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Impact of Mergers and Acquisitions on Stock Price Behaviour of Merger and Acquirer Companies in Automobile Industry

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Abstract: Mergers and Acquisitions is a corporate strategy which fetch synergy benefits, accelerate growth, improves performance quality, acquire technology and skills and eliminate excess capacity pertaining to the business. Automobile is one of the fastest growing industry worldwide. Automobile industry has witnessed major growth in mergers and acquisitions from 2000 till 2020 worldwide. To study the share prices behaviour and the impact three analysis and methods are used and those are Market study method using technical analysis using the indicator, event-study method by computing Cumulative Abnormal Returns (CAR) and Developing GARCH Model. In order to analyse the impact of mergers and acquisition on the CAR, the Cumulative Abnormal Return (CAR) is computed for the merger and acquiring companies using two event windows and they are -31 days (-15, 0, +15) and 7 days (-3, 0, +3). t-statistics is computed to analyse whether there is significant impact or insignificant impact. The expected return on the stock for each day was calculated using CAPM Model. To analyse the stock price behaviour, Autoregressive Conditional Heteroskedasticity (ARCH) Model is used. Results and outcome revealed that there was remarkable effect and unremarkable effect on the abnormal return of mergers and acquisitions.

INTRODUCTION

Automobile industry is one of the largest and growing industries. It is one of the key sectors of the economy on a global scale. Automobile industry collectively comprises the automobile produces like commercial vehicles, passenger cars, two-wheelers, three-wheelers, tractors, multi utility vehicles and auto components/parts. As a game changing corporate strategy, mergers and acquisitions happen on a large scale globally and almost in all the industries. There are equal chances of being successful and unsuccessful when mergers and

acquisition is pursued by the companies. Motives for M&A's can be different but companies strive hard to make it a successful move.

In today's competitive market, every company's objective would be to earn profits and create shareholder wealth. Company can achieve growth by introducing new products and services or by innovating the existing produces.

Internal growth of a company can be achieved by producing new products or innovating existing products. Whereas, external growth can be achieved by entering into mergers and acquisitions[1].

Literature review: Impact of mergers on Stock performance and risk of acquiring firms, evidence from India examine the wealth impact of merger announcements on the acquirer firms in India. The 2 variable considered to study the impact are stock volatility and stock return. Mergers and acquisitions from the year 2008-2015 were considered, sample of 429 merger announcements were collected and analysed. Announcements of mergers and acquisitions were analysed in 21 days event window[2]. A study on the impact of Pre and Post Bank merger announcement on stock price movements examines the pre and post Bank merger effect on the stock prices. This study has considered the recent Bank mergers from the year 2010 till 2018. This study has considered both the private and public Banks. The data considered and collected consisted the closing prices of banks 7 days pre and 7 days post-merger announcement. According to researchers outcome of the study revealed that there was a significant impact post-merger event but pre-merger event did not get affected that much[3]. Focussed on the financial brand's value of mergers and acquisitions. The study examines the drivers of the financial value of brands when the ownership of the brand is not changed[4].

MATERIALS AND METHODS

This study's main concern is to analyse stock price behaviour and the impact of pre and post Mergers and Acquisitions (M&A) in the Automobile industry. In this study in order to study the share prices behaviour and the impact three analysis and methods are used and those are Market study method using technical analysis, event study method by computing Cumulative Abnormal Returns (CAR) and Developing GARCH Model. The following steps are involved.

To analyse the impact on the share price by calculating Cumulative Abnormal Returns (CAR) on the shares of merger and acquirer companies using 31 days (-15, 0, +15) and 7 days (-3, 0, +3) event period.

Developing GARCH Model with distribution in mean equations and the Dummy variables as variance equations are used to analyse and check the effect of mergers and acquisitions.

RESULTS AND DISCUSSION

The current study's focus is on the impact on the share price of the mergers and acquisitions of companies between the years 1999-2020, worldwide. The study's secondary data sample were formed in the following criteria: the date of mergers and acquisitions from January, 1999 to March, 2020 are chosen for the study.

Completed and on-going mergers and acquisitions are considered. All the companie's share prices and returns which are chosen for this research are in and converted to (INR) Indian Rupees and considered for the calculations. CAR for 31 days window (-15, 0, +15) and 7 days windows (-3, 0, +3) are computed.

Market prices considered are the market index of the respective companies. The t-distribution table value for the probability of 0.05 (5%) maximum is 1.96.

All the chosen companie's share price returns are computed converting to the respective company's currency to Indian Rupee (INR) for easy analysis and for better understanding purpose.

