Homework 3
Market Model, Abnormal Return, and Event Study

107B (5587) Investments　王傳鈞　0416047

第一題

- 使用 2017/10/25 到 2018/03/28 的每日報酬率資料，分別進行 T-Mobile、Sprint、Verizon、AT&T 與 S&P500 的迴歸分析，詳細結果請見表格一、表格二、表格三和表格四。

Regression Function: $r(\text{T-Mobile}) = \alpha(\text{T-Mobile}) + \beta(\text{T-Mobile}) \times r(\text{S\&P500}) + \varepsilon(\text{T-Mobile})$					
	Coefficients		Std Error		P-values
$\alpha(\text{T-Mobile})$	−0.00022078		0.001433847		0.87792618
$\beta(\text{T-Mobile})$	0.80289802		0.148426264		0.00000041
ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.00637475	0.00637475	29.26167991	0.00000041
Residual	104	0.02265674	0.00021785	–	–
Total	105	0.02903149	–	–	–
Regression Statistics					
Multiple R	R Square		Adj. R Square	Standard Error	Observations
0.46859428	0.21958060		0.21207657	0.01475985	106

Table 1 Regression Results between Daily Returns of T-Mobile and S&P500

Regression Function: $r(\text{Sprint}) = \alpha(\text{Sprint}) + \beta(\text{Sprint}) \times r(\text{S\&P500}) + \varepsilon(\text{Sprint})$					
	Coefficients		Std Error		P-values
$\alpha(\text{Sprint})$	−0.00319983		0.00240494		0.18625549
$\beta(\text{Sprint})$	0.44387202		0.24895023		0.07750783
ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.00194831	0.00194831	3.17899975	0.07750783
Residual	104	0.06373837	0.00061287	–	–
Total	105	0.06568668	–	–	–
Regression Statistics					
Multiple R	R Square		Adj. R Square	Standard Error	Observations
0.17222270	0.02966066		0.02033047	0.02475619	106

Table 2 Regression Results between Daily Returns of Sprint and S&P500

Regression Function: $r(\text{Verizon}) = \alpha(\text{Verizon}) + \beta(\text{Verizon}) \times r(\text{S\&P500}) + \varepsilon(\text{Verizon})$					
	Coefficients		Std Error		P-values
$\alpha(\text{Verizon})$	−0.00013098		0.00102146		0.89821849
$\beta(\text{Verizon})$	0.77355789		0.10573810		≈0
ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.00591736	0.00591736	53.52080175	≈0
Residual	104	0.01149844	0.00011056	–	–
Total	105	0.01741580	–	–	–
Regression Statistics					
Multiple R	R Square		Adj. R Square	Standard Error	Observations
0.58289771	0.33976974		0.33342137	0.01051484	106

Table 3 Regression Results between Daily Returns of Verizon and S&P500

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Regression Function: $r(\text{AT\&T}) = \alpha(\text{AT\&T}) + \beta(\text{AT\&T}) \times r(\text{S\&P500}) + \varepsilon(\text{AT\&T})$			
	Coefficients	Std Error	P-values
$\alpha(\text{AT\&T})$	0.00027547	0.00115365	0.81174701
$\beta(\text{AT\&T})$	0.73580947	0.11942155	0.00000001
ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.00535394	0.00535394	37.96342217	0.00000001
Residual	104	0.01466700	0.00014103	–	–
Total	105	0.02002094	–	–	–
Regression Statistics				
Multiple R	R Square	Adj. R Square	Standard Error	Observations
0.51712371	0.26741693	0.26037286	0.01187556	106

Table 4 Regression Results between Daily Returns of AT&T and S&P500

第二題

- 利用上面每一檔股票的α和β、S&P500 每日報酬率資料，以及 market model 公式：$\alpha(\text{asset}) + \beta(\text{asset}) \times r(\text{S\&P500})$，我們可以得到每一檔股票基於 market model 的每日應有報酬率。將股票的實際每日報酬率扣掉每日應有報酬率之後，就能獲得每日異常報酬率，詳細結果請見表格五。

Days Relative to Announcement	T-Mobile	Sprint	Verizon	AT&T
-20	-0.80%	0.12%	-1.43%	-0.79%
-19	-0.51%	0.70%	0.36%	0.07%
-18	-1.04%	2.03%	-0.24%	-0.19%
-17	-0.64%	1.82%	0.02%	0.56%
-16	-0.43%	2.19%	0.13%	0.19%
-15	1.51%	0.91%	0.13%	0.17%
-14	-0.09%	-0.02%	-0.18%	-0.16%
-13	4.35%	16.70%	1.60%	0.56%
-12	0.13%	0.23%	-0.99%	-1.18%
-11	-0.48%	-2.05%	-0.29%	-0.89%
-10	-1.44%	-1.25%	0.07%	0.13%
-9	0.66%	1.17%	0.92%	0.80%

