_{it} = R_{it} - \left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$, where N is the number of average trading days in a given year, and n is (event period – 1 day)/2. The number of days in (- N to - n) is called "estimation period" and provides to the normal return estimations. Also, the (- n to n) is a relatively short period of days and called "event period," and the CARs are calculated for the event period. The addition of estimation and event periods should yield the total trading days in a given year.

3. An Excel Application to the CARs

There are 250 stock trading days in the sample for the calculation of the abnormal returns:

Method 1: Market Adjusted Cumulative Abnormal Returns: $CAR_{it} = R_{it} - [\alpha_i + \beta_i R_{Mt}]$, and

CAR_{it} is calculated for an event period of 21 trading days, $\sum_{-10}^{10} R_{it}$ where n takes a value of 10, (event period – 1 day)/2. The event period is also called event window, (-10, 0, +10 days), and includes the event day at time 0.

Method 2: Mean Adjusted Cumulative Abnormal Returns: $CAR_{it} = R_{it} - \left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$, and

the $\left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$ is the arithmetic average of historical returns from the estimation period of

229 trading days, $\left[\dfrac{1}{229} \sum_{-239}^{-11} R_{it} \right]$.

It is also possible to use a shorter event window of 11 days, (-5, 0, +5 days), and a shorter sample period of 125 trading days representing a 6-month' daily trading activities. The selection criteria for the length of the estimation and event periods should concern with the optimality of measurement for the firm and market fundamentals.

4. Findings from the HP's Takeover of 3Com

On November 11, 2009 at 5 p.m. ET / 2 p.m. PT, Hewlett-Packard Company (HP) announced to its stockholders that HP will purchase 3Com Corporation at a price of $7.90 per share in cash or an enterprise value of approximately $2.7 billion. After the announcement, the following day on November 12, 2009, the target firm's (3COM) stock price closed at $7.46 up from $5.69 a day earlier, and stayed in that range for the following 10 days period. Also, the acquiring firm's (HPQ) stock price on November 12 was $49.62 slightly down from the previous day $49.92, and stayed in that range for the following 10 days.

Table 1 provides a lesson plan for faculty and students to calculate the CARs. Additionally, the mini-table in Table 1 summarizes the data for the sample and event periods (notice that there are hidden rows). The event period data is located at Rows 2-22 and estimation period data is located at Rows 23-251. The event period has 21 days total with 10 days before and 10 days after the event.

Tables 2 present how the data from Table 1 can be applied to Method 1 (with CAPM). The Column A (DAYS RT=Days Respect to the event) counts days before and after the event. To generate this column, type 0 into A12, the event date (11/11/2009), and =A12+1 at cell address of A11, and =A12-1 at A13. After the second column, Column B, named as DATE, the stock prices and index numbers for COMS, HPQ, and S&P500 respectively occupies Column C through E. The following three columns from Column F to H are returns of the stocks and the market index, and obtained by typing =C2/C3-1 at F2 cell and copied and pasted to the remaining cells.

Furthermore, to generate the Market Adjusted Abnormal Returns: $AR_{it} = R_{it} - [\alpha_i + \beta_i R_{Mt}]$ use the following shortcut in Excel at I10 cell for the AR of COMS:

=F2(INTERCEPT(\$F\$23:\$F\$251,\$H\$23:\$H\$251)+(SLOPE(\$F\$23:\$F\$251,\$H\$23:\$H\$251)*H2)), and copy and paste for the event period of 21 days. In the expression, The regression component, $\alpha_i + \beta_i R_{Mt}$, refers to:

INTERCEPT(\$F\$23:\$F\$251,\$H\$23:\$H\$251)+(SLOPE(\$F\$23:\$F\$251,\$H\$23:\$H\$251)*H2 and can be generated alternatively by using a regression analysis corresponding to a characteristic line (see the steps to run a regression with Excel 2007 in the Appendix).

Next, the generation of cumulative abnormal returns require summing up the abnormal returns over the event period, and therefore choose K22 cell to start strategically and type the following: =SUM(I22:\$I\$22), and copy and paste from K22 through K2 backwards.

