“One of the earliest and most enduring questions of financial econometrics is whether financial asset prices are forecastable. Perhaps because of the obvious analogy between financial investments and games of chance, mathematical models of asset prices have an unusually rich history that predates virtually every other aspect of economic analysis. The fact that many prominent mathematicians and scientists have applied their considerable skills to forecasting financial securities prices is a testament to the fascinating and the challenges of this problem. Indeed, modern financial economics is firmly rooted in early attempts to “beat the market”, an endeavor that is still of current interest, discussed and debated in journal articles, conferences, and at cocktail parties!” (Campbell, Lo and MacKinlay, 1997, p.27).

Numerous empirical investigations provide evidence of market efficiency and seasonal anomalies in the capital market, but the pattern and types of anomaly vary from one study to another. A review of important research papers on calendar anomalies are discussed below;

Eugene Fama (1965) research was one of the detailed studies on theory underlying random-walk model and its empirical validity. The study concludes that there existed consistent evidence to prove random walk theory in the behavior of stock market prices and technical analysis was of no real value in prediction of future price of the stocks. The role of uncertainty and new information were discussed thoroughly in understanding the relationship between the intrinsic values and actual prices of the companies. On an average, they insisted that if there are many astute traders in the market, the full effects of new information on intrinsic values will be reflected nearly instantaneously in actual prices. Daily prices of thirty stocks of the Dow-Jones Industrial Average from period 1957 to 1962 were used for the study. It was observed that the weekend and holiday changes were not so different from the daily changes within the week.

Frank Cross (1973) examined the distribution of price changes on Fridays and Mondays and their relationship. The data from January 2, 1953 through December 21, 1970 of Standard & Poor’s Composite Stock Index was considered for the study. Mann-Whitney U Test, a non-parametric test was used. Fridays were found to better perform than Mondays in terms of both mean percentage change and the percentage
of times the index advanced. The point which is noteworthy is that mean percentage change on Mondays preceded by “up Fridays” was algebraically less than that on Mondays following “down Fridays” in all of the data considered.

Rozeff and Kinney (1976) documented the presence of seasonal anomalies in monthly rate of returns for the first time on New York Stock Exchange using the data for the period 1904-1974. They obtained long term time series by splicing together several indices, among which few were value-weighted and others were equal-weighted. They used both parametric and non-parametric tests in the study. The analysis of seasonality in the risk premia or “price” of risk, was conducted to observe that high returns were usually associated with higher market risk premium. The study revealed that, January mean returns were comparatively higher than other months of the year. According to them, the presence of high market risk premium during January might have been the reason for high returns and thus the cause of seasonal anomaly. The January risk premium was mainly associated with inadequate adjustment of prices to information available which resulted in higher returns compared to other months. Peculiar patterns were also found to be exhibited by certain months like, relatively high mean returns were found in the month of July, November and December and relatively low mean returns were found during the February and June months.

French (1980) analyzed daily stock returns of Standard and Poor’s composite portfolio for the period 1953 through 1977. Two alternative models were examined namely calendar time and trading time hypotheses. The calendar time hypothesis operates continuously and during the period considered the expected return for Monday was found to be three times more than the expected return for other days of the week. In trading time hypothesis, the returns were generated during active trading and the expected return was found to be same for all days of the week. It was observed that the returns were negative on Mondays, whereas, they were positive on other days of the week.

Gibbons and Hess (1981) examined and confirmed the day of the week effect obtained by Cross (1973) and French (1980). The study on indexes was done for the first time wherein the tests were conducted with S &P 500 and value and equal-weighted portfolios constructed by Center for Research in Security Prices (CRSP) for the period between July 1962 to December 1978. The average annual return on
Monday ranged from -33.5% (S & P 500) and -26.8% (the equal weighted index). In the study, market-adjusted returns were found to exhibit day of the week effects, but the effects were not concentrated on a particular day of the week. Important limitation pointed out in this research was regarding the estimated autocorrelations. According to Scholes and Williams (1977), these autocorrelations were explained by non-trading of securities. In order to avoid non-trading problem, actively traded individual securities listed on Dow Jones 30 were tested for Monday effect. They found uniformity of negative returns for Monday across individual stocks. The test was extended for the first time across other fixed capital markets mainly treasury bills to know if institutional peculiarities limited the presence of this phenomenon. The t-bills, like stocks were found to exhibit strong day of the week effect. This paper identified the presence of patterns / anomalies across other markets.

