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Spillover effects in the financial year cycle for Indian markets

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Abstract

Purpose – The stock market anomalies have been studied across the globe with intermingled results for individual markets. The present study has investigated the financial year effect for Indian stock markets by testing month-of-the-year-effect anomalies.

Design/methodology/approach – The oldest stock exchange's index returns (Bombay Stock Exchange [BSE]) have been tested using ordinary least squares (OLS) and autoregressive conditional heteroskedasticity in mean (ARCH-M) models with Student's *t* and Student's *t*-fixed distributions for the period between 1991 and 2019. The Glosten, Jagannathan and Runkle-generalised autoregressive conditional heteroskedasticity (GJR-GARCH) model has been further used to find out existence of the leverage effect in returns.

Findings – The findings indicated no evidence for anomalies in the Indian stock market which may be used by investors for making unusual returns. However, the volatility in returns has shown weak but significant results due to the financial year impact. The leverage effect has not been found in the financial year cycle change over. The Indian market may be said to be moving towards a state of efficiency, leaving no scope for investors to gauge bizarre profits.

Research limitations/implications – The study has incorporated the Indian context for testing anomalies during the start and end of the financial year cycle. The model may be extended further to developed and developing nations' markets for testing efficiency in their stock markets during the same cycle.

Originality/value – The paper may be the first of its kind to test for the financial year effect on standalone basis for Indian markets. The paper also adds to the existing literature on testing events' effect.

Keywords OLS, ARCH-M, GJR-GARCH, Sensex, April, March, Spillover effect, Financial year, Volatility

Paper type Research paper

1. Introduction

Stock markets fully reflect all available information and hence, markets may be weak, semi-strong or strong depending upon the velocity of discounted information (Malkiel and Fama, 1970). Prices move as per their own set patterns and thus, it may be difficult to predict prices (Kendall and Hill, 1953). The Indian stock markets have been studied in different time frames and varied result output persists thereby from their results. However, majority of the studies have found that there exists a relationship between information and stock prices. There exist Monday and Wednesday effects in Standard & Poor's (S&P) CNX Nifty with an absence of weekend effect during the week analysis. March, September and December show anomalies during the monthly analysis (MC and KG, 2013). Ukraine markets have not shown any day-of-the-week effect (Caporale and Plastun, 2019). The same results existed for New Zealand (Raj and Thurston, 1994). The Indian stock markets demonstrated contradictory results (Raj and Kumari, 2006). The present paper throws light on the spillover effect from the month of March stock returns to April for the Indian stock market. The financial year change being the annual results disclosure time for companies may be one of the important factors which may impact the following monthly returns. This may tend to change the perception of investors for

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certain industries or companies. The study has used monthly stock indices to investigate the possible anomalies in the Indian stock markets.

The assay of stock market efficiency for developing and developed nations has been of prodigious interest for academicians since Eugene Fama established the theory of efficient markets. The risk-attuned basis for trouncing the market with consistent efforts (with publicly/privately available information) may depend upon the rapidity of adjustment in its prices. The technique of entry and exit while constructing an investment plays a predominant role for brokers, strategists, arbitrageurs, investors, speculators, etc. A conjoint objective for all these groups may be to enrich the worth of their portfolio by intriguing spontaneous actions at appropriate time intervals. In this gaze, the state of market efficiency may beckon traces for contriving the portfolio revisions. One of the utmost looked-for and substantial information about the stocks may be the closure of their books of accounts which precedes the annual disclosures. The publication of the result may generate thuds for prevailing stakeholders embracing shareholders. This can craft market sentiments to buffer and retort to publicly accessible information which beforehand could have been a close-knit buzz. With this stout belief, the present study has endeavoured to test spillover of annual disclosure at the end of financial year towards the flinch of a next cycle. The curious element of scheduling a scrupulous investment during this period using a fundamental or technical analysis may depend on markets' efficiency. The efficiency state may indicate usefulness of the right strategy whether fundamental or technical by prospective investors.

An outlay in any genre of a stock subjects to an elementary fundamental analysis positioned in key financial indicators from financial statements. In accumulation to this scrutiny, historical charts depicting trends may be of additional use. Plugging money in any company or industry-specific portfolio may require a thorough analysis of any of them (or both) depending upon the efficiency of markets. A charting and technical analysis may be only a trivial custom in case of strong efficient markets.