Cumulative abnormal return in order to analyse the impact of mergers and acquisitions on the respective companie's share prices an event study method is used where in 31 days window that is (-15, 0, +15) days mergers and acquisitions event period including the date on which companies pursued mergers and acquisitions is chosen and studied. A short 7 days window that is (-3, 0, +3) days is analysed too. Both the mentioned event study helps us to know the impact of the mergers and acquisitions on the share prices was there or not (significant or insignificant impact). The daily expected return on the stock is calculated by using CAPM Model which includes beta and alpha (intercept). The CAPM equation is as follows:

$$E(Rf) = Rf + \beta(Rm - Rf)$$

Where:

- $E(Rf)$ = Expected return of the stock on t day
- Rf = Risk free return of the security for t day
- Rm = Market return for t day
- β = Slope of stock return and market return or the volatility measure of stock return with the market return

For the Abnormal return calculation, the following equation is used:

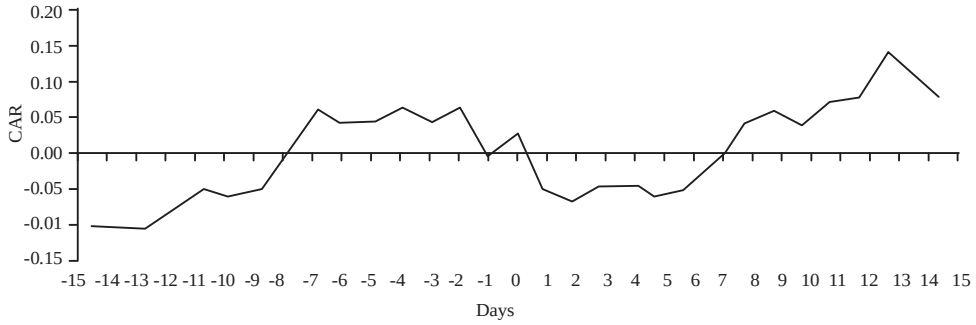

Fig. 1: The 31 days CAR of Renault SA, CAR-31 days windows; Cumulative abnormal returns of renault SA

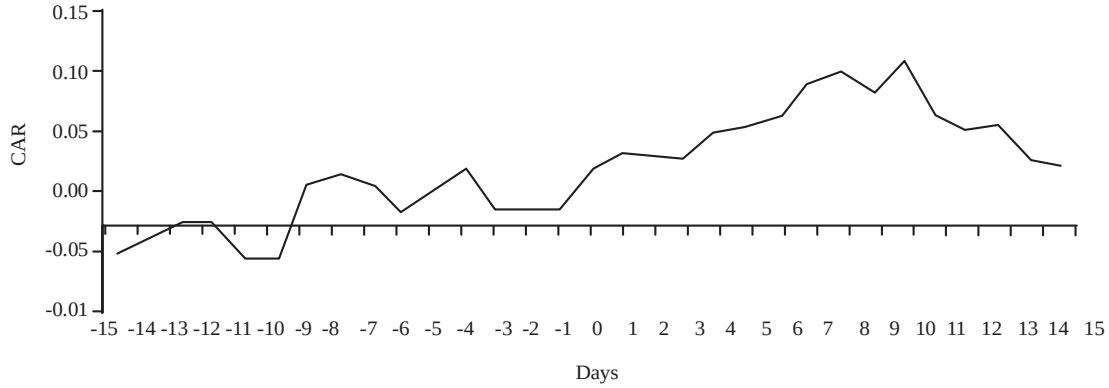

Fig. 2: The 31 days CAR of Tata motors Ltd, CAR-31 days window; Cumulative abnormal returns of Tata motors LTD

$$ARt = Rt\text{-}E(Rt)$$

Where:

Art = Abnormal return of the stock on t day
Rt = Actual or the normal return of the stock on t day
t = Particular day of the event

CAR test of 31 days event window [-15, 0, -15]: The Cumulative abnormal returnsfor 31 days [-15, 0, +15] event window is graphically represented as follows.

Renault SA and Nissan motor Co Ltd. merger: The 31 days cumulative abnormal return shows that there is a downfall or decrease in the CAR immediately after the date of merger event. Although there was decrease in initial days, the CAR of shares, gradually increased from day 7 till the last day that is 15th day. This means there was a positive impact of merger on shareholders return lately. One point that should be noted is that CAR has been increasing lately in the post-merger event (Fig. 1).

Tata motors Ltd.'s acquisitionof Ford motor Co.: The 31 days cumulative abnormal return shows that there has been an increase in the CAR immediately the date of acquisition. There is a positive impact on the shareholders return on TATA's shares. After the 10th day there has been a slight decrease in CAR till 15th day. One point that should be noted is that CAR has been increasing in the post-merger event (Fig. 2).

Fiat chrysler merger: The 31 days cumulative abnormal return shows that, on the day of acquisition event the CAR was very low. And there has been an increase in the CAR immediately the date of acquisition. There has been positive impact on shareholders returns of Fiat Chrysler automobile NV's shares. Although, the CAR increased in post-merger event days, there was downfall on the 11th day of post-merger event. This means there was positive as well as no much impact post-merger event period.

Mahindra's acquisition of Sang Yong motor: The 31 days cumulative abnormal return shows that there has been slightly increase in the CAR immediately the date of acquisition. There was no much impact in the post-acquisition event period. The CAR was increasing and decreasing from day 4 to the last day that is 15th day. Post acquisition event CAR was not that better than pre acquisition event period.