On Table 3, to generate the Mean Adjusted Abnormal

Returns: $AR_{it} = R_{it} - \left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$, use the following shortcut in excel at I10 cell for the AR

of COMS: =F2-AVERAGE(\$F\$23:\$F\$251), and copy and paste for the event period of 21 days. Next, again finding of cumulative abnormal returns requires summing up the abnormal returns over the event period, and follows the process applied in Table2. And, the last column counts the total number of days on the worksheet. A "1" entry at M2, and =M2+1 at M3 will suffice to generate this column.

Finally, Table 4 uses the CARs information for 3Com from Tables 2 and 3, and plot return reactions around the event date for a window of 21 trading days. To achieve the graphing on both Tables 2 and 3, highlight cells of DATE, CARs (COMS), and CARs (HPQ) simultaneously by holding down the CTRL key, and find 2-D line graph from the "Insert" menu. First graph is based on Method 1, and clearly show that there was about 30% of return reaction for 3Com stock just one day after the announcement date while the returns of HP stay flat. This one day of delayed reaction is consistent with the exact timing of takeover announcement: the Hewlett-Packard announced the merger news after the markets were closed on November 11, 2009. Additionally, the last graph on Table 4 shows the same return reactions using Method 2. Overall, the graphs clearly indicate that while there were significant CARs for 3Com Corporation, there are no significant abnormal return reactions for the acquiring firm, Hewlett Packard Company.

5. Summary and Conclusions

The Excel application of HP's takeover of 3Comm event yields the typical results of an event study in merger literature: The target firm's CARs take positive values at and after the event date and the acquiring firm's CARs stays relatively insignificant or might take negative values at and after the event date.

A spreadsheet application of an event study from its start to finish takes relatively short time for business faculty and students to accomplish within the confines of one lecture using a computer and a projector in front of the students.

The Excel application in this paper achieves two goals: (1) enforces students' understanding of normal returns and cumulative abnormal returns, and (2) presents the typical results of merger for the target and acquiring firms from the real world examples.

As a result, the business faculty and students might carry on using the event study methods independently for their assignments and projects.

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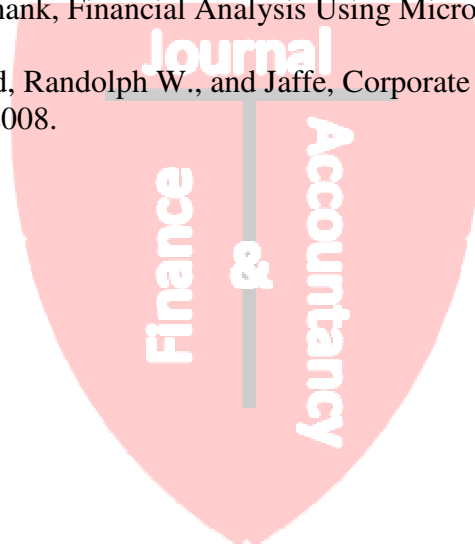
Table 1: Recommended Lesson Plan for CARs Application for 3Com

SAMPLE LESSON PLAN: FINDING CUMULATIVE ABNORMAL RETURNS
- Use the following data (copy and paste into an Excel worksheet) to find Cumulative Abnormal Returns (CARs)
- First, find abnormal returns (AR) based on the following two definitions (please choose only one):

Abnormal Returns (AR) = Actual Returns – Normal Returns

1. Market Adjusted Abnormal Returns: $AR_{it} = R_{it} - [\alpha_i + \beta_i R_{Mt}]$ where R_{it} is the daily returns of 3com at time t and R_{Mt} is the daily returns of S&P500 at time t, and α is the intercept and β_i is the slope (and beta) of characteristic line.

2. Mean Adjusted Cumulative Abnormal Returns: $CAR_{it} = R_{it} - \left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$.

The $\left[\dfrac{1}{N-n-1} \sum_{-N}^{-n} R_{it} \right]$ is the arithmetic average of historical returns for 229 trading days, $\left[\dfrac{1}{229} \sum_{-239}^{-11} R_{it} \right]$.