The objective of the study has been to examine the efficiency of Indian markets at the time of financial reporting by companies which usually takes place at the end of March every year. The results obtained may provide insights for planning investment in Indian markets with the right approach and a prior analysis subject to possibility of anomalies and opportunities thereof. The assorted findings in prior literature called for a focussed examination of Indian markets wherein a candid approach may be developed while investing by foreign nationals or domain investors.

The present study revolves around an interesting bouquet of the literature on asymmetries in stock markets around the world. Adding to the previous work on anomalies like day of the week, month of the year, calendar year, financial year, festivities, etc. it has been found that Indian markets may not be statistically significant for presence of any anomalies around the financial year. The outcome indicates that investors may not be able to generate abnormal gains while strategising their portfolio between close and start of the financial year. Thus, Indian markets have started showing strong signs of efficiency leading to more transparency in the stock trading and miniature chance of any possibility for extraordinary returns.

A strenuous attempt has been made to explicitly test the financial year effect for Indian markets for the oldest stock exchange in the country. Multiple statistical approaches like correlation dynamics, *t*-test, ordinary least squares (OLS), autoregressive conditional heteroskedasticity in mean (ARCH-M) and Glosten, Jagannathan and Runkle-generalised autoregressive conditional heteroskedasticity (GJR-GARCH) have been applied to cross check the results from a model. The results from the study add to the existing literature on market anomalies and further provide evidence that Indian markets have gradually rolled efficient. The omission of the recessionary period from the analysis feeds scope for testing market anomalies in different time periods by applying a structural break analysis. There may be multiple events that occurred in the last three decades which may be the basis for designing an analysis and expanding the study across time, indices, sectors, countries, etc.

2. Literature review

Brazil, Russia, India and China (BRIC) markets have attained the developed stage for trading (Singh, 2014). The US and the UK stock returns have been found significant for the month-of-the-year effect during the pre-World War I period (Choudhry, 2001). The study suggested that American institutions alone have not been showing significant opportunities for abnormal returns during the pre-holidays period. It has been found for Canada, the UK, Australia, Switzerland and West Germany (Cadsby and Ratner, 1992). The month-of-the-year effect examined for Australian stock markets revealed higher returns in April, July and December months using the regression model (Marrett and Worthington, 2011). There has been no evidence of January, April and Diwali effects for Indian markets using single-index and Fama–French models (Sobti, 2018). There have been studies related to Vietnamese financial statements anomalies which found one-fourth of the firms were anomalous (Lokanan *et al.*, 2019).

The Kenyan stock market demonstrated presence of anomalies during 1980–2006 wherein high volatility has been found for Fridays and January months (Onyuma, 2009). Small firms experienced higher average returns in January indicating consistency with a tax-loss-selling effect (Reinganum, 1983). The returns in the African markets have found to be significant with month-of-the-year and pre-holiday effects (Alagidede, 2013). There has been no evidence to show any month-of-the-year effect for Greek stock markets, both before and after the 1999 crisis (Floros, 2008). The anomalies in the Canadian stock market may allow investors to gain abnormally (Berges *et al.*, 1984). There existed a seasonal pattern for the buy–sell ratio which revealed below-normal values in December and above-normal values in January (Ritter, 1988). The intramonth effect has been found significant for the US and Australian stock markets, but the Japanese market witnessed a reversed trend (Wong, 1995).

There has been strong evidence of seasonality in the UK with large returns in January and April. Australia has been found as an exception in the study amongst major industrialised countries (Gultekin and Gultekin, 1983). The Monday returns have been found consistently negative for S&P Composite (Keim and Stambaugh, 1984). Monday and Thursday effects have found to be significant by using the ARCH-M model for Istanbul stock markets, with negative returns on Mondays and positive returns on Thursdays and Fridays (Dicle and Hassan, 2007). The market anomalies disappeared for the Kuala Lumpur Stock Exchange post-1990s when settlement procedures were improved (Clare *et al.*, 1998). The markets in the Arab region have shown a significant day-of-the-week effect in the beginning and at the end of the week along with a significant effect on volatility (Kamaly and Tooma, 2009). The forecast performance for Thai markets improved by incorporating calendar year effects before and after the Asian crisis (Holden *et al.*, 2005).