Lakonishok and Levi (1982) attempted to provide explanation to the occurrence of day of the week effect by considering the delay between trading and settlements in stocks and in clearing checks. The daily stock market returns from July 1962 to December 1979 were considered for the study. The study was mainly done to observe the effects of settlement day changes before and after 1968. Since 1968, settlement of stocks usually took five business days after trading in an ordinary week without holidays which was previously four business days. The clearing delay extended the settlement period in normal circumstances during no-holidays from eight calendar to ten calendar days, if stocks were purchased on business days other than Friday and on Friday respectively. If the trade was on Friday, the sellers were inclined to charge higher price for stocks sold because of two days extra delay before being paid and buyers were supposed to pay higher price due to the extra two days interest. They clearly showed the impact of holidays on the settlement period which extends by one extra day to eleven calendar days which is in fact three days longer than for all days other than Fridays in normal weeks which tends to nullify the advantage of Friday effect. This test forced the future researchers to consider the adjusted return accounting for the interest rate during the weekends and holidays which may change with economic situations.

Roll (1983) attempted to provide the explanation for the turn-of-the-month effect and the return premia of small firms like Lakonishok and Levi (1982) did for day-of-the-week effect. The author associated the phenomenon to tax loss selling
which is induced by negative returns over the previous year. The author found that large average return between large and small firms was mainly due to transaction costs and low liquidity which did prevent arbitrageurs from eliminating the return seasonality. This paper contributed to the empirical literature by identifying tax loss as a major justification to possible patterns in turn-of-the-year effect.

Keim (1983) examined the empirical relation between abnormal returns and market value of NYSE and AMEX common stocks. The study pointed out the important fact which went unnoticed in previous papers that more than fifty percent of the January premium was seen during the first week of trading in the year, particularly on the first trading day. This paper thus paved way for analyzing high frequency data sets in the future for research purposes.

Theobald and Price (1984) provided analytical explanation to the impact of nontrading in thin markets and seasonality. The study was conducted using daily data of two U.K. indexes namely Financial Times (FT) ordinary and FT-All Share Indexes. The FT-All share Index was predicted to be more affected by non-trading due to its broader composition. The authors found the presence of seasonality in both the indexes in mean return disturbances and less strongly in variance returns. It was thus concluded that variance seasonality in true process is able to just explain only a small amount of observed seasonality.

Keim and Stambaugh (1984) further investigated the weekend effect in stock returns by extending the research to larger data from 1928 to 1982 using Standard and Poor’s Composite Stock Price Index and by considering additional stocks like small (low capitalization stocks) and over the counter stocks which were previously not considered in the study done by Cross (1973) and French (1980). The weekend effect was found to be consistent before 1952 (1928-1952) and later (1952-1982), when the last day traded on New York Stock Exchange used to be Saturday and Friday respectively. In particular, the last price of the week was found to be “high” and Monday effect was prevalent in both periods. The authors extended the empirical research more towards small capitalization stocks by analyzing returns of ten portfolios based on market value as given by Keim (1983). The study found convincing proof that magnitude of day of the week effects was related cross-sectionally to firm size and the returns’ increase was more pronounced for smaller firms. Measurement Error explored by Cross(1973) to explain day of the week effect
was tested among thirty stocks of Dow Jones Industrial Index by computing correlation coefficient among days of the week. Inspite of finding negative correlation between Friday positive and Monday negative returns, the authors found positive correlation as observed by Cross (1973) which is opposite to prediction theory of Measurement-error.

Rogalski (1984) examined the inter-link between anomalies found in the stock market. The study emphasized on how close the anomalies such as January effect, firm size were related to day-of-the-week effect. The study decomposed the weekend returns into trading and non-trading day returns by splitting the Friday close to Monday close return into two component parts namely the Friday close to Monday open return and the Monday open to Monday close return. Open and close values of Dow Jones Industrial Average (DJIA) from October 1974 to April 1984 along with open and closing S&P 500 index values from December 1978 to December 1983 was considered for the study. Trading time hypothesis was accepted using open and close returns for each trading day of the week which is in line with studies done by Oldfield and Rogalski (1980). The study deciphered for the first time, the non-trading weekend effect which proves the fact that negative Monday returns was contained in the average Friday close to Monday open return. In order to find if there exists a relationship between January and day-of-the-week effect, the day-of-the-week returns were segmented into January versus rest of the year returns and surprisingly large portion of the January effect was found to occur, on an average, during the first Monday in January. The holiday effect categorized into holiday and holiday weekend were tested and it was found that non-trading weekend returns still had negative returns which increased if holiday occurred on Monday.