Volkswagen AG and Porsche SE merger: The 31 days cumulative abnormal return shows that on the day of

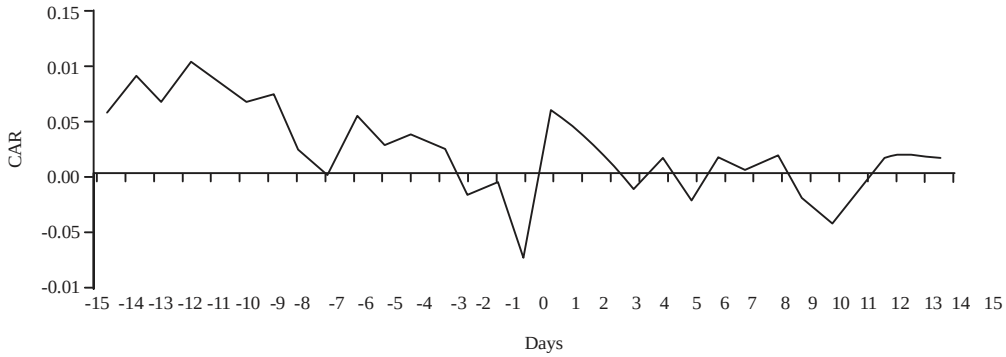

Fig. 3: The 31 days CAR of fiat Chrysler automobile NV, CAR-31 days windows; Cumulative abnormal returns of fiat Chryler

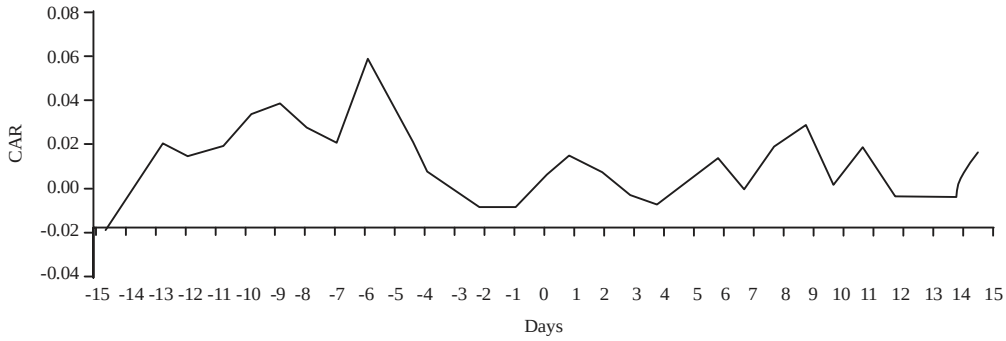

Fig. 4: The 31 days CAR of Mahindra and Mahindra, CAR-31 days windows; Cumulative abnormal returns of Mahindra

acquisition event the CAR was very low. And there has been an increase in the CAR immediately the date of acquisition. There has been positive impact on shareholders returns of Volkswagen AG's shares. The CAR in the post-merger event period has been increasing and there was a slight decrease on one of the days that is on the 13th day of post-merger event otherwise the merger event depicts significant positive impact on the CAR.

Nissan's acquisition of Mitsubishi motors: The 31 days cumulative abnormal return shows that there has been slight increase in the CAR immediately the date of acquisition. But after the +3, 3rd day post-acquisition event the CAR has been increasing till 15th day, the last day. There is a positive impact on the shareholders return on Nissan Motor Co Ltd.'s shares. The acquisition event has created significant impact on the CAR.

Toyota motor corp's acquisition of Subaru corp: The 31 days cumulative abnormal return shows that there is decrease in CAR on zero (0), +1 and +2 days-the initial days post-acquisition event. Lately from the +6 that is 6th day post-acquisition event the CAR gradually increased. There is no much impact on the shareholders return on Toyota motor corporation's shares.

Rev group's acquisition of Spartan motor Inc: The 31 days cumulative abnormal return shows that there has been increase in the CAR immediately the date of acquisition. From day zero (0) that means the day of the event till the days in post-acquisition event the CAR has been increasing. There is a positive impact on the shareholders return on Rev Group Inc's shares. The acquisition event has created significant impact on the CAR.

Borg Warner Inc and Delphi technologies plc merger: The 31 days cumulative abnormal return shows that on the day of the merger event the CAR was very low. There was no much impact on the CAR due the merger event. Although, the CAR was low from day +9 that is 9th day in post -merger event period the CAR has been increasing till 15th day that is +15 (Fig. 3-9).

CAR test of 7 days event window [-3, 0, -3]: The cumulative abnormal returns for 7 days [-3, 0, +3] event window is graphically represented as follows:

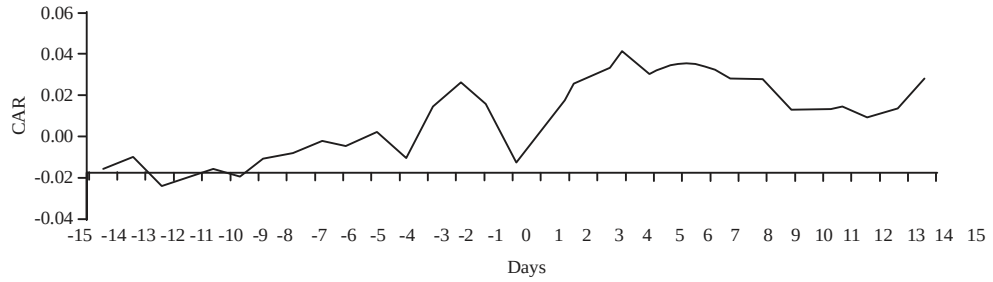

Fig. 5: The 31 days CAR of Volkswagen AG, CAR-31 datys window; Cumulative abnormal returns of Volkswagen AG

