QF604 Econometrics of Financial Markets (AY2021/2022)

Research Project: Cash Dividend Declaration Event Study – P&G 3Q2020

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Contents

1. Introduction

The dividend policy decision for a company is a very important one as it impacts the future performance of the company. The management goal is to maximize shareholders value, in other words, to maximize the value of the company as measured by the price of common stock. This goal can be achieved by giving the shareholders a fair payment on their investments.

The impact of dividend policy on shareholders' value however is still a highly debated topic. The objective of the management should be to determine the optimal dividend policy that will increase the value of the firm.

The theory of "Dividend Signaling" argues that the announcement of dividend increase generates abnormal positive returns, and the announcement of dividend decrease generates abnormal negative returns. This is because dividend increases are an indication of positive future results for a company, and only managers overseeing positive potential will provide such a signal. Hence, dividends can signal information to investors about the firms' future performance. Many researchers analyze dividend policy under the assumption of asymmetrical information between managers and investors.

The purpose of this research is to observe whether stock price reacts to the announcement of dividends in Procter and Gamble (P&G) for the dividend announced on 14th July 2020 for 3Q2020. The analysis will investigate both abnormal return (AR) and cumulative abnormal return (CAR).

2. Dividend History

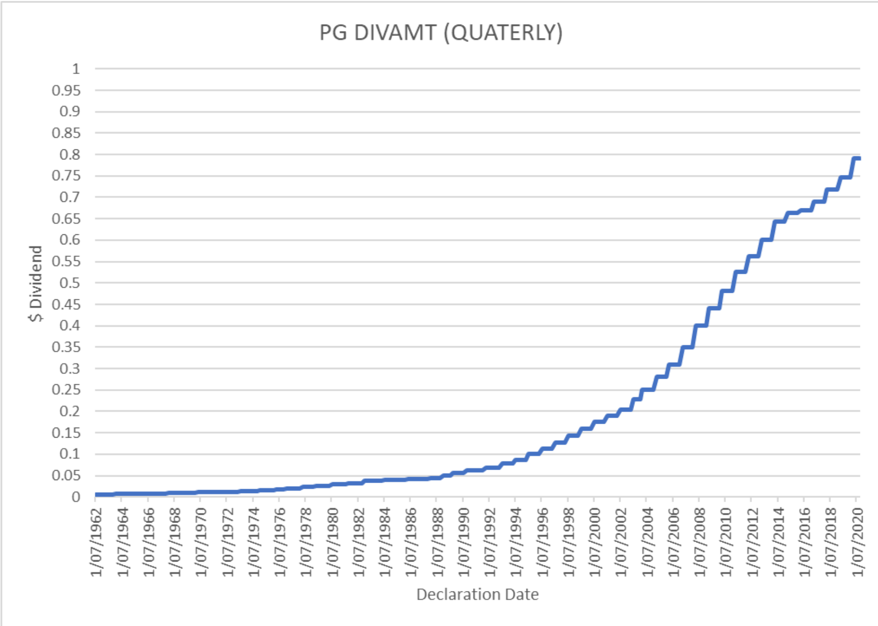

Fig 1: P&G $ Dividends Per Share (1962 – 2020)

P&G is a company that specialises in consumer staple products like home care, baby care and personal care. Because of this, it is a long-time staple holding for many dividend investors.

Fig 2: P&G Returning Value to Shareholders
Source: https://www.pginvestor.com/stock-information/splits-dividend-history/

The company has issued dividends for over 131 years since it first went public in 1891, with 65 years of dividend increase since 1957.

Compound Annual Growth Rate				
Year	**1**	**3**	**5**	**7**
Growth Rate	0.071	0.052	0.041	0.041

Fig 3: Compound Annual Dividend Growth Rate (2017 – 2021)

Fig 4: P&G Earnings and Dividends Per Share (2017 – 2021)

Though not explicitly mentioned the company about having a specific dividend policy, it can be inferred that it seeks to have a Stable Dividend Policy by analysing its history:

1. the company's policy is to pay dividends each quarter
2. increase of dividend rate per share annually
3. not allow the dividend payout ratio to rise too high

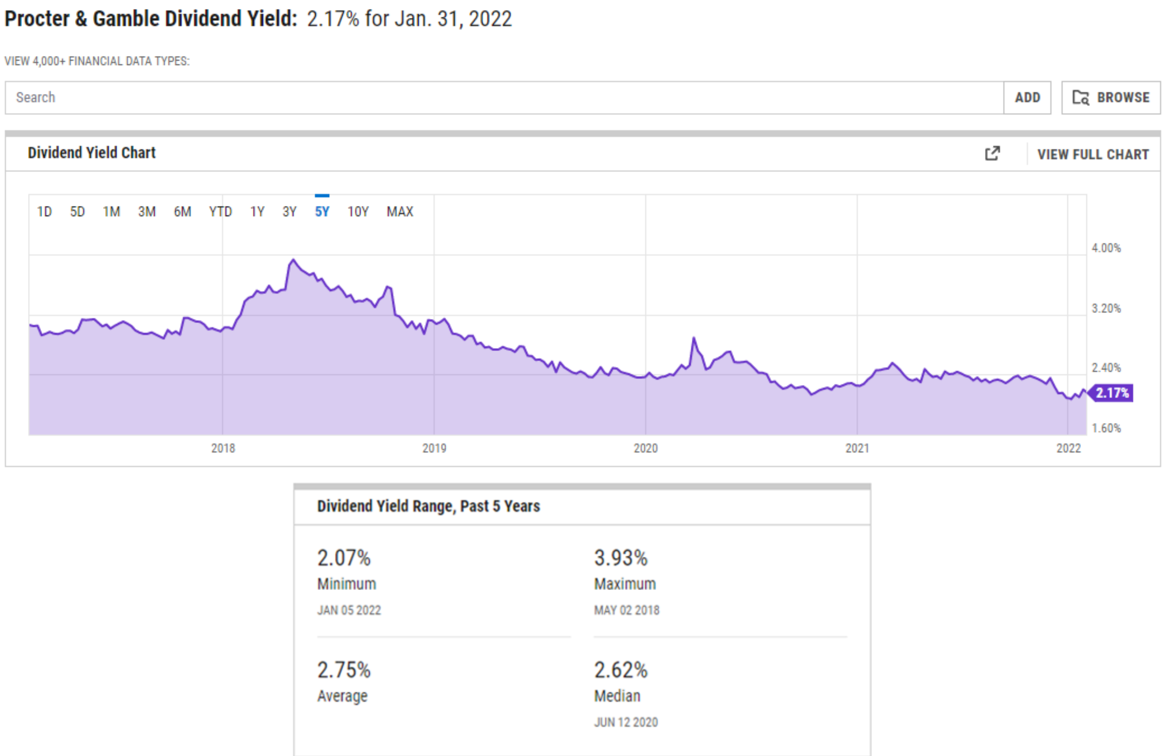

Fig 5: P&G Dividend Yield (2017 – 2022)
Source: https://ycharts.com/companies/PG/dividend_yield

Based on the past 5 years data from 2017 to 2021, the dividend yield range is relatively stable ranging between 2.07% to 3.93%, with a median of 2.62%.