Jaffe and Westerfield (1985) tested weekend effect in the international markets for the first time. The main objective of this paper was to test whether seasonal patterns existed in other foreign markets and whether they exhibited trends different from results obtained in U.S. due to factors such as time zone difference, settlement procedures and exchange rate respectively. The daily returns of stock market indexes of four countries mainly Japan (The Nikkei-Dow from 1970 to 1983), Canada (Toronto stock Exchange Index from 1976 to 1983), Australia (Statex Actuaries Index from 1973 to 1982) and U.K (Financial Times Ordinary Share Index from 1950 to 1983) along with U.S. were considered for the study. The weekend effect was found
to be significant in all the countries. Japanese Nikkei-Dow index Fridays mean return was found to be lower than Saturdays mean return consistent with Keim and Stambaugh (1984) results. Japanese and Australian indices were found to exhibit more negative returns on Tuesday rather than Monday which were not observed in Canadian and U.K markets. The regression results clearly pointed to the fact that, weekend effects in each foreign country considered is independent of weekend effect in U.S. markets. The authors found no support for random type of measurement error in line with the studies by Keim and Stambaugh (1984). The authors found higher than average correlation between returns on Fridays and Mondays.

McInnis and Wood (1985) examined the impact of thin trading in shadowing day of the week effect in index returns. In order to precisely understand the effect of thin trading in the indexes, the authors used transaction data consisting of 958 common stocks listed on the NYSE between September 1, 1971 to February 28, 1972. The transaction data helped the authors in segmenting the data easily into intra-day, inter-day and overnight returns for the study. As a measure for thin trading, the average time from last trade to market close was considered for the first time in literature. The authors concluded that trading activity of the stocks need to be considered in segmentation of the periods and in testing for anomalies mainly of day-of-the-week effect.

French and Roll (1986) explained the response of the stock markets to the news during trading hours and non-trading hours. The authors found convincing evidence of increased volatility during the exchange trading hours to three factors namely arrival of public information, trading of informed investors using the private information and pricing errors during trading. This research helped in relating to and assessing the impact of private information on the unusually high trading time volatility in the stock market.

Lawrence Harris (1986) extended the study of Keim (1983) and Lakonishok and Levi (1982) by analyzing high frequency (intra-day) data to identify patterns in common stock prices. The author noticed significant weekday differences in intra-day returns which accrued during the first 45 minutes after the market opened. The author confirmed the hunch of Lakonishok and Levi (1982) that for large firms, negative Monday close-to-close returns accrue between the Friday close and the Monday open but for small firms it accrued primarily during the Monday trading day.
Smirlock and Starks (1986) investigated day of the week effect using high frequency data similar to Lawrence Harris (1986) study but over a longer sample period which provided additional insight into the nature and timing of the weekend effect in addition to knowing the return generating process. For the study, hourly return data of Dow Jones Industrial Average (DJIA) from 1963 to 1983 for a period of 21 years was considered for the study. Similar to McNish and Wood (1985) classification of data, the DJIA returns were decomposed into closing, close to open and open to close returns for various sample periods. Similar to the results of Rogalski, during the two sample periods before 1974, weekend effect could not be seen during non-trading weekends, which otherwise was found later suggesting reversals and shift in the timing of the weekend effect. The authors found convincing evidence of weekend effect ‘moving up’ in time which meant that, in pre-1974 period almost all of the Monday hourly returns were negative but post-1974 period shows only Monday morning and the non-trading weekend periods to have negative returns. Thus trading time hypothesis for pre-1974 period was rejected and others conclude that non trading weekend effect which characterizes the pre-1974 is inappropriate.

Condoyanni, Hanlon and Ward (1987) extended the research on Day-of-the-Week effect internationally by considering six countries reflecting the three geographical areas mainly North America (U.S., Canada), Europe (U.K, France) and Far Eastern (Japan, Australia and Singapore) capital markets. The study was done using the data of six country indices namely Dow Jones Industrial, Australian Stock Exchanges, All Ordinary Share Price Index, Toronto Composite, Paris C.A.C Industrial, F.T. All Share, Tokyo New Stock Exchange and the Straits Times (Singapore). The conclusions drawn in the study were in tune to some extent, with the study of Jaffe and Westerfield (1985). The authors found some diminution of Monday effect and increase of the Tuesday effect due to time zones difference when one moved from North America to Europe and to the Far East, thus pointing to the conclusion that markets might be reacting to a common set of information. When tested for whether there is a impact of US weekend effect on Non U.S markets using number of lagged and unlagged cross correlations, it was found that far eastern markets were strongly correlated with the behavior of non far eastern markets especially U.S. markets in the previous days suggesting that U.S. markets have a dominant influence on other markets. The authors thus suggest the influence of the
U.S. market disguising the indigenous weekend effect closes before it opens. The authors also advise the researchers investigating non-US capital markets to seek means of purging their data of any US-driven effects before investigating whether or not an indigenous weekend effect is present. Thus the study concludes that weekend effect is a norm rather than an exception in range of capital markets around the world.