-8	-0.40%	1.56%	0.14%	-1.60%
-7	-0.24%	1.12%	-0.52%	-0.51%
-6	1.04%	-0.09%	0.07%	-0.71%
-5	0.45%	1.37%	-0.42%	0.17%
-4	-1.25%	-1.68%	1.60%	0.60%
-3	1.56%	1.42%	3.12%	1.27%
-2	2.03%	2.10%	0.74%	0.41%
-1	-0.55%	-0.48%	-1.47%	-6.76%
0 (2018/04/27)	0.59%	8.60%	3.56%	-0.29%
+1	-5.54%	-13.01%	-3.66%	-0.45%
+2	-1.97%	-3.18%	-1.26%	-0.70%
+3	-3.54%	-3.97%	-1.62%	-0.97%
+4	-1.64%	1.19%	0.38%	-0.24%
+5	1.39%	1.09%	-0.25%	-0.34%
+6	-1.51%	-0.59%	-1.21%	-0.59%
+7	-1.65%	-1.39%	-1.45%	-1.07%
+8	0.58%	0.47%	-2.10%	-1.69%
+9	0.21%	-0.10%	1.06%	0.81%
+10	-0.92%	-0.14%	2.89%	1.13%
+11	0.08%	-0.11%	-0.32%	-0.40%
+12	0.41%	0.43%	-0.90%	0.17%
+13	-0.02%	-1.03%	-0.15%	0.33%
+14	0.36%	0.75%	0.06%	-1.11%
+15	0.67%	0.83%	-0.01%	0.54%
+16	-0.11%	0.97%	0.89%	1.11%
+17	0.26%	0.85%	1.04%	-0.29%
+18	-0.52%	-0.60%	-0.69%	-0.57%
+19	0.11%	0.80%	0.27%	1.51%
+20	-0.47%	0.23%	-0.05%	-0.68%

Table 5 Abnormal Daily Returns within ±20 Days Relative to Announcement

第三題

- 從發布日前 20 天開始計算累積異常報酬率的詳細結果請見表格六和圖一。

Days Relative to Announcement	T-Mobile	Sprint	Verizon	AT&T
−20	−0.80%	0.12%	−1.43%	−0.79%
−19	−1.32%	0.82%	−1.07%	−0.71%
−18	−2.36%	2.85%	−1.31%	−0.90%
−17	−2.99%	4.67%	−1.28%	−0.34%
−16	−3.42%	6.86%	−1.16%	−0.15%
−15	−1.91%	7.76%	−1.02%	0.03%
−14	−2.00%	7.74%	−1.20%	−0.13%
−13	2.35%	24.44%	0.39%	0.43%
−12	2.48%	24.67%	−0.60%	−0.75%
−11	2.00%	22.63%	−0.88%	−1.64%
−10	0.56%	21.37%	−0.82%	−1.52%
−9	1.22%	22.54%	0.10%	−0.72%
−8	0.82%	24.10%	0.24%	−2.31%
−7	0.58%	25.22%	−0.28%	−2.83%
−6	1.62%	25.13%	−0.22%	−3.54%
−5	2.07%	26.50%	−0.64%	−3.37%
−4	0.82%	24.82%	0.96%	−2.77%
−3	2.39%	26.24%	4.08%	−1.50%
−2	4.42%	28.34%	4.82%	−1.09%
−1	3.87%	27.87%	3.35%	−7.85%
0 (2018/04/27)	4.46%	36.47%	6.91%	−8.14%
+1	−1.08%	23.46%	3.25%	−8.59%
+2	−3.05%	20.28%	1.99%	−9.30%
+3	−6.59%	16.31%	0.37%	−10.27%
+4	−8.23%	17.50%	0.75%	−10.51%
+5	−6.84%	18.60%	0.50%	−10.85%
+6	−8.35%	18.01%	−0.71%	−11.44%
+7	−10.00%	16.62%	−2.16%	−12.51%
+8	−9.43%	17.09%	−4.26%	−14.20%
+9	−9.22%	17.00%	−3.20%	−13.39%
+10	−10.14%	16.86%	−0.31%	−12.26%

+11	−10.07%	16.75%	−0.63%	−12.66%
+12	−9.65%	17.18%	−1.54%	−12.49%
+13	−9.67%	16.15%	−1.69%	−12.16%
+14	−9.32%	16.90%	−1.63%	−13.27%
+15	−8.64%	17.73%	−1.64%	−12.73%
+16	−8.76%	18.70%	−0.76%	−11.62%
+17	−8.50%	19.55%	0.28%	−11.91%
+18	−9.02%	18.95%	−0.41%	−12.48%
+19	−8.91%	19.75%	−0.13%	−10.97%
+20	−9.38%	19.98%	−0.18%	−11.65%