3. Methodology Framework

The data for the research is taken from WRDS. The share price data is collected for a total of 136 days.

Firstly, the estimation window is 116 days long from (T_{-126}) to (T_{-10}).

Next, the event window is 21 days long – 10 days before dividend declaration (T_{-10}), the event being the dividend declaration date (T_0) and 10 days after the declaration date (T_{+10}).

The dividend declaration date (T_0) is the announcement date of the board meeting recommending the dividends for the company. This study assumes that the information about dividend announcements is known to the market on the event day.

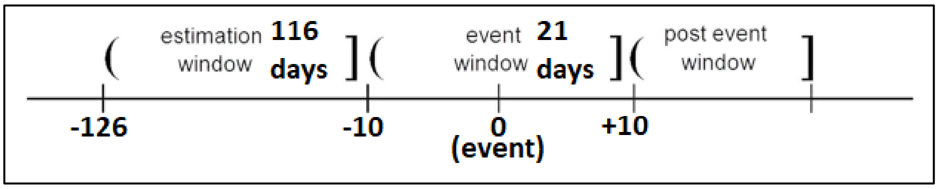

Fig 6: Event Sampling Illustration

<table>
<tr><th>T</th><th>DATE</th><th>Window</th></tr>
<tr><td>-126
…
-11</td><td>13/01/2020
…
26/06/2020</td><td>Estimation Window (116 days)</td></tr>
<tr><td>-10</td><td>29/06/2020</td><td rowspan="10">Event Window (10 days)</td></tr>
<tr><td>-9</td><td>30/06/2020</td></tr>
<tr><td>-8</td><td>1/07/2020</td></tr>
<tr><td>-7</td><td>2/07/2020</td></tr>
<tr><td>-6</td><td>6/07/2020</td></tr>
<tr><td>-5</td><td>7/07/2020</td></tr>
<tr><td>-4</td><td>8/07/2020</td></tr>
<tr><td>-3</td><td>9/07/2020</td></tr>
<tr><td>-2</td><td>10/07/2020</td></tr>
<tr><td>-1</td><td>13/07/2020</td></tr>
<tr><td>0</td><td>14/07/2020</td><td>Event (1 day)</td></tr>
<tr><td>1</td><td>15/07/2020</td><td rowspan="10">Event Window (10 days)</td></tr>
<tr><td>2</td><td>16/07/2020</td></tr>
<tr><td>3</td><td>17/07/2020</td></tr>
<tr><td>4</td><td>20/07/2020</td></tr>
<tr><td>5</td><td>21/07/2020</td></tr>
<tr><td>6</td><td>22/07/2020</td></tr>
<tr><td>7</td><td>23/07/2020</td></tr>
<tr><td>8</td><td>24/07/2020</td></tr>
<tr><td>9</td><td>27/07/2020</td></tr>
<tr><td>10</td><td>28/07/2020</td></tr>
</table>

Table 1: Event Sampling Framework

In this research, four different benchmark models will be used to determine the expected return:

1. Market Model
2. Capital Asset Pricing Model (CAPM)
3. Market Adjusted Excess Return Model
4. Mean Adjusted Excess Return Model

These models mentioned above are characterized as statistical expected return models which use several different statistical historic data (the estimation window) to compute the return to be expected for the stock during the event window.

The table below sums up the most important differences between the different models for the calculation of normal return:

Benchmark Models	Advantage	Disadvantage
Market Model	• Precise for stocks with strong index correlation • Well documented • Easy to use • Consider market movements in the event window	• Unprecise for stocks with weak index correlation • Does not consider company-specific differences
Market Adjusted Excess Return Model	• Requires little knowledge to use • Saves time because of simplified calculations • Consider market movements in the event window	• Overly simplified model • Does not consider company-specific differences
Mean Adjusted Excess Return Model	• Requires little knowledge to use • Saves time because of simplified calculations	• Overly simplified model • Does not consider company-specific differences • Does not consider market movements in the event window

Table 2: Benchmark Models

4. Empirical Study

4.1. Market Model

T	DATE	RET	VWRETD	E(R)	AR	CAR	Squares of Residuals	t-statistic (AR)	z-score (CAR)
-126	13/01/2020	0.00734	0.007077	0.005168543	0.002171457	-	4.71523E-06	-	-
…	…	…	…	…	…	…	…	…	…
-11	26/06/2020	-0.022563	-0.022878	-0.016554983	-0.006008017	-	3.60963E-05	-	-
-10	29/06/2020	0.021088	0.014497	0.010549567	0.010538433	0.010538433	-	0.551219219	0.551219219
-9	30/06/2020	0.016233	0.014671	0.010675753	0.005557247	0.016095681	-	0.29067524	0.595309281
-8	1/07/2020	0.003429	0.004033	0.002961018	0.000467982	0.016563663	-	0.024478085	0.500200422
-7	2/07/2020	0.007501	0.00502	0.003676796	0.003824204	0.020387867	-	0.200027354	0.533199949
-6	6/07/2020	0.006205	0.014884	0.010830221	-0.004625221	0.015762646	-	-0.24192504	0.368716366
-5	7/07/2020	0.004851	-0.010263	-0.007406518	0.012257518	0.028020163	-	0.641136991	0.598333532
-4	8/07/2020	0.005482	0.008437	0.006154822	-0.000672822	0.027347341	-	-0.035192388	0.540647738
-3	9/07/2020	-0.003336	-0.005703	-0.004099581	0.000763581	0.028110922	-	0.039939588	0.519850427
-2	10/07/2020	0.011512	0.010387	0.007568973	0.003943027	0.032053949	-	0.206242458	0.558867169
-1	13/07/2020	0.001291	-0.011212	-0.008094738	0.009385738	0.041439687	-	0.490926768	0.685432624
0	14/07/2020	0.008384	0.013289	0.009673519	-0.001289519	0.040150168	-	-0.067449071	0.633197705
1	15/07/2020	-0.004717	0.011799	0.008592963	-0.013309963	0.026840205	-	-0.696185777	0.405269124
2	16/07/2020	0.002088	-0.004003	-0.002866732	0.004954732	0.031794938	-	0.25916031	0.461248117
3	17/07/2020	0.006973	0.003636	0.002673111	0.004299889	0.036094826	-	0.224908309	0.504579081
4	20/07/2020	-0.003104	0.008567	0.006249099	-0.009353099	0.026741727	-	-0.489219592	0.361153749
5	21/07/2020	-0.001357	0.002298	0.001702787	-0.003059787	0.02368194	-	-0.160044024	0.309674608
6	22/07/2020	0.008555	0.005138	0.00376237	0.00479263	0.02847457	-	0.250681459	0.361227682
7	23/07/2020	0.006427	-0.010909	-0.007875	0.014302	0.042776571	-	0.748074912	0.527373154
8	24/07/2020	-0.001585	-0.006986	-0.00503002	0.00344502	0.04622159	-	0.180193874	0.554646645
9	27/07/2020	0.002858	0.009009	0.00656964	-0.00371164	0.042509951	-	-0.194139602	0.497191744
10	28/07/2020	0.01235	-0.006925	-0.004985782	0.017335782	0.059845733	-	0.906758736	0.683080437