It was found that the day-of-the-week effects have been negative and insignificant for the Sudan market using OLS and GARCH models (Abdalla, 2012a, b). The extensive study of 20 emerging markets had shown concentrated returns around Fridays and highest volatility on Mondays with lowest on Tuesdays and Fridays (Yalcin and Yucel, 2006). It leads to better returns and higher volatility after long holidays in Thai markets (Tangjitprom, 2010). Anomalies existed for weekend effect but with no expiration effect in the Dutch market (De Jong *et al.*, 1992). There have been changing patterns for stock market anomalies in Greece markets due to changing statutory conditions in different time periods (Alexakis and Xanthakis, 1995). Stock market anomalies have been prevalent in Asia–Pacific countries, though there may be ample scope for abnormal profits investigation due to information asymmetry (Yakob *et al.*, 2005). The day-of-the-week effect has not been observed for

Egyptian stock markets using OLS and GARCH models, and there has been no effect on the volatility of returns (Abdalla, 2012a, b). There has been a significant day-of-the-week effect before and after the new Chinese calendar year for Hong Kong markets (Chia *et al.*, 2015). The Saturday effect has been found to exist for Saudi Arabia's stock market which contradicts the previous results for Western calendar markets (Abalala and Sollis, 2015). The Amman Stock Exchange has shown positive and significant Thursday returns and downer Sundays, indicating investors to avoid selling on the second day of the week (Al-Rjoub, 2004). There has been a pre- and post-holiday effect in Indian stock markets, though general holiday effect has been absent (Kinateder *et al.*, 2019). There have been weak but significant results for day-of-the-week and month-of-the-year effects for sectoral indices in Malaysia post the global financial crisis (Kaur *et al.*, 2019).

There have been variegated results for the month-of-the-year effect across seven different countries (Boudreaux, 1995). The day-of-the-month and day-of-the-week effects have found to be significant for the future index than the underlying spot index (Khaksari and Bubnys, 1992). The month-of-the-year effect subsisted for the Kuala Lumpur Stock Exchange and the Stock Exchange of Singapore but not for the Stock Exchange of Thailand and the Bombay Stock Exchange (BSE) (Chan *et al.*, 1996). The stock markets in Pakistan have not shown any signs of above-average returns on any specific day or month of the year (Ali and Akbar, 2009).

The Greek stock market displayed efficiency in terms of month-of-the-year, day-of-the-week and end-of-the-month effects during 1975–1999 (Kantzi, 2001). There is no evidence of semi-monthly effect in selected sectoral indices of the BSE (Shakila *et al.*, 2017). The mean returns for the Saudi Arabian market have been found to be positively influenced by the Ramadan effect and that of the Iranian market have been found to be insignificantly related (Wasiuzzaman and Al-Musehel, 2018). The results from GARCH and OLS models demonstrated doubts on calendar anomalies and their significance for France, Germany, Italy and Spain markets (Rossi and Gunardi, 2018).

The stock markets of Brazil, India and Russia still have ample opportunities for testing of calendar anomalies (Tadepalli and Jain, 2018). A study of 55 stock markets revealed that January and April effects existed only for six markets with non-persistence of negative returns for specific months (Giovanis, 2016). There has been a minor positive impact on Karachi markets in the holy month of Ramadan and the prices have been less volatile during this period (Khan *et al.*, 2017). The October returns for the Tunisian market have been low compared to other months of the year and negatively significant (Ahmed and Boutheina, 2017).

The above-mentioned types of research study have been recently tested for cryptocurrencies also. Varied results have been found for different currency returns for Mondays than other days of the week using the dummy regression analysis (Caporale and Plastun, 2019). The evidence of time-specific anomalies has been found in Bitcoin trading with no persistent effects over time (Baur *et al.*, 2019).

2.1 Research gap

Diversity in outcomes exists on stock market anomalies for different time periods across the world stock markets. The fallouts have been of different intensities for developed and developing markets. The findings also diverge for day-of-the-week, month-of-the-year, pre-holiday, Diwali and Ramadan effects, opening financial year, financial statements anomalies and calendar year effect. However, fewer studies related to dedicated investigation of the financial year (April and March effects) for Indian markets occurred. The present study has been planned to find out the trading efficiency of Sensex returns at the time of opening and closing of the financial year.