Lakonishok and Smidt (1988) tested for the existence of anomalous regularities in the securities return. The data consisting of daily closing prices of Dow-Jones Industrial Average (DJIA) from January 4, 1897 to June 11, 1986, approximately 90 years was examined, to test for monthly, semimonthly, weekend, holiday, end-of-December, and turn-of-the-month seasonalities. They identified three characteristics with respect to quality of the evidence of seasonal anomalies. The three generic considerations were mainly due to boredom (danger of attaching undue importance to studies reporting anomalies), noise level and data snooping (attempting to discover and test hypotheses using the same data). So, they found the remedy for data snooping to be use of new data. If new data are not available, then they suggested adjusting the significance level on the tests of individual hypotheses. The study identified the presence of anomalous patterns in DJIA returns around the turn of the week, around the turn of the month, around the turn of the year and around holidays. The rates of return were found to be higher during turn of the month and post holiday periods. One specific point which was noteworthy was relating the magnitude of anomalies with the size of a tick (smallest price change). They found that the movement of one tick in price was much larger than most of the seasonal anomalies which can be further researched in Indian context.

Flannery and Protopopadakis (1988) investigated institutional and general equilibrium explanations with intra-week seasonality among eleven securities, three stock indices (namely equal-weighted and value-weighted CRSP returns and Standard & Poor 500) and Treasury bonds of varying maturities for the period 1976 to 1984. In the study substantial intra-week seasonality was observed across all assets and Treasury bills showed negative returns across all maturities becoming prominent as maturities increased. The unique point noticed was that intra-week seasonal patterns disappeared when returns were adjusted for clearing and payment conventions. The authors point to the fact that a common factor exists between securities considered for study since they exhibited negative Monday returns. The possibility of market
discount rates to be the common factor was discussed wherein viable explanation was found in that term premia contained in the interest rates used to discount future cash flows tend to rise over the weekend because non-trading periods are characterized by different risks and information flows. So, conclusively the authors were able to suggest that market-specific, institutional features cannot explain all seasonality since similar securities exhibited significantly different seasonal patterns.

Cadsby (1989) obtained similar results for Canada. Ogden (1990) analyzed the turn of the month effects in the United States using data from 1969 to 1986 and concluded that the standardization of payments at the turn of each calendar month induced a surge in stock returns. In a study of the stock indices of 10 countries over different time periods until the late 1980s,

Aswath Damodaran (1989) attempted to explain weekend effect by considering the earnings and dividend announcements during Friday’s. The author hypothesized that weekend effect may be due to announcements by the firms with bad news toward or after the close of Friday fearing panic selling in the financial markets. The study considered 18,996 earnings announcements, 11554 quarterly dividend announcements in the sample period from January 1981 to December 1985. The author found tendency of disclosing bad news on Fridays’ to impart more negative returns among small firms. With respect to earnings announcements on Fridays’ and other days of week, the author found declines of five percent on average and two percent increase, on an average respectively. With respect to dividend announcements, the average change in dividends per share is -1.3 percent for Friday’s and 6.67 percent during other weekdays. Thus, negative abnormal returns were found to spillover to the next trading days thus more profoundly on Monday following Friday’s announcements.

Aggarwal and Rivoli (1989) investigated day-of-the-week effect and January effect in four emerging Asian markets namely Hong Kong, Malaysia, Singapore and the Philippines. The study was conducted across the selected markets using daily returns data for a period of twelve years from 1976 to 1988. The study found evidence of both January effect and Day-of-the-week effect in all the countries except Philippines. The study found evidence of impact of time zones on the markets. Due to the time difference of around +thirteen hours between New York and the selected countries, ‘Tuesday effect’ was observed. Thus, it was found that the emerging
countries though exhibited strong day of the week effect, were distinct from U.S. by showing low Monday returns. This study thus paved way for more research on seasonal anomalies in other emerging countries.

Barone (1989) analyzed the anomalies namely the weekend effect, the holiday effect, the turn-of-the-month effect, the settlement effect and the January effect to test the efficiency (information efficiency) of Italian Stock markets. The analysis was conducted based on the Milan Stock Exchanges’ MIB storico stock index with reference to the period 1975 to 1989. The author concludes that the anomalies obtained are in line with the results obtained for the U.S. market and thus Italian market is found to be informationally not efficient. The point worth mentioning is that the largest fall in stock prices occurred more on Tuesday rather than Monday suggesting the effect of different time zones.

Lakonishok and Maberly (1990) examined the weekend effect by analyzing the trading behavior of the individual and institutional investors during the weekdays. The authors found more selling activity on Mondays’ by individual investors which could explain the weekend effect. Market participants, especially, individual investors are more active on Monday after devoting relatively long time during weekends and institutional investors are less active since it is a time for strategic planning which is reflected in less block trades on Monday than on any other days of week (Osborne (1962)). The authors found that during the period 1962-1986, Monday was found to have lowest trading volumes and null hypothesis of mean trading volume being same across all days of the week was rejected.