Table 3: Market Model Statistics I

Market Model	
Intercept (α)	3.62648E-05
Slope (β)	0.725205352
Residual Sum of Squares (σ^2)	0.000365513
Standard Error of Regression (σ)	0.019118407

Table 4: Market Model Statistics II

Steps	Output	Description	Formula	Excel Function/Example
1	Regression Slope β	Calculate the estimation window slope	$\widehat{\beta_i} = \frac{cov(r_i, r_m)}{\sigma_m^2}$	At T = -126 to -11 SLOPE(RET, VWRETD) = 0.7252
2	Regression Intercept α	Calculate the estimation window intercept	$\widehat{\alpha_i} = \overline{r_i} - \widehat{\beta_i}\overline{r_m}$	At T = -126 to -11 INTERCEPT(RET, VWRETD) = 3.626E-05
3	Expected Return E(R)	Calculate the expected return for each period T	$E(r)_{i,t} = \alpha + \beta * r_{m,t}$	At T = 10 3.626E-05 + 0.7252 x (-0.00692) = -0.00498
4	Abnormal Return AR	Calculate the abnormal return for each period T	$AR_{i,t} = r_{i,t} - E(r)_{i,t}$	At T = 10 0.01235 - (-0.00498) = 0.01733
5	Cumulative Abnormal Return CAR	Calculate the cumulative abnormal return for each period T	$CAR_{i(t1,tk)} \sum_{\tau=\tau_1}^{\tau_k} AR_{i,t}$	At T = 10 0.01053 + … + 0.01733 = 0.05984
6	Squares of Residuals	Calculate the squares of residuals for each period T during estimation window	$Squares\ of\ Residuals_{i,t} = AR_{i,t}^2$	At T = -11 $(-0.00600)^2$ = 3.609E-05
7	Residual Sum of Squares σ^2	Calculate the estimation window residual sum of squares	$\sigma_i^2 = \frac{1}{116-2} \sum_{t=-126}^{-11} Squares\ of\ Residuals_{i,t}$	At T = -126 to -11 (4.715E-06 + … + 3.609E-05)/114 = 0.00036
8	t–statistic (AR)	Calculate the event window t-statistic for abnormal return	$\mathrm{t-statistic\ (AR)} = \frac{AR_{i,t}}{\sigma_i}$	At T = 10 $0.01733/(0.00036)^{1/2}$ = 0.90675
9	z-score (CAR)	Calculate the event window z-score for cumulative abnormal return	$\mathrm{t-statistic\ (CAR)} = \frac{CAR_{i(\tau1,\tau k)}}{\sqrt{(\tau_k - \tau_1 + 1)\sigma_i^2}}$	At T = 10 $0.05984/(21 \times 0.00036)^{1/2}$ = 0.68308
where τ_1 is the start of Event Window and τ_{21} is the end of Event Window				

Table 5: Market Model Process

4.2. CAPM Model

T	DATE	RET	VWRETD	Rf	E(R)	AR	CAR	Squares of Residuals	t-statistic (AR)	z-score (CAR)
-126	13/01/2020	0.00734	0.007077	0.0154	0.009364116	-0.002024116	-	4.09704E-06	-	-
…	…	…	…	…	…	…	…	…	…	…
-11	26/06/2020	-0.022563	-0.022878	0.0014	-0.016206536	-0.006356464	-	4.04046E-05	-	-
-10	29/06/2020	0.021088	0.014497	0.0014	0.010898014	0.010189986	0.010189986	-	0.530531569	0.530531569
-9	30/06/2020	0.016233	0.014671	0.0016	0.011079159	0.005153841	0.015343826	-	0.268329653	0.564880187
-8	1/07/2020	0.003429	0.004033	0.0014	0.003309466	0.000119534	0.015463361	-	0.006223436	0.464815844
-7	2/07/2020	0.007501	0.00502	0.0014	0.004025243	0.003475757	0.018939117	-	0.180961849	0.493023254
-6	6/07/2020	0.006205	0.014884	0.0015	0.011206148	-0.005001148	0.013937969	-	-0.260379873	0.324527985
-5	7/07/2020	0.004851	-0.010263	0.0015	-0.007030591	0.011881591	0.025819559	-	0.618603322	0.548795912
-4	8/07/2020	0.005482	0.008437	0.0015	0.00653075	-0.00104875	0.02477081	-	-0.054602112	0.487448627
-3	9/07/2020	-0.003336	-0.005703	0.0013	-0.003778613	0.000442613	0.025213423	-	0.023044215	0.464113799
-2	10/07/2020	0.011512	0.010387	0.0013	0.007889941	0.003622059	0.028835482	-	0.188578936	0.500430332
-1	13/07/2020	0.001291	-0.011212	0.0014	-0.00774629	0.00903729	0.037872772	-	0.470517607	0.623540629
0	14/07/2020	0.008384	0.013289	0.0015	0.010049446	-0.001665446	0.036207326	-	-0.086709802	0.568378674
1	15/07/2020	-0.004717	0.011799	0.0016	0.008996369	-0.013713369	0.022493957	-	-0.713973085	0.338074874
2	16/07/2020	0.002088	-0.004003	0.0011	-0.002600723	0.004688723	0.027182679	-	0.244113745	0.392516803
3	17/07/2020	0.006973	0.003636	0.0011	0.002939121	0.004033879	0.031216559	-	0.210019953	0.434368849
4	20/07/2020	-0.003104	0.008567	0.0013	0.006570067	-0.009674067	0.021542491	-	-0.503670796	0.289592936
5	21/07/2020	-0.001357	0.002298	0.0013	0.002023755	-0.003380755	0.018161736	-	-0.17601568	0.236393235
6	22/07/2020	0.008555	0.005138	0.0013	0.004083338	0.004471662	0.022633398	-	0.232812675	0.285800491
7	23/07/2020	0.006427	-0.010909	0.0012	-0.007581512	0.014008512	0.03664191	-	0.729339374	0.449655092
8	24/07/2020	-0.001585	-0.006986	0.0011	-0.00476401	0.00317901	0.03982092	-	0.165512053	0.475633197
9	27/07/2020	0.002858	0.009009	0.0011	0.006835649	-0.003977649	0.035843271	-	-0.207092388	0.41728263
10	28/07/2020	0.01235	-0.006925	0.0011	-0.004719773	0.017069773	0.052913044	-	0.888720934	0.601160956