2.2 Hypotheses of the study

H1. There exists a difference between monthly average returns for March and April.

H2. There has been a cause and effect relationship running from March to April average monthly returns.

H3. There exist March and April effects and spillover of returns from March to April during 1991–2019.

H4. The spillover and volatility in returns have been extended to future returns from past lags for April month.

H5. There is a leverage effect in April returns from March returns.

3. Research methodology

3.1 Variables

The testing of the financial year cycle effect required the monthly returns surrounded with the possible effect of disclosure of results by Indian corporates. There may be two accounting cycles which companies may adopt to prepare their annual results (calendar year: January to December or accounting year: April to March). However, in general, the numbers may be disclosed in the month of March which remains the closing date for all business houses. Hence, with this belief, April and March returns have been taken as dependent and independent variables, respectively, to study the financial year anomaly in Indian markets.

3.2 Sample selection technique

Primarily two stock exchanges that exist in India accounting for most of the trading volume have been the BSE and the National Stock Exchange (NSE). The BSE has been the oldest in India, which was incorporated in the year 1875 and the NSE in 1992. The sample has been randomly chosen from the BSE being older than the NSE and representing more than a century old trading regime than the latter. Hence, the trading anomalies could be better tested with Sensex data (BSE).

3.3 Software used

Microsoft Excel, SPSS, version 23, and EViews, version 10, have been used to analyse the data in the study.

3.4 Data

The historical data for the Indian stock market (Sensex from the BSE, oldest in India) have been taken on monthly basis from the website of the BSE. The data have been taken from 1991 to 2019 (347 data points in total and 310 data points after excluding 2007–2009 assumed as a recessionary period and hence non-normal) with a belief that liberalisation, privatisation and globalisation reforms brought a drastic change in the industries. The raw stock indices require conversion into normal series. Thus, monthly stock returns have been computed using the following formula:

$$R_{it} = P_t - (P_{t-1})/(P_{t-1}) * 100 \tag{1}$$

where R_{it} = monthly return,

P_t = current month and

$(P_{t\text{-}1})$ = previous month.

3.5 Unit root testing

The augmented Dickey–Fuller test (Cheung and Lai, 1995) had been run to test whether the series have been stationary at the level and estimate first difference. The non-stationary time series in financial returns may lead to complications in formally testing efficiency with successful forecasting models (Timmermann and Granger, 2004).

3.6 Levene's test for equality of variances and independent sample t*-test*

The usual *F*-test for finding equality of variances between two group means has been Levene's test of equality (Carroll and Schneider, 1985), which has been used before applying independent sample *t*-test. The two independent groups may be tested for statistical difference between their means to find out substantial difference in their occurrence (Archie, 1985).

3.7 Model specification

3.7.1 Ordinary least square. A linear approach to find out cause and effect relationship between two sets of variables with OLS as maximum likelihood indicator (Hutcheson, 2011) has been used to find out linear relationship between independent (March returns) and dependent variables (April returns) of the study.

$$C + x_1 0_t + et \tag{2}$$

3.7.2 ARCH mean model. The ARCH-M model (Engle, 1995; Bollerslev *et al.*, 1992) has been used to investigate the presence of spillover effects from the closure of financial year to the start of next cycle. ARCH-M assumptions of clustering volatility and presence of the ARCH effect (Lee and King, 1993) have been checked before applying the model. The ARCH-M model has been used to determine risk premium variations and volatility (Bottazzi and Corradi, 1991).

$$\sigma_t^2 = \propto_0 + \sum_{i=1}^{q} \propto_i \in_{t-i}^2 \tag{3}$$

3.7.3 GJR-GARCH model. The volatility spillover may be assessed in a better form with GJR-GARCH and other multivariate GARCH models (Brownlees *et al.*, 2011). The multivariate GARCH model may be a better fit to analyse spillover and leverage effects (Laurent *et al.*, 2012). The GJR-GARCH or threshold autoregressive conditional heteroskedasticity (TARCH) model has been used to check for leverage effects in April returns.

$$\sigma_t^2 = w + (\propto + \gamma \Pi_{t-1}) \in_{t-1}^2 + \beta \sigma_{t-1}^2 \tag{4}$$

4. Findings

4.1 Descriptive statistics

The mean average returns in Table 1 (https://drive.google.com/file/d/1hqPiNAh4qCXJfW1cWp5sDD-3W9TEcnzc/view?usp=sharing) reflected that February had the maximum average returns and October experienced the minimum throughout the year. There have been negative average returns for three months during 1991–2019, namely, April, May and October. There have been positive returns for the closing financial year (March) and negative returns for the opening financial year (April).