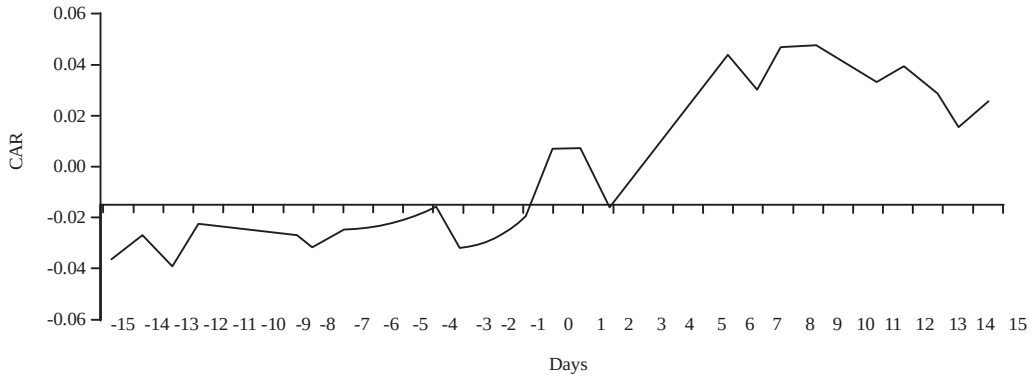

Fig. 6: The 31 days CAR of Nissan Motor Co., CAR-31 days windows; Cumulative abnormal returns of Nissan

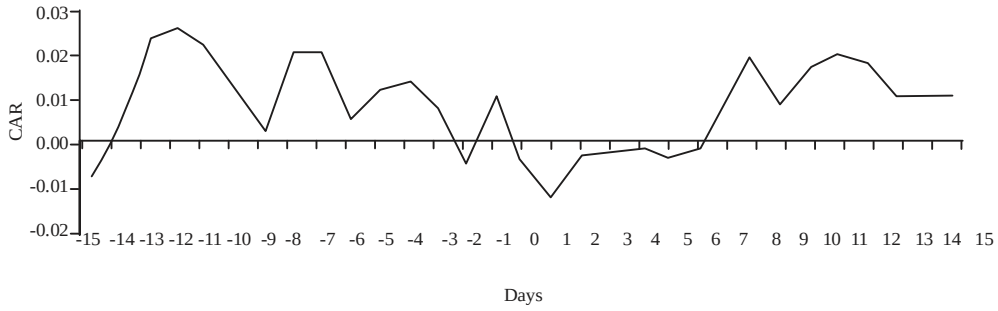

Fig. 7: The 31 days CAR of toyota motor corp, CAR-31 days windows; Cumulative abnormal returns of toyota motor corp

Renault SA and Nissan motor Co Ltd. merger: The 7 days cumulative abnormal return shows that there is decrease in the CAR immediately after the date of merger event. The 7 days CAR event window clearly depicts that the returns were better on the day of the event.

Tata motors Ltd.'s acquisition of Ford motor Co.: The 7 days cumulative abnormal return shows that there is increase in the CAR immediately after the date of merger event. The 7 days CAR event window clearly depicts that the CAR was better in the post-acquisition event period than the day of the event and during pre- acquisition event days too.

Fiat Chrysler merger: The 7 days cumulative abnormal return shows that there is increase in the CAR immediately after the date of merger event. The 7 days CAR event window clearly depicts that the CAR was much better in the post-acquisition event period than the day of the event and during pre-acquisition event days too.

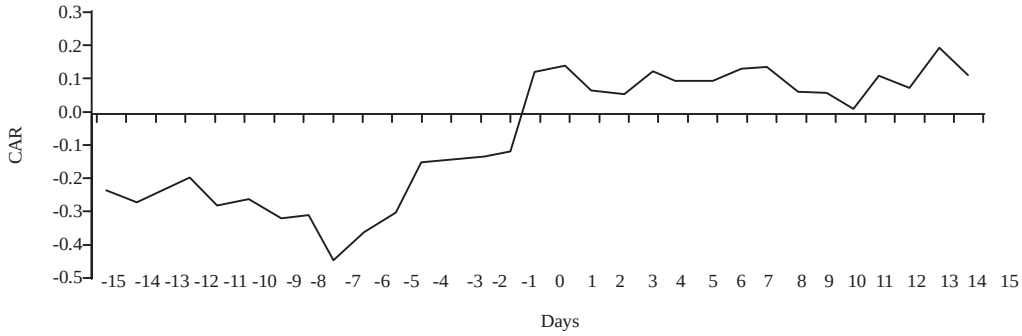

Fig. 8: The 31 days CAR of rev group Inc, CAR-31 days windows; Cumulative abnormal returns rev group Inc