Table 6: CAPM Model Statistics I

CAPM Model	
Beta (β)	0.725205352
Residual Sum of Squares (σ^2)	0.000368914
Standard Error of Regression (σ)	0.019207124

Table 7: CAPM Model Statistics II

Steps	Output	Description	Formula	Excel Function/Example
1	Beta β	Calculate the estimation window beta	$\widehat{\beta_i} = \frac{cov(r_i, r_m)}{\sigma_m^2}$	At T = -126 to -11 SLOPE(RET, VWRETD) = 0.7252
2	Risk-Free Rate Rf	Calculate the estimation window risk-free rate	$3\ Month\ Treasury\ Bill\ Rate\ (Daily)$	-
3	Expected Return E(R)	Calculate the expected return for each period T	$E(r)_{i,t} = r_{f,t} + \beta * (r_{m,t} - r_{f,t})$	At T = 10 0.0011 +0.7252 x (-0.00692 - 0.0011) = -0.00471
4	Abnormal Return AR	Calculate the abnormal return for each period T	$AR_{i,t} = r_{i,t} - E(r)_{i,t}$	At T = 10 0.01235 - (-0.00471) = 0.01706
5	Cumulative Abnormal Return CAR	Calculate the cumulative abnormal return for each period T	$CAR_{i(t1,tk)} \sum_{\tau=\tau_1}^{\tau_k} AR_{i,t}$	At T = 10 0.01018 + … + 0.01706 = 0.05291
6	Squares of Residuals	Calculate the squares of residuals for each period T during estimation window	$Squares\ of\ Residuals_{i,t} = AR_{i,t}^2$	At T = -11 $(-0.00635)^2$ = 4.0404E-05
7	Residual Sum of Squares σ^2	Calculate the estimation window residual sum of squares	$\sigma_i^2 = \frac{1}{116-2} \sum_{t=-126}^{-11} Squares\ of\ Residuals_{i,t}$	At T = -126 to -11 (4.0970E-06 + … + 4.0404E-05)/114 = 0.00036
8	t–statistic (AR)	Calculate the event window t-statistic for abnormal return	$\mathrm{t-statistic\ (AR)} = \frac{AR_{i,t}}{\sigma_i}$	At T = 10 $0.01706/(0.00036)^{1/2}$ = 0.88872
9	z-score (CAR)	Calculate the event window z-score for cumulative abnormal return	$\mathrm{t-statistic\ (CAR)} = \frac{CAR_{i(\tau1,\tau k)}}{\sqrt{(\tau_k - \tau_1 + 1)\sigma_i^2}}$	At T = 10 $0.05291/(21\ \mathrm{x}\ 0.00036)^{1/2}$ = 0.60116
where τ_1 is the start of Event Window and τ_{21} is the end of Event Window				

Table 8: CAPM Model Process

4.3. Market Adjusted Excess Return Model

T	DATE	RET	VWRETD	E(R)	AR	CAR	Squares of Residuals	t-statistic (AR)	z-score (CAR)
-126	13/01/2020	0.00734	0.007077	0.007077	0.000263	-	6.9169E-08	-	-
…	…	…	…	…	…	…	…	…	…
-11	26/06/2020	-0.022563	-0.022878	-0.022878	0.000315	-	9.9225E-08	-	-
-10	29/06/2020	0.021088	0.014497	0.014497	0.006591	0.006591	-	0.317364967	0.317364967
-9	30/06/2020	0.016233	0.014671	0.014671	0.001562	0.008153	-	0.075212271	0.277594027
-8	1/07/2020	0.003429	0.004033	0.004033	-0.000604	0.007549	-	-0.029083362	0.209863287
-7	2/07/2020	0.007501	0.00502	0.00502	0.002481	0.01003	-	0.119463281	0.241478578
-6	6/07/2020	0.006205	0.014884	0.014884	-0.008679	0.001351	-	-0.417904802	0.029092298
-5	7/07/2020	0.004851	-0.010263	-0.010263	0.015114	0.016465	-	0.727758172	0.323663542
-4	8/07/2020	0.005482	0.008437	0.008437	-0.002955	0.01351	-	-0.142286979	0.24587479
-3	9/07/2020	-0.003336	-0.005703	-0.005703	0.002367	0.015877	-	0.113974037	0.270290713
-2	10/07/2020	0.011512	0.010387	0.010387	0.001125	0.017002	-	0.05417017	0.272889252
-1	13/07/2020	0.001291	-0.011212	-0.011212	0.012503	0.029505	-	0.602035228	0.44926573
0	14/07/2020	0.008384	0.013289	0.013289	-0.004905	0.0246	-	-0.23618194	0.357146532
1	15/07/2020	-0.004717	0.011799	0.011799	-0.016516	0.008084	-	-0.795266242	0.112368182
2	16/07/2020	0.002088	-0.004003	-0.004003	0.006091	0.014175	-	0.293289336	0.189303684
3	17/07/2020	0.006973	0.003636	0.003636	0.003337	0.017512	-	0.160680761	0.225361334
4	20/07/2020	-0.003104	0.008567	0.008567	-0.011671	0.005841	-	-0.561973378	0.07261883
5	21/07/2020	-0.001357	0.002298	0.002298	-0.003655	0.002186	-	-0.175992862	0.026314665
6	22/07/2020	0.008555	0.005138	0.005138	0.003417	0.005603	-	0.164532862	0.065434055
7	23/07/2020	0.006427	-0.010909	-0.010909	0.017336	0.022939	-	0.834750276	0.260342998
8	24/07/2020	-0.001585	-0.006986	-0.006986	0.005401	0.02834	-	0.260064966	0.313062262
9	27/07/2020	0.002858	0.009009	0.009009	-0.006151	0.022189	-	-0.296178412	0.238907842
10	28/07/2020	0.01235	-0.006925	-0.006925	0.019275	0.041464	-	0.928115573	0.435681603