Month	N	Minimum	Maximum	Mean	Standard deviation
January	26	−11.88	20.62	2.763	8.737
February	26	−7.51	31.06	4.118	8.807
March	26	−18.07	42.00	0.588	11.492
April	26	−11.08	14.29	−0.024	6.096
May	26	−22.68	19.18	−0.355	8.670
June	26	−11.82	13.41	2.279	5.340
July	26	−11.47	28.57	1.513	7.760
August	26	−9.98	13.13	1.942	6.553
September	26	−13.35	11.67	0.774	6.489
October	26	−14.00	10.19	−0.574	6.008
November	26	−12.54	20.92	1.186	7.786
December	26	−4.78	15.74	2.465	4.635

Source(s): Compiled by the author
Note(s): Mean average returns, maximum and minimum with standard deviations for 26 years for all months excluding 2007–2009

Table 1.
Descriptive statistics

The phenomenon of positive returns in March and negative returns in April has further been checked with *t*-test.

4.2 Correlation matrix

The correlation between monthly returns during 1991–2019 has shown negative and significant value for February–May, February–October, March–May, March–November, March–April and April–August. On the other hand, positive and significant value has been demonstrated for May–July and September–December. This shows that there may be some possibility for investors to strategise between different months relationship and plan their international portfolios.

4.3 Financial year group statistics

The mean average returns in April were negative and March average returns were positive. This may be due to the annual report disclosure cycle (April–March) when all companies report their annual results. The disclosed information in March reports may vary from investor's expectations leading to negative returns in the followed month (April).

4.4 Independent sample t*-test*

Table 2 (https://drive.google.com/file/d/1hqPiNAh4qCXJfW1cWp5sDD-3W9TEcnzc/view?usp=sharing) shows the results for Levene's test for equality of variances and Student's *t*-test. It may be noted that the variances have not been assumed to be equal for considering the *t*-statistic from Levene's results (*F*-statistic: 4.206; *p*-value: $0.046 < 0.05$).

The difference between mean average returns for two sets of month (April and March) has not been found to be significant using Student's *t*-test (*t*-statistic: −0.24; *p*-value: $0.811 > 0.05$ and 0.10).

4.5 Unit root results

The unit root results depicted with the help of augmented Dickey–Fuller statistic and respective *p*-values have been shown in Table 3 (https://drive.google.com/file/d/1hqPiNAh4qCXJfW1cWp5sDD-3W9TEcnzc/view?usp=sharing). The test has been run at level I (0) and first difference I (1). It may be said that the monthly returns have been majorly

Table 2. Independent sample t-test

					Levene's test for equality of variances				
	H_O: there is no difference between mean returns of March and April					95% confidence interval of the difference			
Assumption	F	Significance	t	Df	Significance (two-tailed)	Mean difference	Standard error difference	Lower	Upper
Equal variances assumed	4.206**	0.046	−0.24	50	0.811	−0.613	2.551	−5.737	4.511
Equal variances not assumed			−0.24	38.038	0.811	−0.613	2.551	−5.778	4.551

Source(s): Compiled by the author
Note(s): **Shows significant results at 5% level of significance