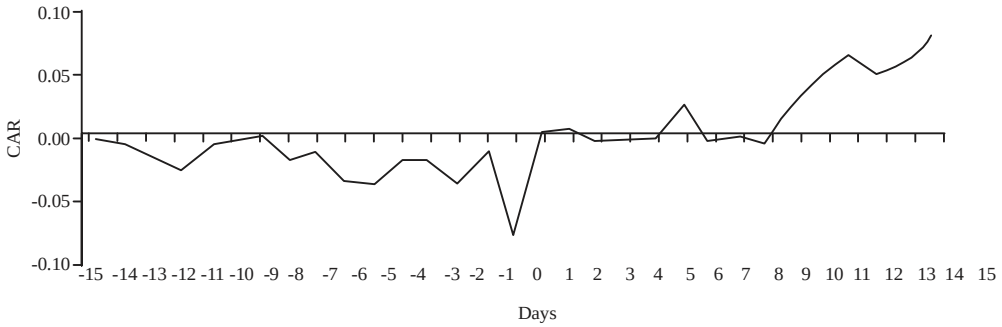

Fig. 9: The 31 days CAR of Borgwarner Inc, CAr-31 days windows; Cumulative abnormal returns of Borgwarner Inc

Mahindra's acquisition of SangYong motor: The 7 days cumulative abnormal return shows that there is increase in the CAR immediately after the date of merger event. The 7 days CAR event window clearly depicts that the CAR was much better in the post-acquisition event period than the day of the event and during pre-acquisition event days too. But in the long-run the post-acquisition CAR was better.

Volkswagen AG and Porsche SE merger: The 7 days cumulative abnormal return shows that there is increase in the CAR immediately after the date of merger event. There was complete downfall in CAR on the day of the event that is on the zero day. The 7 days CAR event window clearly depicts that the CAR was much better in the post-acquisition event period than the day of the event and during pre-acquisition event days too.

Nissan's acquisition of mitsubishi motors: The 7 days cumulative abnormal return shows that there is decrease in the CAR immediately after the date of merger event. on the +2 day of the event there was decrease in the CAR. The 7 days CAR event window clearly depicts that the CAR was much better in the post-acquisition event period than the day of the event and during pre-acquisition event days too.

Toyota motor corp's acquisition of Subaru corp: The 7 days cumulative abnormal return shows that there is decrease in the CAR immediately after the date of merger event on the +1 day of the event there was decrease in the CAR. The 7 days CAR event window clearly depicts that the CAR was much better in the pre-acquisition event period than the day of the event and during post- acquisition event days too.

Rev group's acquisition of Spartan motor Inc: The 7 days cumulative abnormal return shows that there is increase in the CAR immediately after the date of merger event. The 7 days CAR event window clearly depicts that the CAR was much better in the post-acquisition event period than the day of the event and during pre-acquisition event days too.

Borgwarner Inc and Delphi technologies Plc merger : The 7 days cumulative abnormal return shows that on the day of the merger event the CAR was very low and +1, +2 and +3 days in post-merger event days also did not have increasing CAR. The 7 days CAR event window clearly depicts that the CAR was slightly fine or good in the post-acquisition event period than the day of the event and during pre-acquisition event days too but still the impact was not more or less like no impact and the CAR was not up to the mark.

Table 1: Result of GARCH model of Renault SA

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000678	0.000242	2.800362	0.0051
Variance equation				
C	8.96E-06	1.53E-06	5.840014	0.0000
RESID (-1) ^2	0.058545	0.003258	17.96703	0.0000
GARCH (-1)	0.932318	0.004066	229.3088	0.0000
DUMMY	-3.07E-06	1.24E-06	-2.465387	0.0137*
R^2	-0.000092	Mean dependent var		0.000431
Adjusted R^2	-0.000092	SD dependent var		0.025736
SE of regression	0.025737	Akaike info criterion		-4.743665
Sum squared resid	4.285072	Schwarz criterion		-4.738430
Log likelihood	15350.76	Hannan-Quinn criter		-4.741854
Durbin-Watson stat	1.906017			

*Indicates statistical significance at 5% level; Dependent variable: RENAULT_SA; Method: ML ARCH- Normal distribution (BFGS/Marquardt steps); Date: 06/06/20 Time: 17:10; Sample (adjusted): 1/03/1995 6/03/2020; Included observations: 6470 after adjustments; Convergence achieved after 33 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5)*DUMMY

Findings: Both the event study windows that is 31 days [-15, 0, +15] and 7 days [-3, 0, +3] shows that there is and has been significant impact of the mergers and acquisitions on the abnormal returns of the shareholders. The share prices and the cumulative abnormal returns increased immediately preceding the date of merger and acquisition, where as in few cases it decreased. Thus, there is seems to be positive impact in most of the cases and negative in few cases. There is wealth creation of the shareholders as it is reflected from the abnormal returns of stocks of merger and acquiring companies.