The event window is 21 days (-10, 0, +10 days), and n is -11. The minus sign is assigned because it is before the event.
- If you choose Method 1, run a simple regression (follow Data/Data Analysis/Regression steps) to find beta using the sample period (229 days). Then, derive ARs and CARs (see Tables 2 and 3).
- If you choose Method 2, find the arithmetic average based on the sample period (229 days), and use it to derive ARs and CARs (see Tables 4 and 5).
- Using the coefficients from the regression estimation and find cumulative abnormal returns (CARs) for the whole year (start with the oldest date to accumulate returns over time).
- Graph the CARs against days for the event period (21 days).

Sample Data for 3com and HP

	A	B	C	D	E	F
1	DAYS	DATE	HPQ	COMS	S&P500	TOTAL
2	10	11/25/2009	49.97	7.41	1110.63	1
11	1	11/12/2009	49.62	7.46	1087.24	10
12	0	11/11/2009	49.92	5.69	1098.51	11
13	-1	11/10/2009	49.88	5.41	1093.01	12
22	-10	10/28/2009	46.85	5.30	1042.63	21
23	-11	10/27/2009	47.22	5.36	1063.41	22
251	-239	12/1/2008	33.08	1.88	816.21	250
252	-240	11/28/2008	34.91	2.01	896.24	
253	-241	11/26/2008	34.84	1.97	887.68	

1. The meaning of the column labels: DAYS = days respect to the event at time 0, DATE = calendar days, HPQ = stock prices of Hewlett-Packard Company, COMS = stock prices of 3Com Corporation, S&P500 = index numbers of Standard & Poors' 500 , and TOTAL = total days including the event period [sample period (239 days) + event period (21 days)].
2. The meaning of cell colors: blue= labels, yellow = days before and after the event, red = event day, and gray = sample period of 239 days, and green = regression coefficients.
3. Hidden rows are at 3-10, 14-21, and 12-249.

Table 2: Calculations of CARs for 3com using Method 1: $CAR_{it} = R_{it} - [\alpha_i + \beta_i R_{Mt}]$

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	DAYS RT	DATE	COMS	HPQ	S&P500	RHPQ	RCOMS	RS&P500	AR (COMS)	AR (HPQ)	CAR (COMS)	CAR (HPQ)	TOTAL
2	10	11/25/2009	7.41	49.97	1110.63	-0.28%	-0.40%	0.45%	-1.33%	-0.74%	23.44%	0.35%	1
11	1	11/12/2009	7.46	49.62	1087.24	-0.60%	31.11%	-1.03%	31.95%	0.20%	30.17%	2.13%	10
12	0	11/11/2009	5.69	49.92	1098.51	0.08%	5.18%	0.50%	4.19%	-0.43%	-1.79%	1.92%	11
13	-1	11/10/2009	5.41	49.88	1093.01	-0.06%	-1.46%	-0.01%	-1.83%	-0.13%	-5.97%	2.35%	12
22	-10	10/28/2009	5.30	46.85	1042.63	-0.78%	-1.12%	-1.95%	0.84%	0.82%	0.84%	0.82%	21
23	-11	10/27/2009	5.36	47.22	1063.41	-1.17%	-2.19%	-0.33%					22
24	-12	10/26/2009	5.48	47.78	1066.95	-1.44%	-4.53%	-1.17%					23
25	-13	10/23/2009	5.74	48.48	1079.60	0.50%	-1.37%	-1.22%					24
26	-14	10/22/2009	5.82	48.24	1092.91	0.21%	3.37%	1.06%					25
27	-15	10/21/2009	5.63	48.14	1081.40	-1.07%	-3.60%	-0.89%					26
27	-16	10/20/2009	5.84	48.66	1091.06	0.56%	0.52%	-0.62%					27
29	-17	10/19/2009	5.81	48.39	1097.91	0.21%	3.38%	0.94%					28
30	-18	10/16/2009	5.62	48.29	1087.68	0.77%	-1.23%	-0.81%					29
31	-19	10/15/2009	5.69	47.92	1096.56	0.23%	-2.57%	0.42%					30
32	-20	10/14/2009	5.84	47.81	1092.02	2.55%	2.46%	1.75%					31
33	-21	10/13/2009	5.70	46.62	1073.19	-0.72%	0.00%	-0.28%					32
34	-22	10/12/2009	5.70	46.96	1076.19	-0.72%	0.88%	0.44%					33
35	-23	10/9/2009	5.65	47.30	1071.49	1.96%	1.99%	0.56%					34
36	-24	10/8/2009	5.54	46.39	1065.48	-0.22%	3.36%	0.75%					35
37	-25	10/7/2009	5.36	46.49	1057.58	-0.94%	-0.56%	0.27%					36