Table 9: Market Adjusted Excess Return Model Statistics I

Market Adjusted Excess Return Model	
Residual Sum of Squares (σ^2)	0.000431305
Standard Error of Regression (σ)	0.020767888

Table 10: Market Adjusted Excess Return Model Statistics II

Steps	Output	Description	Formula	Excel Function/Example
1	Expected Return E(R)	Calculate the expected return for each period T	$E(r)_{i,t} = r_{m,t}$	At T = 10 VWRETD = -0.00692
2	Abnormal Return AR	Calculate the abnormal return for each period T	$AR_{i,t} = r_{i,t} - E(r)_{i,t}$	At T = 10 0.01235 - (-0.00692) = 0.01927
3	Cumulative Abnormal Return CAR	Calculate the cumulative abnormal return for each period T	$CAR_{i(t1,tk)} \sum_{\tau=\tau_1}^{\tau_k} AR_{i,t}$	At T = 10 0.00659 + … + 0.01927 = 0.04146
4	Squares of Residuals	Calculate the squares of residuals for each period T during estimation window	$Squares\ of\ Residuals_{i,t} = AR_{i,t}^2$	At T = -11 $(0.000315)^2$ = 9.922E-08
5	Residual Sum of Squares σ^2	Calculate the estimation window residual sum of squares	$\sigma_i^2 = \frac{1}{116-2} \sum_{t=-126}^{-11} Squares\ of\ Residuals_{i,t}$	At T = -126 to -11 (6.916E-08 + … + 9.922E-08)/114 = 0.00043
6	t–statistic (AR)	Calculate the event window t-statistic for abnormal return	$\mathrm{t-statistic\ (AR)} = \frac{AR_{i,t}}{\sigma_i}$	At T = 10 $0.01927/(0.00043)^{1/2}$ = 0.92811
7	z-score (CAR)	Calculate the event window z-score for cumulative abnormal return	$\mathrm{t-statistic\ (CAR)} = \frac{CAR_{i(\tau1,\tau k)}}{\sqrt{(\tau_k - \tau_1 + 1)\sigma_i^2}}$	At T = 10 $0.04146/(21\ \mathrm{x}\ 0.00043)^{1/2}$ = 0.43568
where τ_1 is the start of Event Window and τ_{21} is the end of Event Window				

Table 11: Market Adjusted Excess Return Model Process

4.4. Mean Adjusted Excess Return Model

T	DATE	RET	VWRETD	E(R)	AR	CAR	Squares of Residuals	t-statistic (AR)	z-score (CAR)
-126	13/01/2020	0.00734	0.007077	-0.000119629	0.007459629	-	5.56461E-05	-	-
…	…	…	…	…	…	…	…	…	…
-11	26/06/2020	-0.022563	-0.022878	-0.000119629	-0.022443371	-	0.000503705	-	-
-10	29/06/2020	0.021088	0.014497	-0.000119629	0.021207629	0.021207629	-	0.738950023	0.738950023
-9	30/06/2020	0.016233	0.014671	-0.000119629	0.016352629	0.037560259	-	0.569784375	0.925414968
-8	1/07/2020	0.003429	0.004033	-0.000119629	0.003548629	0.041108888	-	0.123646999	0.826985785
-7	2/07/2020	0.007501	0.00502	-0.000119629	0.007620629	0.048729517	-	0.265530113	0.848955755
-6	6/07/2020	0.006205	0.014884	-0.000119629	0.006324629	0.055054147	-	0.220372815	0.85788283
-5	7/07/2020	0.004851	-0.010263	-0.000119629	0.004970629	0.060024776	-	0.173194589	0.853842691
-4	8/07/2020	0.005482	0.008437	-0.000119629	0.005601629	0.065626405	-	0.195180897	0.86427617
-3	9/07/2020	-0.003336	-0.005703	-0.000119629	-0.003216371	0.062410034	-	-0.112069914	0.768833631
-2	10/07/2020	0.011512	0.010387	-0.000119629	0.011631629	0.074041664	-	0.405287768	0.859959222
-1	13/07/2020	0.001291	-0.011212	-0.000119629	0.001410629	0.075452293	-	0.049151395	0.831371986
0	14/07/2020	0.008384	0.013289	-0.000119629	0.008503629	0.083955922	-	0.296297006	0.882018996
1	15/07/2020	-0.004717	0.011799	-0.000119629	-0.004597371	0.079358552	-	-0.160188917	0.798226339
2	16/07/2020	0.002088	-0.004003	-0.000119629	0.002207629	0.081566181	-	0.076921739	0.788245312
3	17/07/2020	0.006973	0.003636	-0.000119629	0.007092629	0.08865881	-	0.247132695	0.825621179
4	20/07/2020	-0.003104	0.008567	-0.000119629	-0.002984371	0.08567444	-	-0.1039862	0.770776716
5	21/07/2020	-0.001357	0.002298	-0.000119629	-0.001237371	0.084437069	-	-0.043114442	0.735522735
6	22/07/2020	0.008555	0.005138	-0.000119629	0.008674629	0.093111698	-	0.302255261	0.786869534
7	23/07/2020	0.006427	-0.010909	-0.000119629	0.006546629	0.099658328	-	0.228108093	0.818465327
8	24/07/2020	-0.001585	-0.006986	-0.000119629	-0.001465371	0.098192957	-	-0.051058781	0.784921963
9	27/07/2020	0.002858	0.009009	-0.000119629	0.002977629	0.101170586	-	0.103751306	0.788246792
10	28/07/2020	0.01235	-0.006925	-0.000119629	0.012469629	0.113640216	-	0.4344867	0.864062873

Table 12: Mean Adjusted Excess Return Model Statistics I

Mean Adjusted Excess Return Model	
Expected Return (E(R))	-0.00011963
Residual Sum of Squares (σ^2)	0.000823672
Standard Error of Regression (σ)	0.02869968