GARCH model: The ARCH Model can be fitted when the error variance in a time series follows an Autoregressive pattern or model and so does the (GARCH) Generalised Autoregressive Conditional Heteroskedasticity Model (Manasa and Narayanarao, 2018). The estimation output consists of the sample of estimation, the methods used in computing the initial variance, coefficient of standard errors, mean equation and the variance equation.

The result or the output of GARCH (1,1) model from the ARCH estimation is divide into two sections, the upper part provides the standard output for the mean equationwhere as the lower part and is labelled as variance equation which includes the coefficients, standard errors, p-value coefficients and z statistics.

In order to fit ARCH/GARCH Model we have to run the regression model and check on the residuals if they are stationery or not. And before developing and using GARCH model for the stock returns, Heteroskedasticity Test is done and tested in order to check whether the volatility in the stock returns exists or not. If and when volatility exists the GARCH model can be applied.

Developing the GARCH (1,1) model: In the development of ARCH/GARCH Model, it generally, consists of two equations which is Mean equation and other variance equation[6, 7]. And is represented by:

Mean equation is: C = C1*C+e

Variance equation: GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5) *DUMMY+e

Where:

C = Daily return of the Company

GARCH = Residual Variance (error term which is derived from Eq. 1), In other words it is the current day's stock return

RESID (-1)^2 = Previous period's residual square obtained from Eq. 1 also known as the Lag/previous day's return information regarding the volatility. It is called as the ARCH term.

GARCH (-1) = Lag/previous day's variance residual or the Volatility of stock return. The term is known as GARCH. DUMMY = Variable to represent the effect of mergers and acquisitions.

To analyse the stock and the index which have the effect on the volatility an exogenous Dummy variable (D) is considered in the variance equation. If the dummy variable found is at ≤0.05 level of significance that means the stock has the effect on the volatility of spot market and has impact. The model can be said right when the residuals satisfy for no serial correlation during the serial correlation tests.

Interpretation of GARCH (1,1) Model of Renault SA: According to Table 1, the Dummy term's probability is (0.0137) which is <0.05 (5%)-it is found that the probability of Dummy is significant. With the coefficient of (0.9323) the GARCH term is also significant. It means that the lag/previous day Renault SA return's volatility can influence current day's volatility of return.

Interpretation of GARCH (1,1) Model of Tata Motors Ltd.: According to Table 2, the probability of Dummy variable is (0.000) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.8034) depicts that it is significant too.

Table 2: Result of GARCH model of Tata Motors Ltd.

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000274	0.000378	0.724849	0.4685
Variance equation				
C	0.000114	1.41E-06	80.96023	0.0000
RESID (-1) ^2	0.146357	0.002998	48.82600	0.0000
GARCH (-1)	0.803438	0.002004	400.8250	0.0000
DUMMY	-6.43E-05	2.07E-06	-31.01484	0.0000*
R^2	-0.000436	Mean dependent var		0.001668
Adjusted R^2	-0.000436	SD dependent var		0.066751
SE of regression	0.066765	Akaike info criterion		-4.111877
Sum squared resid	28.02507	Schwarz criterion		-4.106513
Log likelihood	12932.74	Hannan-Quinn criter		-4.110019
Durbin-Watson stat	2.517058			

*Indicates statistical significance at 5% level; Dependent variable: TATA_MOTORS_LTD; Method: ML ARCH-Normal distribution (BFGS/ Marquardt steps); Date: 06/06/20 Time: 18:02; Sample (adjusted): 1/02/1995 6/03/2020; Included observations: 6288 after adjustments; Convergence achieved after 35 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2) + C (3) *RESID (-1) ^2 + C (4) *GARCH (-1) + C (5) *DUMMY

Table 3: Result of GARCH model of Fiat Chrysler Automobiles NV

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000732	0.000263	2.777550	0.0055
Variance equation				
C	1.82E-05	2.10E-06	8.675298	0.0000
RESID (-1) ^2	0.095988	0.006265	15.32098	0.0000
GARCH (-1)	0.867617	0.008960	96.83641	0.0000
DUMMY	1.49E-05	1.87E-06	7.998381	0.0000*
R^2	-0.000088	Mean dependent var		0.000492
Adjusted R^2	-0.000088	SD dependent var		0.025467
SE of regression	0.025468	Akaike info criterion		-4.668682
Sum squared resid	4.015078	Schwarz criterion		-4.663246
Log likelihood	14456.90	Hannan-Quinn criter		-4.666797
Durbin-Watson stat	1.985708			

*Indicates statistical significance at 5% level; Dependent variable: FIAT_CHRYSLER_AUTOMOBILES_NV; Method: ML ARCH-Normal distribution (BFGS/Marquardt steps); Date: 06/06/20 Time: 18:12; Sample (adjusted): 1/02/1996 6/03/2020; Included observations: 6191 after adjustments; Convergence achieved after 33 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5) *DUMMY