1. The meaning of the column labels: DAYS RT EVENT = days respect to the event at time 0, DATE = calendar days, HPQ = stock prices of Hewlett-Packard Company, COMS = stock prices of 3Com Corporation, S&P500 = index numbers of Standard & Poors' 500, RHPQ = daily returns of Hewlett-Packard Company, RCOMS = daily return of 3Com Corporation, RS&P500 = daily returns of Standard & Poors' 500 index, AR = daily abnormal returns, CAR = cumulative abnormal returns, and TOTAL DAYS = total days including the event period [sample period (239 days) + event period (21 days)].
2. The meaning of cell colors: blue= labels, yellow = days before and after the event, red = event day, and gray = sample period of 239 days, and green = regression coefficients.
3. Hidden rows are at 3-10 and 14-21.

Table 3: Calculations of CARs for 3Com using Method 2: $CAR_{it} = R_{it} - \left[\dfrac{1}{229} \sum\limits_{-239}^{-11} R_{it} \right]$

	A DAYS RT	B DATE	C COMS	D HPQ	E S&P500	F RHPQ	G RCOMS	H RS&P500	I AR (COMS)	J AR (HPQ)	K CAR (COMS)	L CAR (HPQ)	M TOTAL
2	10	11/25/2009	7.41	49.97	1110.63	-0.28%	-0.40%	0.45%	-0.90%	-0.44%	26.48%	2.52%	1
11	1	11/12/2009	7.46	49.62	1087.24	-0.60%	31.11%	-1.03%	30.61%	-0.76%	31.63%	3.18%	10
12	0	11/11/2009	5.69	49.92	1098.51	0.08%	0.50%	4.68%	4.68%	-0.08%	1.02%	3.94%	11
13	-1	11/10/2009	5.41	49.88	1093.01	-0.06%	-1.46%	-0.01%	-1.96%	-0.22%	-3.66%	4.01%	12
22	-10	10/28/2009	5.30	46.85	1042.63	-0.78%	-1.12%	-1.95%	-1.62%	-0.94%	-1.62%	-0.94%	21
23	-11	10/27/2009	5.36	47.22	1063.41	-1.17%	-2.19%	-0.33%					22
24	-12	10/26/2009	5.48	47.78	1066.95	-1.44%	-4.53%	-1.17%					23
25	-13	10/23/2009	5.74	48.48	1079.60	0.50%	-1.37%	-1.22%					24
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27	-15	10/21/2009	5.63	48.14	1081.40	-1.07%	-3.60%	-0.89%					26
27	-16	10/20/2009	5.84	48.66	1091.06	0.56%	0.52%	-0.62%					27
29	-17	10/19/2009	5.81	48.39	1097.91	0.21%	3.38%	0.94%					28
30	-18	10/16/2009	5.62	48.29	1087.68	0.77%	-1.23%	-0.81%					29
31	-19	10/15/2009	5.69	47.92	1096.56	0.23%	-2.57%	0.42%					30
32	-20	10/14/2009	5.84	47.81	1092.02	2.55%	2.46%	1.75%					31
33	-21	10/13/2009	5.70	46.62	1073.19	-0.72%	0.00%	-0.28%					32
34	-22	10/12/2009	5.70	46.96	1076.19	-0.72%	0.88%	0.44%					33
35	-23	10/9/2009	5.65	47.30	1071.49	1.96%	1.99%	0.56%					34
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2. The meaning of cell colors: blue= labels, yellow = days before and after the event, red = event day, and gray = sample period of 239 days, and green = regression coefficients.
3. Hidden rows are at 3-10 and 14-21.