Table 13: Mean Adjusted Excess Return Model Statistics II

Steps	Output	Description	Formula	Excel Function/Example
1	Expected Return E(R)	Calculate the estimation window expected return	$E(r)_{i,t} = \overline{r_i}$	At T = -126 to -11 AVERAGE(RET) = -0.00011
2	Abnormal Return AR	Calculate the abnormal return for each period T	$AR_{i,t} = r_{i,t} - E(r)_{i,t}$	At T = 10 0.01235 - (-0.00011) = 0.01246
3	Cumulative Abnormal Return CAR	Calculate the cumulative abnormal return for each period T	$CAR_{i(t1,tk)} \sum_{\tau=\tau_1}^{\tau_k} AR_{i,t}$	At T = 10 0.0212 + … + 0.01246 = 0.11364
4	Squares of Residuals	Calculate the squares of residuals for each period T during estimation window	$Squares\ of\ Residuals_{i,t} = AR_{i,t}^2$	At T = -11 $(-0.02244)^2$ = 0.0005
5	Residual Sum of Squares σ^2	Calculate the estimation window residual sum of squares	$\sigma_i^2 = \frac{1}{116-2} \sum_{t=-126}^{-11} Squares\ of\ Residuals_{i,t}$	At T = -126 to -11 (5.564E-05 + … + 0.0005)/114 = 0.00082
6	t–statistic (AR)	Calculate the event window t-statistic for abnormal return	$\text{t} - \text{statistic (AR)} = \frac{AR_{i,t}}{\sigma_i}$	At T = 10 $0.01246/(0.00082)^{1/2}$ = 0.43448
7	t–statistic (CAR)	Calculate the event window z-score for cumulative abnormal return	$\text{t} - \text{statistic (CAR)} = \frac{CAR_{i(\tau1,\tau k)}}{\sqrt{(\tau_k - \tau_1 + 1)\sigma_i^2}}$	At T = 10 $0.11364/(21 \times 0.00082)^{1/2}$ = 0.86406
where τ_1 is the start of Event Window and τ_{21} is the end of Event Window				

Table 14: Mean Adjusted Excess Return Model Process

4.5. Hypothesis Testing

Hypothesis 1:
Event has no impact on returns - i.e. no abnormal returns

H_0: AR = 0
H_α: AR ≠ 0

With an estimation window of 116 days, the degrees of freedom for testing will be 116 – 2 = 114.
The t-critical values are 1.98099 and -1.98099 for 5% two-tail significance levels while 2.61964 and -2.61964 for 1% two-tail significance levels.

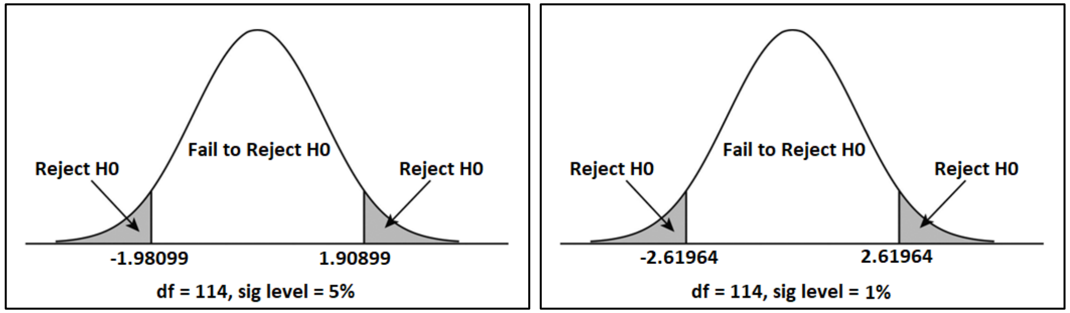

Fig 7: Two-Tail Significance Level (AR t-statistic)

Hypothesis 2:
Event has no impact on cumulative returns - i.e. no cumulative abnormal returns

H_0: CAR = 0
H_α: CAR ≠ 0

The z-critical values are 1.96 and -1.96 for 5% two-tail significance levels while 2.576 and -2.576 for 1% two-tail significance levels.

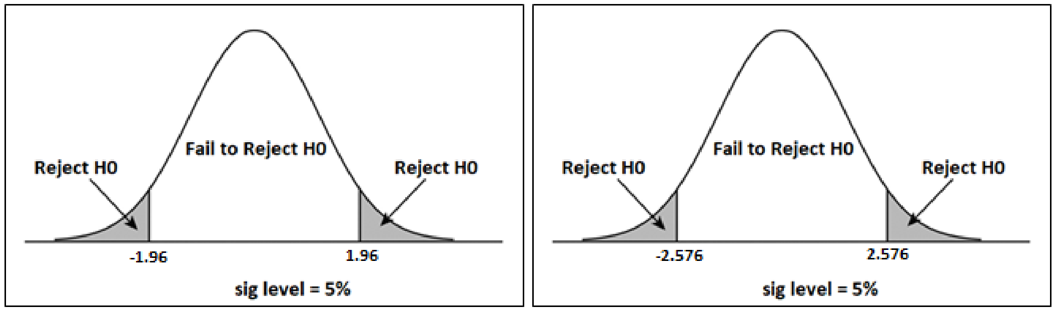

Fig 8: Two-Tail Significance Level (CAR z-score)