Table 3.
Unit root results

	Augmented Dickey–Fuller statistics H_O: series has a unit root					
	Level			First difference		
Series	Intercept	Trend	Without trend	Intercept	Trend	Without trend
January	−7.62*** (0.00)	−7.67*** (0.00)	−6.50*** (0.00)	−6.40*** (0.00)	−6.31*** (0.00)	−6.55*** (0.00)
February	−1.71 (0.41)	−5.18*** (0.00)	−3.06*** (0.00)	−6.19*** (0.00)	−6.57*** (0.00)	−9.61*** (0.00)
March	−5.66*** (0.00)	−5.57*** (0.00)	−5.76*** (0.00)	−6.66*** (0.00)	−6.38*** (0.00)	−6.90*** (0.00)
April	−3.77** (0.01)	−3.66*(0.05)	−3.87*** (0.00)	−3.72** (0.01)	−3.61* (0.05)	−3.81*** (0.00)
May	−7.47*** (0.00)	−7.62*** (0.00)	−7.58*** (0.00)	−14.04*** (0.00)	−13.80* (0.00)	−14.29*** (0.00)
June	−7.46*** (0.00)	−5.39*** (0.00)	−0.95 (0.29)	−6.68*** (0.00)	−6.69*** (0.00)	−6.81*** (0.00)
July	−3.81** (0.01)	−3.74** (0.04)	−3.67*** (0.00)	−4.41*** (0.00)	−4.36** (0.01)	−4.54*** (0.00)
August	−3.48** (0.02)	−3.62* (0.05)	−3.46*** (0.00)	−5.41*** (0.00)	−5.44*** (0.00)	−5.45*** (0.00)
September	−3.04* (0.05)	−2.97 (0.16)	−3.11*** (0.00)	−6.77*** (0.00)	−6.61*** (0.00)	−6.87*** (0.00)
October	−4.45*** (0.00)	−5.24*** (0.00)	−4.50*** (0.00)	−10.05*** (0.00)	−10.09*** (0.00)	−10.27*** (0.00)
November	−4.08*** (0.00)	−3.99** (0.02)	−4.09*** (0.00)	−7.64*** (0.00)	−7.50*** (0.00)	−7.79*** (0.00)
December	−3.63** (0.01)	−3.96** (0.02)	−3.06*** (0.00)	−6.89*** (0.00)	−6.77*** (0.00)	−7.03*** (0.00)

Source(s): Compiled by the author
Note(s): *Shows significant results at 10% level of significance, **shows significant results at 5% level of significance and ***shows significant results at 1% level of significance

found to be stationary at level and at first difference tested with intercept, trend and without trend. Therefore, the regression analysis may be performed on the data series.

4.6 Estimation of OLS output

The results for the OLS model applied with the help of Eqn. (3) have been shown in Table 4 (https://drive.google.com/file/d/1hqPiNAh4qCXJfW1cWp5sDD-3W9TEcnzc/view?usp=sharing). The mean average returns for April being the dependent variable and mean average returns for March being an independent variable.

$$R_{it}(\text{Apr}) = X_1 + X_2\{\text{Rit(Mar)}\} + e_{it} \quad (5)$$

where R_{it} (Apr) = mean average returns for April month during 1991–2019,

X_1 = constant,

X_2 = coefficient for independent variable and

{Rit (Mar)} = mean average returns for March month during 1991–2019.

The regression output has indicated that the coefficient for March returns has been negative and not significant (p-value: 0.446 > 0.05). Hence, the OLS model indicated that March returns may not be a significant variable in causing April returns. Residual diagnostics for the model have been shown with the help of tests for normality, heteroskedasticity and serial correlation. Jarque–Bera statistic (1.513) with the null hypothesis (H_O: data are normally distributed) has indicated that data are normally distributed (p-value: 0.469 > 0.05).

Further, Breush–Pagan–Godfrey statistic (0.340) with the null hypothesis (H_O: there is no heteroskedasticity in data) has indicated that there is no problem of heteroskedasticity in the model (p-value: 0.560 > 0.05). The Breusch–Godfrey serial correlation Lagrange multiplier (LM) test statistic (8.160) has also indicated that there is no serial correlation for the model (H_O: there is no serial correlation in the model, p-value: 0.319 > 0.05). The above obtained results have been further verified with the help of the ARCH-M model which called for satisfying two conditions: (1) there is a clustering volatility and (2) there is an ARCH effect.

4.7 ARCH effect

The ARCH effect has been tested for the data series with the help of the ARCH test of heteroskedasticity (H_O: there is no ARCH effect), and it has been found that the series has shown an ARCH effect (p-value: 0.004 < 0.05), implying that ARCH-M may be applied on the data.