Ariel (1990) examined and explained the occurrence of high stock returns before holidays. The author found over one-third of the returns earned accruing on the eight trading days which fall annually before holidays for the period of study. The study considered daily stock index returns drawn from Centre for Research in security prices (CRSP) value weighted and equally-weighted returns for period 1963 to 1982. The hourly return values of DJIA surrounding holidays were also considered for the study. The study considered eight holidays which provoke stock market closings mainly New Year’s Day, Presidents’ Day, Good Friday, Memorial Day, July Fourth, Labor Day, Thanksgiving, and Christmas. The author found means of the pre-holiday returns exceeding the non pre-holiday returns by factors of 9 and 14 for the equally and value-weighted indices respectively and found the difference of the mean returns
to be statistically significant. Another key point noted is that not only pre-holiday variance was found to be no greater than the variance for other days, the pre-holiday variance was actually lower than the variance of non-pre-holidays, which emphasizes the fact that high pre-holiday return is not a reward for bearing extra risk. The author also predominantly found high returns only on the single trading day preceding holidays and not any other day surrounding the holiday period.

Agrawal and Tandon (1994) examined seasonal anomalies namely Weekend, Turn-of-the-month, End-of-December, Monthly and Friday the thirteenth effect in around eighteen countries stock markets. The study extended emphasis on testing the anomalies across different countries apart from U.S. similar to the study done by Aggarwal and Rivoli (1989) in four emerging Asian markets. The eighteen countries examined consisted of ten European countries (Belgium, Denmark, France, Germany, Italy, Luxembourg, Netherlands, Sweden, Switzerland and the U.K.), three Asian countries (Hong Kong, Japan and Singapore), two Latin American countries (Brazil and Mexico) and Canada, Australia and New Zealand. The study provided mixed response to the presence of anomalies which Jaffe and Westerfield (1985) attributed to time zone difference. The study found that among five countries which had more than twelve hours difference with U.S., only three countries (Australia, Hong Kong and Japan) exhibited negative Tuesday returns. More surprisingly, the time zone hypothesis was not able to explain the negative Tuesday returns in five European countries (Belgium, France, Netherlands, Sweden and Switzerland) which are less than around seven hours from U.S. The study also revealed that the day-of-the-week effect is independent of the U.S. seasonal effect. Settlement procedures overall was found not to explain day of the week effect. The study emphasized the fact that the high negative Monday/Tuesday returns disappeared after the 1980s period, which points towards attainment of greater homogeneity among security markets. The variances of the returns were found to be highest during Mondays and lowest during Fridays among most of the countries. The January returns were found to be significantly large in most countries though statistically only ten countries exhibited the monthly seasonality thus supporting the tax-loss selling hypothesis. Overall, the study provided an opportunity to understand the anomalies across different countries which are unique in their own ways. The study emphasized on understanding each
market uniquely and the factors governing it when judging for the presence of anomaly.

Abraham and Ikenberry (1994) strengthened the Information processing hypothesis explanation given by Lakonishok and Maberly (1990) that individual investors play an important role in causing negative returns on Monday by being more active sellers. The daily CRSP Equal-Weighted Index returns from 1963-1991 was considered for the study during which surprisingly Monday’s returns was found to be positive to the extent of 0.1136 percent when the Friday’s returns was positive and -0.6069 percent negative following Fridays negative return. The result that conditional mean return for Mondays following positive Friday returns was found to be lowest of any weekday meant that individuals irrespective of positive news, continued to have liquidity needs leading to selling decisions during the weekend and execution of these trades during subsequent weekday i.e. Monday. The study was extended to understand the behavior of the investors during intra-day.

Balaban (1995) examined the Day-of-the-Week effect in Turkish stock market. The author considered the daily data returns of the Istanbul Securities Exchange Composite Index (ISECI) for the period 1988 to 1994. The findings of the study were found to be consistent with those of Agrawal and Tandon(1994) as Tuesdays were found to exhibit negative returns and Fridays were found to have highest positive returns within a week. The research thus found significant day of the week returns in the ISECI.

Alexakis and Manolis (1995) examined the day of the week effect on the Greek stock market for the period January 1985 to February 1994. Tendency of normalization towards Monday effect is mainly highlighted in this study. Greek stock market during the study considered underwent structural changes which perhaps may have led to a particular behavior on part of the investors in the Athens Stock Exchange (ASE). The stock market was found to unusually show more negative returns on Tuesday’s rather than what is empirically proven in the literature and tested throughout the world. The author’s argue that Tuesday’s returns have been found to become less negative over sub periods considered and it was forecasted that in the coming years the pattern may follow the familiar world pattern.
Wang, Li and Erickson (1997) documented new evidence to day of the week effect. The test was conducted on three indexes mainly NYSE-AMEX equally- and value-weighted return indices (1962-1993), the NASDAQ equally-and value-weighted return indices (1973-1993), and the S&P Composite Index (1928-1993). The study revealed that Monday effect occurred primarily in the last two weeks of the month and mean Monday return of the first three weeks of the month was found to be significantly different from zero. The authors examined the magnitude of the anomaly with the size of the tick as pointed out by Lakonishok and Smidt (1988) and found that the negative returns on fourth and fifth Mondays are relatively smaller to movement of one tick. Thus, investors may have little chance to profit from the observed return pattern even if they ignored the transaction costs.