Table 4: Result of GARCH model of Mahindra and Mahindra

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000868	0.000270	3.216028	0.0013
Variance equation				
C	3.61E-05	2.88E-06	12.56365	0.0000
RESID (-1) ^2	0.102220	0.006520	15.67850	0.0000
GARCH (-1)	0.868893	0.007199	120.6910	0.0000
DUMMY	-2.40E-05	1.93E-06	-12.40023	0.0000*
R^2	-0.000003	Mean dependent var		0.000824
Adjusted R^2	-0.000003	SD dependent var		0.027233
SE of regression	0.027233	Akaike info criterion		-4.624596
Sum squared resid	4.677461	Schwarz criterion		-4.619246
Log likelihood	14590.98	Hannan-Quinn criter.		-4.622743
Durbin-Watson stat	1.815358			

*Indicates statistical significance at 5% level; Dependent Variable: MAHINDRA_MAHINDRA_LTD; Method: ML ARCH-Normal distribution (BFGS/Marquardt steps); Date: 06/06/20 Time: 18:23; Sample (adjusted): 1/02/1995 6/03/2020; Included observations: 6308 after adjustments; Convergence achieved after 36 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2) + C (3) *RESID (-1) ^2+C (4) *GARCH (-1) + C (5) *DUMMY

Interpretation of GARCH (1,1) Model of Fiat Chrysler Automobiles NV: According to Table 3, the probability of Dummy variable is (0.000) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.8676) depicts that it is significant too.

Interpretation of GARCH (1,1) Model of Mahindra and Mahindra: According to Table 4, the probability of Dummy variable is (0.000) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.868893) depicts that it is significant too.

Interpretation of GARCH (1,1) Model of Nissan Motors Co Ltd. According to Table 5, the probability of Dummy variable is (0.000) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.893957) depicts that it is significant too.

Table 5: Result of GARCH model of Nissan Motor Co Ltd.

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000406	0.000226	1.801801	0.0716
Variance equation				
C	8.72E-06	8.98E-07	9.711189	0.0000
RESID (-1) ^2	0.095435	0.005295	18.02513	0.0000
GARCH (-1)	0.893957	0.005414	165.1257	0.0000
DUMMY	-3.74E-06	7.64E-07	-4.895221	0.0000*
R^2	-0.000016	Mean dependent var		0.000311
Adjusted R^2	-0.000016	SD dependent var		0.023856
SE of regression	0.023856	Akaike info criterion		-4.916709
Sum squared resid	3.550225	Schwarz criterion		-4.911309
Log likelihood	15342.67	Hannan-Quinn criter.		-4.914838
Durbin-Watson stat	2.085106			

*Indicates statistical significance at 5% level Dependent Variable: NISSAN_MOTOR_CO_LTD; Method: ML ARCH - Normal distribution (BFGS/Marquardt steps); Date: 06/06/20 Time: 19:43; Sample (adjusted): 1/04/1995 6/03/2020; Included observations: 6239 after adjustments; Convergence achieved after 38 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5)*DUMMY

Table 6: Result of GARCH model of Volkswagen AG

Variables	Coefficient	SE	z-statistic	Prob.
C	0.001003	0.000223	4.504554	0.0000
Variance equation				
C	8.32E-06	9.31E-07	8.936347	0.0000
RESID (-1)^2	0.088101	0.004005	21.99840	0.0000
GARCH (-1)	0.900294	0.004718	190.8181	0.0000
DUMMY	-1.49E-06	7.54E-07	-1.970429	0.0488*
R^2	-0.000123	Mean dependent var		0.000739
Adjusted R^2	-0.000123	SD dependent var		0.023840
SE of regression	0.023841	Akaike info criterion		-4.929028
Sum squared resid	3.650922	Schwarz criterion		-4.923761
Log likelihood	15837.04	Hannan-Quinn criter.		-4.927205
Durbin-Watson stat	1.912738			

*Indicates statistical significance at 5% level; Dependent Variable: VOLKSWAGEN_AG; Method: ML ARCH-Normal distribution (BFGS/Marquardt steps); Date: 06/06/20; Time: 18:55; Sample (adjusted): 1/02/1995 6/03/2020; Included observations: 6424 after adjustments; Convergence achieved after 41 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5)*DUMMY

Table 7: Result of GARCH model of Toyota Motor Corporation

Variables	Coefficient	SE	z-statistic	Prob.
C	0.000637	0.000196	3.255167	0.0011
Variance equation				
C	1.20E-05	1.49E-06	8.060701	0.0000
RESID (-1) ^2	0.115012	0.006900	16.66785	0.0000
GARCH (-1)	0.856586	0.008874	96.53172	0.0000
DUMMY	-3.80E-06	1.14E-06	-3.325360	0.0009*
R^2	-0.000048	Mean dependent var		0.000504
Adjusted R^2	-0.000048	SD dependent var		0.019328
S.E. of regression	0.019329	Akaike info criterion		-5.271644
Sum squared resid	2.330464	Schwarz criterion		-5.266243
Log likelihood	16449.89	Hannan-Quinn criter.		-5.269772
Durbin-Watson stat	2.138679			

*Indicates Statistical significance at 5% level; Dependent Variable: TOYOTA_MOTOR_CORP; Method: ML ARCH-Normal distribution (BFGS/Marquardt steps); Date: 06/06/20; Time: 20:00; Sample (adjusted): 1/04/1995 6/03/2020 ; Included observations: 6239 after adjustments; Convergence achieved after 33 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1) + C (5) *DUMMY

Interpretation of GARCH (1,1) Model of Volkswagen AG: According to Table 6, the probability of Dummy variable is (0.0488) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.900294) depicts that it is significant too.