Variable	Coefficient	Standard error	t-statistic	Probability
c	0.024	1.207	0.020	0.984
x_1	−0.083	0.107	−0.775	0.446

Residual diagnostics

Test method	Statistic	p-value
Jarque–Ber	1.513	0.469
Breusch–Pagan–Godfrey	0.340	0.560
Breusch–Godfrey serial correlation LM Test	8.160	0.319

Source(s): Compiled by the author

Table 4.
OLS results

4.8 ARCH-M results

The ARCH-M model in the study has been applied with two parameters: (1) Student's *t* and (2) Student's *t*-fixed distribution. It is shown in Table 5. The risk of monthly returns (standard deviation in April) has been negative and not significant with *p*-values (Student's *t* distribution: 0.652; Student's *t*-fixed distribution: 0.471) obtained in both the models. The coefficient for March returns has been observed to be negative and not significant (Student's *t* distribution: 0.637; Student's *t*-fixed distribution: 0.724) as shown by *p*-values in both the models in mean equation (Kantzi, 2001). The variance equation under Student's *t* distribution depicted that the ARCH effect has been negative and not significant (*p*-value: 0.185). In Student's *t*-fixed distribution, it has been found negative and significant (*p*-value: 0.001).

However, the GARCH effect has been positive and significant for both the models (Student's *t* distribution: 0.000; Student's *t*-fixed distribution: 0.000). The residual diagnostics for the ARCH-M model have been tested with the help of Jarque–Bera statistics (*p*-values with Student's *t* distribution: 0.657; Student's *t*-fixed distribution: 0.632), the ARCH test of heteroskedasticity (Student's *t* distribution: 0.104; Student's *t*-fixed distribution: 0.184) and autocorrelation *q*-statistics (Student's *t* distribution: 0.107; Student's *t*-fixed distribution: 0.153).

The data have been found to be normally distributed (H_O: data are normally distributed). The problem of heteroskedasticity has not been found (H_O: there is no heteroskedasticity in data) with the ARCH heteroskedasticity test. The autocorrelation has also not been found (H_O: there is no serial correlation). Though the residual diagnostics have not shown any issues for both the models, the Akaike information criterion (Student's *t* distribution: 6.505; Student's *t*-fixed distribution: 6.441) and the Schwarz criterion (Student's *t* distribution: 6.844; Student's *t*-fixed distribution: 6.732) have shown that Student's *t*-fixed distribution may be a better model

	Student's *t* distribution			Student's *t*-fixed distribution		
Variable	Coefficient	*z*-statistic	Probability	Coefficient	*z*-statistic	Probability
Mean equation						
σ	−0.419	−0.451	0.652	−0.451	−0.719	0.471
c	1.619	0.347	0.727	1.416	0.471	0.638
x_1	−0.059	−0.471	0.637	−0.036	−0.352	0.724
Variance equation						
c	−2.386	−15.606	0.000***	−2.187	−1.111	0.266
∝	−0.061	−1.323	0.185	−0.055	−3.221	0.001**
β	1.101	17.884	0.000***	1.082	29.379	0.000***
Selection criterion						
Akaike information criterion			6.505		6.441	
Schwarz criterion			6.844		6.732	

Residual diagnostics

Test	Statistic	*p*-value	Statistic	*p*-value
Serial correlation	2.595	0.107	2.037	0.153
ARCH test	2.641	0.104	1.763	0.184
Jarque–Bera	0.837	0.657	0.917	0.632

Source(s): Compiled by the author

Note(s): **Shows results are significant at 5% level of significance and ***shows significance at 1% level of significance

Table 5.
ARCH-M output

and hence outperforms Student's t distribution. The ARCH term has been negative and non-significant (p-value: 0.076), but the GARCH term (0.000) as shown by the ARCH-M model has been positive and significant.

4.9 GJR-GARCH results

The results from the mean equation of the GJR-GARCH model shown in Table 6 indicated that March returns may not be a significant variable in influencing April returns similar to OLS and ARCH-M results. The GJR-GARCH term has been found to be negative and non-significant (0.194), meaning that the leverage effect has not been existing for April returns from March returns. The spillover of any negative news may not be the cause for more volatility in April returns than positive information. The residual diagnostics have shown absence of autocorrelation (p-value: 0.321) and heteroskedasticity (p-value: 0.354) in residuals. Also, the residuals have been normally distributed (p-value: 0.391) with the model with criteria such as the Akaike information criterion (6.217) and the Schwarz criterion (6.507) which have been lower than both distributions of ARCH-M.