Choudhry (2000) investigated day-of-the-week effect in seven Asian markets namely India, Indonesia, Malaysia, Philippines, Taiwan, South-Korea and Thailand for a period of five years from 2000 to 2005. The paper investigated for the first time day-of-the-week effect on both returns and conditional volatility using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model. The study showed the presence of day-of-the-week effect on all the countries, thus hypothesizing the possible spill-over impact of Japanese Market.

Berument and Kiymaz (2001) investigated for the first time the day of the week effect in the stock return volatility framework in S&P 500 index for the period January 1973 to October 1997. The paper contributed to the literature on seasonal anomalies by documenting the presence of day of week effect in the conditional variance specification. The study employed three different models namely OLS method, Generalized Autoregressive Conditional Heteroscedastic (GARCH(1, 1)) method and Modified GARCH method. The OLS method which assumes the constancy of the residual term variance indicated the presence of weekend effect similar to other studies in literature. Considering the change in volatility over time using GARCH (1, 1) model, the authors found strong and persistent effect on volatility. In the Modified GARCH model, the authors found day of the week effect to be present in both volatility and the return equation with highest and lowest returns observed on Wednesday and Monday and highest and lowest volatility observed on Friday and Wednesday respectively. The authors conclude that patterns in volatility seen in the study would be helpful for investors in adjusting their portfolios by
reducing their commitment to assets and thus in hedging and speculative purposes. The study can also be helpful in valuation of assets such as stock index options by observing the predicted volatility of portfolio of assets. Thus the study added a new dimension in analyzing the seasonal anomalies in the stock market.

Demirer and Karan (2002) investigated day-of-the-week effect in Turkish Stock exchange. The study was different from other studies by considering the inflation and risk-free rates in the analysis since Turkey was a different country which experienced high inflation and an unstable financial environment when considered with other stable western economies. The study used daily value of (Istanbul Stock Exchange Composite Index) ISE closing index from 1988 to 1996. The study considered the adjusted return series namely excess return over inflation and excess return over the risk free rate. The study finds no convincing evidence on presence either Monday or Tuesday effect although Friday returns were found to be consistent. The author noticed that lag variable of returns was consistently significant implying the impact of yesterday’s return on today’s return. The adjusted returns for inflation and overnight returns were found to exhibit no day-of-the-week effect.

IM Pandey (2002) examined Monthly seasonality effect in Indian stock exchange. The study considered monthly closing share price data of the Bombay Stock Exchange’s Sensitivity Index (Sensex) from 1992 to 2002. The study considered India for the study because it differs from U.S in having March end as the Tax year. The capital Gains are taxed on the sale of shares and capital losses are usually offset against capital gains. The resident and non-residents investors are liable to pay the taxes thus it was tested whether tax-loss selling hypothesis would provide explanation to presence/absence of seasonality in India. The study used autoregressive moving average model with dummy variables for testing the hypothesis. The study conclusively showed that seasonality effect exists in India. The study was found to be consistent with the ‘tax-loss selling’ hypothesis since March, the ending tax year month was found to have the statistically significant lowest returns. The author, however, required the study to be conducted on other indices to confirm the informational efficiency of the Indian stock markets.

Bhattacharya, Sarkar and Mukhopadhayay (2003) investigated seasonality in return and volatility of Indian stock market taking BSE 100 Index data series for period 1991 to 2000 using generalized autoregressive conditional heteroscedasticity
(GARCH) model. The study was done in continuation of the work done by Choudhry (2000) who examined the seasonality in returns and volatility prevailing at Indian stock markets under a unified model which had a disadvantage in the sense that there was misspecification of the conditional mean either due to omission of lagged values of returns as explanatory variables or due to structural changes and parameter instability. Thus study tried to understand the impact of autocorrelation on the estimated coefficients pertaining to the day-of-the-week anomaly in Indian stock market. The author considered reporting of the cash reserve ratio maintained by banking sector to Reserve Bank of India (RBI) during alternative Fridays referred to as “Day of the fortnight effect”. The authors find significant effects during reporting and non-reporting periods in the daily returns and the authors theorize that stock exchange regulations and nature of interaction between the banking sector with the capital market could be able to explain the “Day of the fortnight effect” instead of day of the week effect found in other developed countries.