Interpretation of GARCH (1,1) Model of toyota motor corp: According to Table 7, the probability of Dummy variable is (0.0009) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.856586) depicts that it is significant too.

Interpretation of GARCH (1,1) Model of Rev group Inc: According to Table 8, the probability of Dummy variable is (0.0000) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.326203) depicts that it is significant too. Interpretation of GARCH (1,1) Model of BorgWarner Inc

Table 8: Result of GARCH model of Rev Group Inc

Variables	Coefficient	SE	z-statistic	Prob.
C	-0.000350	0.000699	-0.500402	0.6168
Variance equation				
C	0.000275	2.50E-05	10.97373	0.0000
RESID (-1) ^2	0.431311	0.033104	13.02891	0.0000
GARCH (-1)	0.326203	0.043802	7.447207	0.0000
DUMMY	0.001402	0.000336	4.171898	0.0000*
R-squared	-0.000192	Mean dependent var		-0.000857
Adjusted R-squared	-0.000192	SD dependent var		0.036653
S.E. of regression	0.036657	Akaike info criterion		-4.184633
Sum squared resid	1.128716	Schwarz criterion		-4.156484
Log likelihood	1764.638	Hannan-Quinn criter		-4.173845
Durbin-Watson stat	2.192564			

*Indicates statistical significance at 5% level; Dependent Variable: REV_group_Inc; Method: ML ARCH-Normal distribution (BFGS/Marquardt steps); Date: 06/06/20 Time: 20:13; Sample (adjusted): 1/30/2017 6/02/2020; Included observations: 841 after adjustments; Convergence achieved after 30 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7); GARCH = C (2) + C (3) *RESID (-1) ^2 + C (4) *GARCH (-1) + C (5) *DUMMY

Table 9: Result of Graph model pf Brog Warner Inc

Variables	Coefficient	SE	z-Statistic	Prob.
C	0.000960	0.000227	4.226053	0.0000
Variance equation				
C	7.69E-06	6.43E-07	11.96680	0.0000
RESID (-1) ^2	0.052584	0.002817	18.66351	0.0000
GARCH (-1)	0.929653	0.003325	279.5963	0.0000
DUMMY	3.60E-05	1.12E-05	3.211117	0.0013*
R^2	-0.000090	Mean dependent var		0.000750
Adjusted R^2	-0.000090	SD dependent var		0.022030
SE of regression	0.022031	Akaike info criterion		-5.016361
Sum squared resid	3.105382	Schwarz criterion		-5.011076
Log likelihood	16054.85	Hannan-Quinn criter.		-5.014532
Durbin-Watson stat	2.028036			

*Indicates Statistical significance at 5% level; Dependent Variable: BORGWARNER_INC; Method: ML ARCH - Normal distribution (BFGS / Marquardt steps); Date: 06/06/20 Time: 20:22; Sample (adjusted): 1/03/1995 6/02/2020; Included observations: 6399 after adjustments; Convergence achieved after 34 iterations; Coefficient covariance computed using outer product of gradients; Presample variance: back cast (parameter = 0.7) GARCH = C (2)+C (3) *RESID (-1) ^2+C (4) *GARCH (-1)+C (5) *DUMMY

According to Table 9, the probability of Dummy variable is (0.0013) which is <5% (0.05) that means that it is significant and the impact is present. The GARCH'S coefficient is (0.929653) depicts that it is significant too.

CONCLUSION

Modelling and Forecasting of the volatility of stock returns on share prices and share market has become a vital field of empirical study and research in finance. This is due to the fact that volatility is considered as an important aspect and concept in many economic and financial applications. This study attempts to explore the stock prices behaviour and impact of mergers and acquisitions. The stock price behaviour and impact of mergers and acquisitions is analysed using technical analysis (market study method) by calculating Cumulative Abnormal Returns CAR (event-study method) and the returns has been modelled by using (GARCH) Generalised Autoregressive Conditional Heteroskedastic Model that captures the volatility clustering and impact. On the basis of the observed results and outcome, the following are the conclusions.

According to the CAR, there was remarkable as well as unremarkable effect on the abnormal return of mergers and acquisitions. The results of GARCH Model showed there was positive as well as negative impact in the pre and post-merger and acquisition event. The results of ARCH LM test conducted points out the significant presence of the ARCH effect in the residuals and volatility clustering effect. All models were found satisfactory in all the residual and diagnostic tests.

Results also reveals that the chosen companies in the automobile industry depicts that the mergers and acquisitions has led to significant impact and in some case insignificant impact on gaining abnormal returns for the shareholders and on the wealth creation of merger and acquiring companies. The ARCH effect is found on almost all the chosen companie's stocks and on the volatility in GARCH model. The stock's future returns are significant in case of all the chosen companies.

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