Market Model

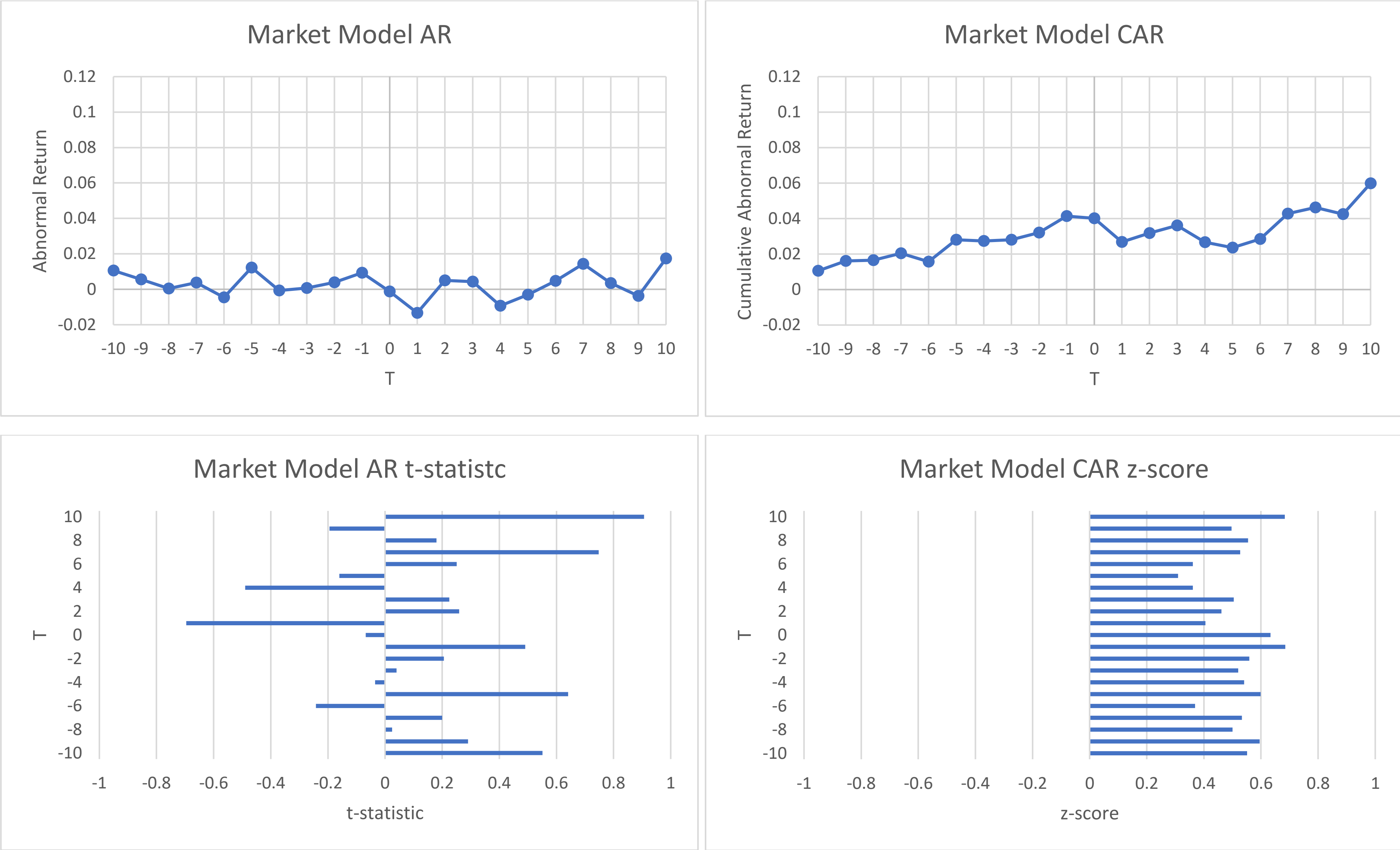

Fig 8: Market Model Results

The t-statistic and z-score falls within the critical values for both the 1% and 5% significance level and hence fails to reject the null hypothesis. This concludes that AR and CAR are not statistically significantly different from zero.

CAPM Model

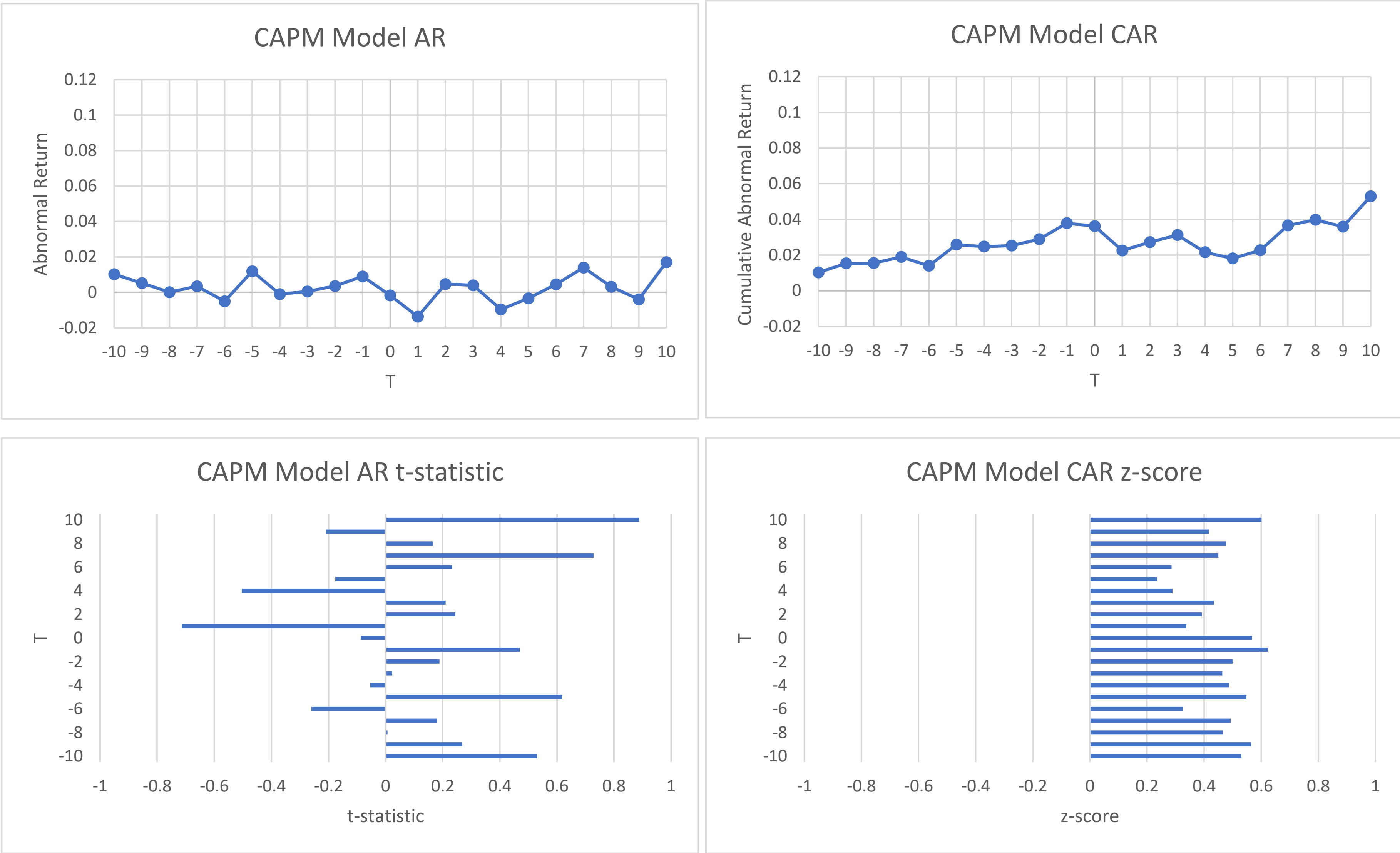

Fig 9: CAPM Model Results

The t-statistic and z-score falls within the critical values for both the 1% and 5% significance level and hence fails to reject the null hypothesis. This concludes that AR and CAR are not statistically significantly different from zero.