IM Pandey (2004) investigated the presence of seasonality in Malaysian stock exchange by considering the monthly return data of Kuala Lumpur Stock Exchange’ Composite Index and Exchange Main Board All Share (EMAS) Index. The study was conducted on Malaysian stock exchange since the country differs from U.S. and other developed and developing countries in tax system by not requiring resident and non-resident shareholders to pay any taxes on capital gains. Thus tax-loss selling hypothesis should not provide any explanation for seasonality in stock returns. The study considers both regression and autoregressive moving average models with dummy variable for testing the hypothesis. After testing the return series for stationarity and heteroscedasticity, the author find seasonal effect in the stock returns but rejects the tax loss hypothesis.

Ajayi, Mehdian and Perry (2004) extended the study by Aggarwal and Rivoli (1989) and Agrawal and Tandon (1994) by conducting the research on day-of-the-week effect on eleven Eastern European Emerging Markets (EEEM). Similar to the findings by Agrawal and Tandon (1994), the authors found Monday effect to be present in only six of the EEEMs, out of which only two markets exhibited negative Monday returns which were statistically significant and different from other week days. The authors also found positive Monday returns in remaining five EEEMs, though only one of the five market index returns was found to be statistically
significant. Thus the study addressed the concerns of Agrawal and Tandon (1994) that, there exists no consistent evidence in support of presence of significant daily patterns in stock markets of EEEMs and other emerging markets and thus stressed for more research in emerging markets spread across various sample periods.

Golaka C. Nath and Dalvi (2004) studied high frequency data to decipher the presence of Day-of-the-Week effect in Indian equity market. For the study, the authors considered S&P CNX Nifty and CNX Nifty Junior indices which consider stocks which never appear in both indexes at the same time. To remove the effects of worldwide price movements on volatility of Nifty Index return, the authors considered S&P 500 index returns. The authors considered linear regression and bi-weight (bisquare) transformation of data for analysis. Wednesday was a significant day in NSE before introduction of compulsory rolling settlement in January 2002 when trading cycle used to be from Wednesday to Tuesday. Wednesday used to be the first day of the trading at NSE and Tuesday the closing day. The author made a significant finding that the Wednesday effect vanished after introduction of rolling settlement.

Amitabh Gupta (2006) extended the period of investigation examined by G. Nath and Dalvi (2004) for presence/absence of day-of-the-week effect after the introduction of compulsory rolling settlement for the period 2002-05. The study used Kruskal-Wallis non-parametric test in the study for four indices mainly BSE Sensitive Index, BSE 100, S&P CNX Nifty and S&P CNX 500. The study reported mixed results with day-of-the-week effect, by showing presence in BSE 100 AND S&P CNX 500 and no pattern for S&P CNX Nifty and BSE Sensitive Index. The author explains that the BSE 100 AND S&P CNX 500 having lowest returns on Wednesday; meant that these indices took two days to absorb the bad news announced on previous Friday.

Bodla and Jindal (2006) investigated the monthly effects in Indian stock market considering S&P CNX Nifty data for the period 1998 to 2005 using the introduction of rolling settlement period (January 2002) as considered by G.Nath and Dalvi(2004) and Amitabh Gupta (2006). The Study was conducted to find whether monthly effect (turn-of-the-month and Semi-monthly effect) existed before and after the introduction of rolling settlement. The authors considered T-test and ANOVA test for the data segmented into three categories, i.e., 1998-01 (Before), 2002-05 (after) and 1998-2005( data period). The study clearly found evidence of turn-of-the-month
effect in India and only in the long-run period the semi-monthly effect. Salaried people getting the money in the first half of the month and investing in the early half of the month might be an explanation for this phenomenon in India.

D. Mangala (2008) investigated in detail the influence of settlement period changes on the Day-of-the-Week effect in Indian stock market using non-parametric methods namely Kruskall-Wallis test, Dunn’s multiple pair comparison test based on rank matrix built in Kruskall-Wallis test and Mann-Whitney U-Test. The study was done using daily data returns for seventeen years period from 1991 to 2007. The study finds statistically significant differences in the mean returns for a period 1991 to 2007 with Wednesday recording highest mean daily returns which is three and half times the overall mean return and Tuesday recording the least mean daily returns. The Dunn’s multiple pair comparison test to identify which particular day of the week differs from the others weekdays found Monday-Wednesday and Tuesday-Wednesday to have positive deviations. A trading strategy of buying on Monday/Tuesday and selling on Wednesday was suggested to help investors to get abnormal returns. A detailed year wise distribution of mean returns by day-of-the-week showed clear evidence of structural changes in Indian stock market. The period commencing from year 1994 through 1999(NSE had Tuesday Settlement period) only showed statistically significant seasonality in daily returns distributions across weekdays with Wednesday having highest mean daily returns. In order to still look closer at the market, the entire study period was divided into three sub-periods namely period 1 (January 1991-December 1994) when NSE was not operational, Period 2 (January 1995 –December 2001) when NSE became operational and there was fixed settlement day i.e., Tuesday and Period 3 (post settlement period from January 2002 onwards) signifying introduction of rolling settlement period. During period 1, the study finds seasonality with Friday having highest mean returns, which is more or less the trend observed on Bombay Stock Exchange (BSE). The period 2 showed the influence of fixed settlement day (Tuesday) on the daily return distributions with Wednesday having the high mean returns and other days being negative. In order to bring the Indian markets at par with international markets, rolling settlement on T+ 5 basis was introduced in December 2001 which was period 3. The period 3 did not show any significant differences in the mean returns during all the days of the week.
pointing towards attainment of efficiency in the markets. Thus the research points to further research in Indian markets with respect to the period considered in the study.