Table 6 Cumulative Abnormal Returns within ±20 Days Relative to Announcement
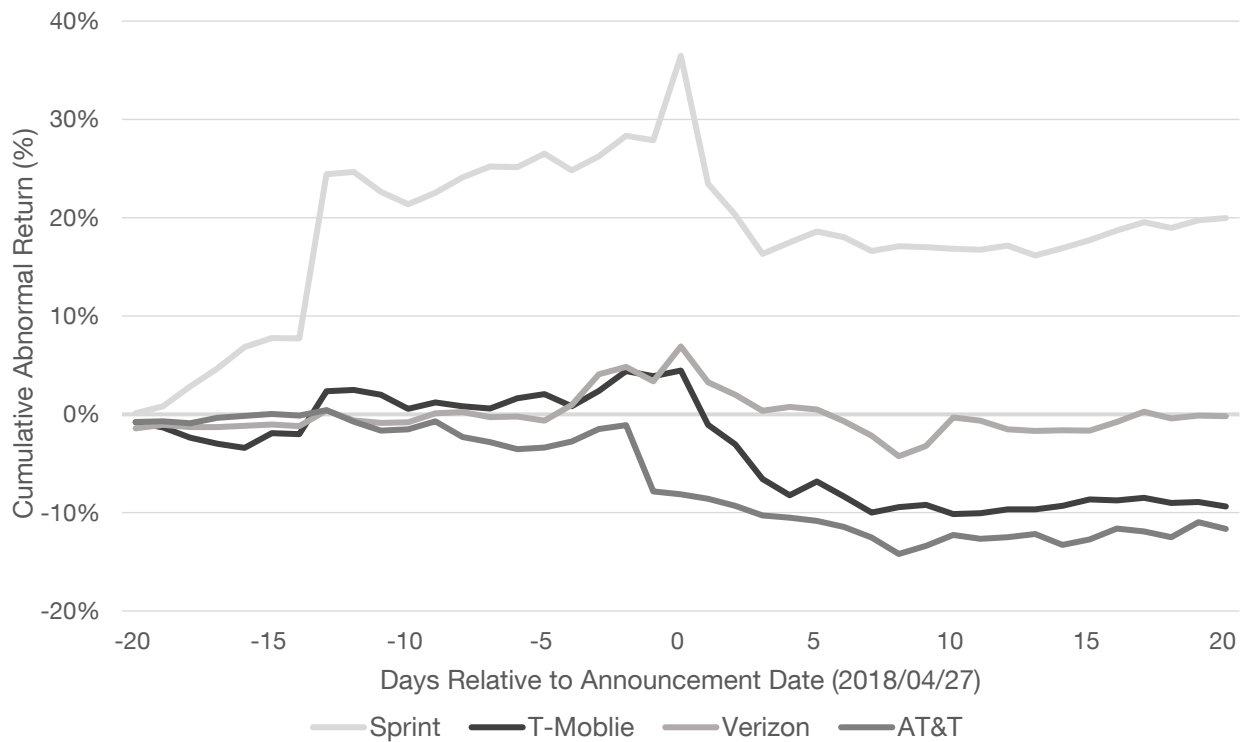

Figure 1 Plot to Cumulative Abnormal Returns of Table 6

第四題

(1) 對於 Sprint：首先，這個併購案顯然對於被併購公司的股價有顯著的正面影響，在消息公布日帶來+8.6%的漲幅；另外，也可以發現早在消息公布的前 20 日開始，被併購公司的股價就有相當可觀的累積異常報酬率，尤其是消息公布的前 13 日的+16.7%漲幅，我們可以合理懷疑這樣子的現象可能來自於這項併購案有消息洩漏的可能，可能發生了內線交易。

(2) 對於 T-Mobile：首先，這個併購案顯然被市場投資者認為是太貴的交易，可能減損併購方公司未來的預期獲利，因此相較於消息宣布日前累積異常報酬率只在零軸附近移動，在消息宣布日之後的持續減少，甚至少於-10%。

(3) 對於 AT&T 和 Verizon：雖然這項併購案的交易雙方都不是 AT&T，但是市場投資者顯然認為這個消息仍對 AT&T 帶來負面的影響，相較於 Verizon 的累積異常報酬率並沒有因這個消息有太大的波動，AT&T 的累積異常報酬率顯然在消息公布之後顯著的下降，甚至超越的 T-Mobile 來到-11%。