4.10 Liaison of findings with previous literature

The financial year succession effect and stumble over of March returns to April has not been established and with this stance the market anomaly in the months adjoining this period lacks statistical evidence. The findings from the study upkeep the earlier results in the context of Indian markets (Raj and Kumari, 2006; Shakila *et al.*, 2017). The use of single-index and Fama–French models had also shown analogous results and April effect had not been uncovered (Sobti, 2018). Market anomalies have not been found for various international stock markets in the modern literature (Singh, 2014; Giovanis, 2016; Ali and Akbar, 2009). The results provide sustenance to these studies and contradict with few studies which have found anomalies of any form for developing markets (Yakob *et al.*, 2005;

Variable	Coefficient	z-Statistic	Probability
Mean equation			
c	−0.327	−27.675	0.000***
x_1	0.135	1.087	0.276
Variance equation			
c	0.013	0.013	0.989
$\propto$	−0.137	−1.771	0.076
γ	−0.251	−1.298	0.194
β	1.232	289.375	0.000***
Selection criteria			
Akaike information criterion		6.217	
Schwarz criterion		6.507	

Residual diagnostics

Test	Statistic	p-value
Autocorrelation	0.983	0.321
ARCH	0.858	0.354
Normality	1.877	0.391

Source(s): Compiled by the author
Note(s): ***Shows significance at 1% level of significance. γ shows the leverage effect

Table 6. GJR-GARCH output

Chia *et al.*, 2015; Kaur *et al.*, 2019). The nature of these anomalies however has varied from the concentrated financial year effect.

5. Conclusion and implications

Market anomalies for the stock markets worldwide have been studied for month-of-the-year, day-of-the-week, holidays, calendar year and festivals effect. The study has investigated the persistence of the financial year effect for Indian markets taking a time period after the Indian Government adopted a liberalised economic policy and thus, markets got attraction from various foreign individual and institutional investors. The financial year cycle is a relevant and crucial time period for companies that have got listed on the stock exchange and their trading has been actively affecting their prices whenever information may be floated (company-specific or other macro-level content).

The results reflected that March returns may not be a significant variable in causing April returns. Hence, the April and March effects for Indian markets have not been found during the period of the study. Therefore, the financial year effect has not been witnessed for Sensex returns during the period 1991–2019, meaning that the Indian market has started showing signs of efficiency which supports the concept of efficient market hypotheses. Thus, short-term strategies may no longer be applicable in Indian stock markets due to increasing efficiency in stock price data. The stock indices have been found to be turning efficient and discount all the information available around the financial year cycle across Sensex at the BSE.

The results of the study indicate o that there may be rare opportunities for investors to plan for abnormal returns around financial year closure and start of next cycle. The findings support many studies that have been carried out post the improvement in settlement procedures at stock markets and transparency in accounting disclosure by companies. The study has neither found any financial year effect nor any significant difference for starting and closure of financial year returns. Thus, the findings add to the existing literature with a standalone effect from the financial year cycle. However, the volatility in returns has shown some evidence through GARCH terms obtained, meaning that there may be a spillover from past lags of previous returns during the same months.

Thus, from investors' perspective, the outcome of the study indicated that the Indian markets during the normal scenario may not offer any leakages for making extraordinary returns. However, the volatility spillover and trends from previous months' returns may extend some information for opportunists and short-term investors to strategise short-run gains.

The policymakers and regulators may peep into the corporate disclosure in annual general meetings and at the time of closure of company accounts and thereby reports published and circulated for public. Though there has been no evidence of market anomalies at the time of financial year's starting and closure, the scope from previous volatility spillovers indicated that further studies may be carried out to understand the context.

6. Scope for further study

The study may be expanded beyond single-index data to check the presence of the financial year effect for developing markets. Further, sectoral comparisons may be made for investigating the month-of-the-year effect in different time frames including calendar year, pre-holiday period, festive seasons and day-of-the-week effect. The analysis of internal and external shocks on market returns may be tested with asymmetric models to document the results further. More important may be to split the data into different subperiods, taking normal and recessionary time periods separately. Also, the ongoing health issues across the world (coronavirus disease 2019 [COVID-19] to be specific) may be studied in detail to find out whether the anomalies situation changes with these contemporary issues. A study on a comparative basis may be extended for such different events in the past and the present surrounding timings which may be relevant for companies and markets.

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