R. Chander, K. Mehta and R. Sharma (2008) extended the research done by Amitabh Gupta (2004) by considering longer sample period. The authors analyzed the same indices taken by Amitabh Gupta (2004) namely BSE Sensex, S&P CNX Nifty, BSE 100 and S&P CNX 500 for a period of ten years from 1997 to 2007. The study divided the time series into two sub-periods considering the rolling settlement period (January 2002) as the base. The authors found presence of day-of-the-week effect in indices following the rolling settlement period.

M. Selvarani and Leena Jenefa (2009) investigated calendar anomalies in five broad based NSE indices namely CNX Midcap, S&P CNX Nifty, S&P CNX Defty, S&P CNX 500 and CNX Nifty Junior respectively for the period 2002 to 2007. The authors used the Non-Parametric methodologies followed by D. Mangala (2008) in the study. The study finds presence of monthly effect and day-of-the-week effect in contrast to the findings by D. Mangala where she obtained absence of any seasonal anomaly in the period 2002 to 2007 with the introduction of rolling settlement. The authors find presence of April effect in line with tax loss hypothesis in Indian markets. The noteworthy factor is that the seasonal anomalies were not consistent throughout the sub periods /years considered separately.

Kamaly and Tooma (2009) investigated day-of-the-week effect in Arab stock Exchanges which had received less attention in the literature. The weekend effect was tested in both mean and variance equations utilizing Autoregressive (AR) and Generalized Autoregressive Conditional Heteroscedastic (GARCH)-type specifications which allow for time varying variance. The study was examined using twelve Arab Monetary Fund (AMF) daily index returns from May 2002 to December 2005. The study found presence of weekend effect in both return and volatility equations with four out of twelve markets showing positive significant day dummies and eight markets exhibiting day of the week effect on volatility.

Ashish Garg and Sangeeta Chhabra (2010) gave new perspective to the study of anomalies by explaining the role of institutional and mutual funds in explaining calendar anomalies in India. The data consisting of daily purchases, daily sales and daily net investments of both FIIs and MFIs for a period of ten years from 1999 to
2009 was considered for the study. The study examined the trading patterns of FIIs and Indian Mutual Funds (IMFs) in explaining anomalies in India. The descriptive statistics of the investments by FIIs and IMFs reveal that FIIs take cue from IMFs in deciding purchase and sales during the week. In case of IMFs, the purchase is maximum on Thursday while FIIs purchase is maximum on Fridays and the maximum sales for IMFs and FIIs is on Wednesday and Thursday respectively. Thus investment strategy is formulated by FIIs by taking cue from IMFs investments the previous day. The study used one-way analysis of variance test, Independent sample t-test and econometric methods (autoregressive model with dummy day variable) for the study. The study period was divided into four sub periods considering rolling settlement date and recent recession impact on Indian markets. The analysis suggests that day-of-the-week pattern exists in Indian market considering FIIs and IMFs investments respectively. The day-of-the-week effect is found to disappear during recession (June 2007-2009). The sample period when subjected to dummy variable regression ensuring stationarity, reveal that FIIs and IMFs adopt a similar strategy irrespective of their origin. Thus the study advises investors to follow the trading pattern of IMFs which also give cue to FIIs in India.

From the literature review, we can observe that while examining seasonality in the emerging economies such as India, most studies adopted the methodology similar to the study of the developed stock markets (Keim, 1983; Kato and Schallheim, 1985; Jaffe and Westerfield, 1989). These studies have failed to handle the issues of normality, autocorrelation, heteroscedasticity etc. Thus, we intend to follow a more robust econometric approach to identify seasonal patterns. In the literature, a combined regression time series model with dummy variables specified with an autoregressive integrated moving average (ARIMA) and generalized autoregressive conditional heteroscedasticity (GARCH) model is found to be robust to handle the issues. It can also be inferred that, seasonal effect is straightforwardly detectable in the market indices or large portfolio of shares rather than in individual shares (Boudreaux, 1995). Thus the study of several calendar anomalies to be discussed shortly below in multiple indices would aid in generalization of the findings, particularly when drawn from different time periods.