Market Adjusted Excess Return Model

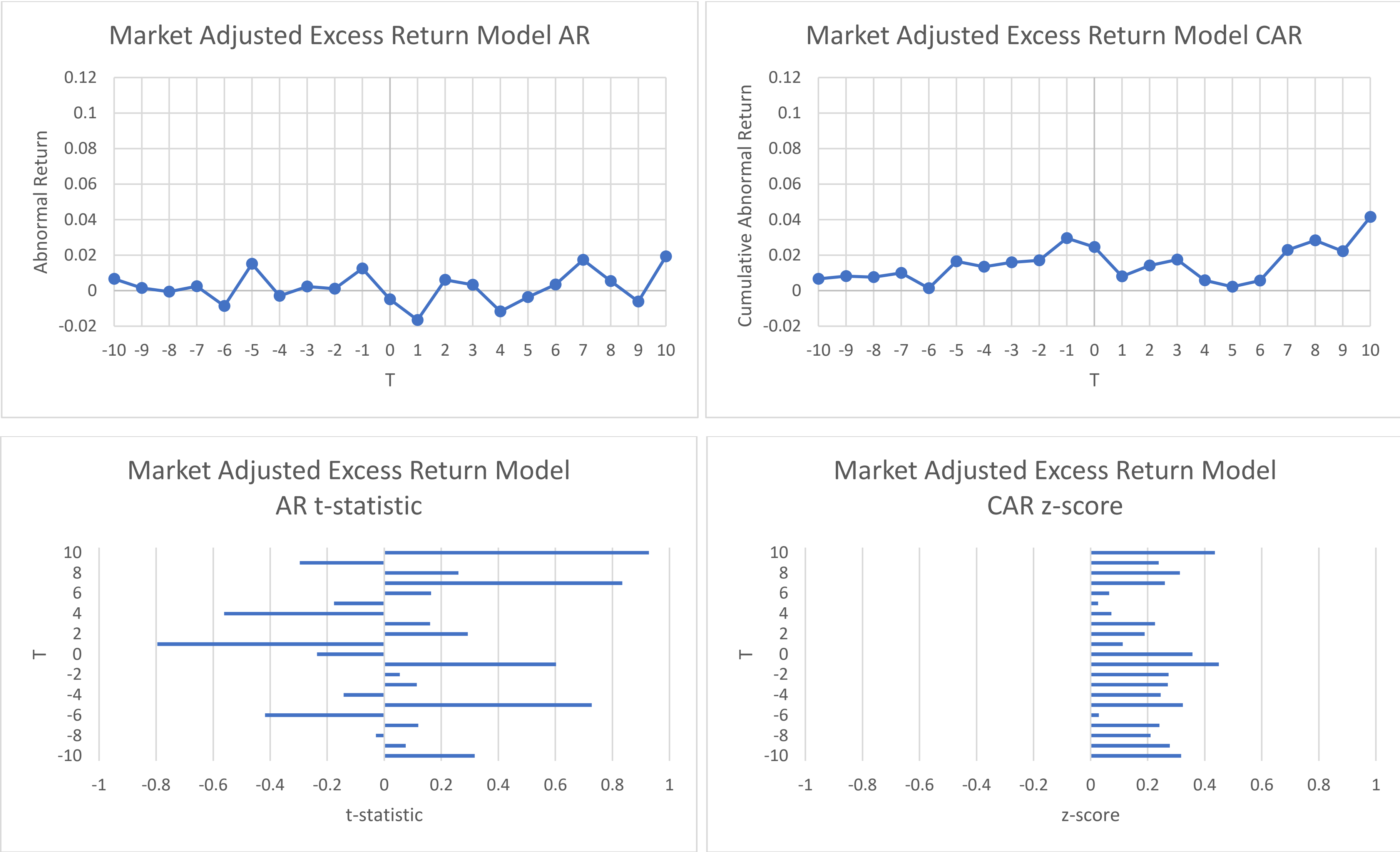

Fig 10: Market Adjusted Excess Return Model Results

The t-statistic and z-score falls within the critical values for both the 1% and 5% significance level and hence fails to reject the null hypothesis. This concludes that AR and CAR are not statistically significantly different from zero.

Mean Adjusted Excess Return Model

Fig 11: Mean Adjusted Excess Return Model Results

The t-statistic and z-score falls within the critical values for both the 1% and 5% significance level and hence fails to reject the null hypothesis. This concludes that AR and CAR are not statistically significantly different from zero.

5. Conclusion

Benchmark Models	Abnormal Return	Cumulative Abnormal Return
Market Model	Fail to reject H_0	Fail to reject H_0
CAPM Model	Fail to reject H_0	Fail to reject H_0
Market Adjusted Excess Return Model	Fail to reject H_0	Fail to reject H_0
Mean Adjusted Excess Return Model	Fail to reject H_0	Fail to reject H_0

Table 15: Hypothesis Testing Summary

It is overwhelmingly conclusive that all the benchmark models failed to reject the null hypothesis and conclude that there is no AR and CAR caused by a cash dividend declaration for P&G.

There are a few possible explanations for this result:

Firstly, with an uninterrupted streak of paying dividends annually since listing 131 years ago and 65 years of dividend increase, the market expectation was that this trend would continue. The onset of Covid19 resulted in many companies issuing dividend cuts or stock dividends instead, P&G however had survived through many crises ranging from world war to financial crisis and was expected to brave through the pandemic without any difficulties.

Secondly, with dividends payment every quarter, any abnormal returns or cumulative abnormal returns would have been diluted 4 times over the year and will either be insignificant or hard to be picked up through hypothesis testing. This would also mean that any insider information or information leakage would be negligible given the frequency of the dividend payments.

Lastly, a study found that dividend-capture strategies that seek to gain abnormal returns by trading on dividend events are only used on high dividend yield stocks (Koski & Scruggs, 1998). P&G has a dividend yield that matches closely with the S&P500 market index implying that its dividend yield was average and hence little abnormal return as implied by the study.

Reference

Koski, J. L., & Scruggs, J. T. (1998). Who trades around the ex-dividend day? Evidence from NYSE Audit File Data. Financial Management, 27(3), 58. https://doi.org/10.2307/3666275

Appendix

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.745814221
R Square	0.556238853
Adjusted R Square	0.552346211
Standard Error	0.019118407
Observations	116

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.052230031	0.052230031	142.894955	7.66435E-22
Residual	114	0.041668536	0.000365513		
Total	115	0.093898567			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.62648E-05	0.001775147	0.020429196	0.983736708
VWRETD	0.725205352	0.060667005	11.95386778	7.66435E-22

Fig A: Market Model Regression Results