Table 4: CARs for 3com and HP at the Announcement Date
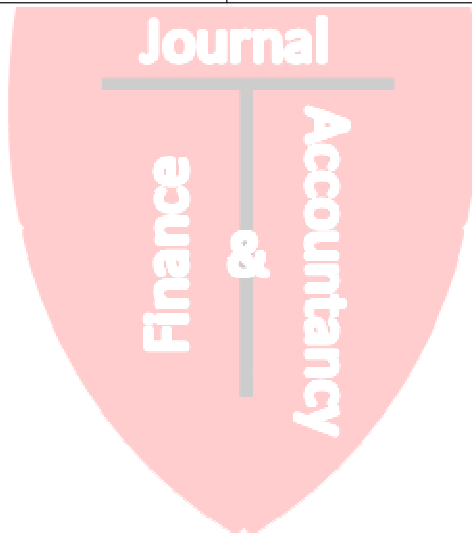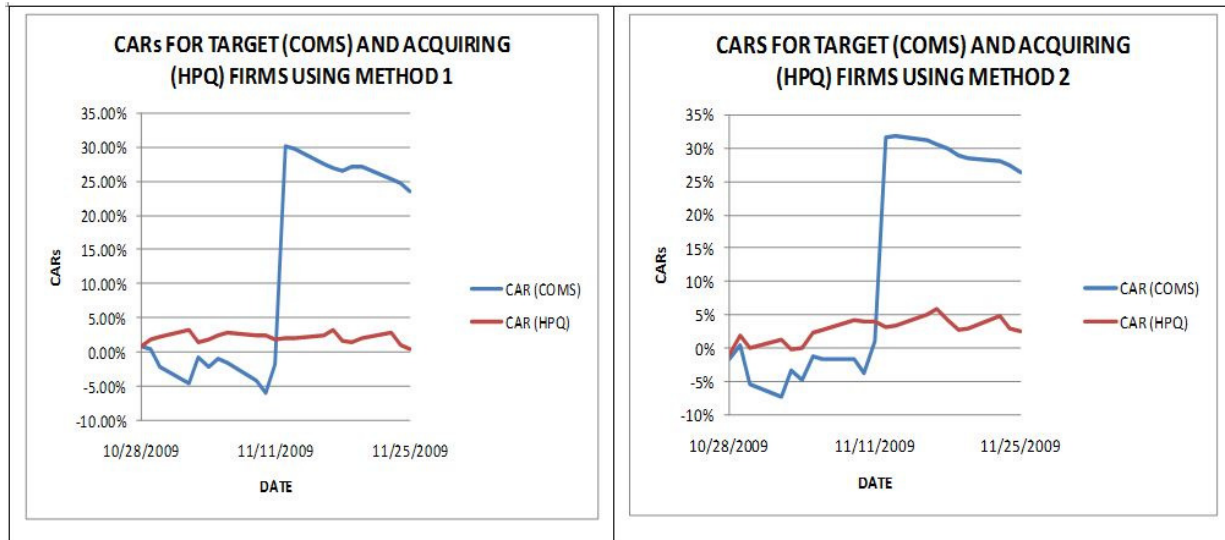
Appendix: How to Run a Regression with Excel 2010 Version

To run a regression on Excel 2010 version, follow the steps from the menu:

1. Data/Data Analysis/Select Regression option/Input firm's returns in Y-axis and input market's returns in X-axis, and run regression.

2. The next step should be to use the intercept and slope numbers (or to lock on them with F4 key) in the abnormal return generation.

3. Initially, after the "Data" selection if you do not see "Data Analysis" option, follow these steps:
   a. Click on "File" selection from the top menu,
   b. Choose "Excel Options" from the menu provided vertically on the left,
   c. Choose "Add-Ins", select "Analysis ToolPak," click on "Go" at the bottom of the window,
   d. Click on "Analysis ToolPak" box, and click on "OK" button and follow the steps above again.