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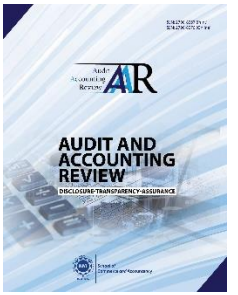

Title: **Testing Daily Seasonality Using Value Premium Portfolios Returns: The Case of Pakistan**

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Testing Daily Seasonality Using Value Premium Portfolios Returns: The Case of Pakistan

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Abstract

Calendar anomalies are well-documented phenomena in financial markets. The current study scrutinized calendar anomalies in the context of the local market by analyzing the Pakistan stock exchange. The data from the listed companies of PSX have been considered to test for seasonality in value premium portfolios using OLS regression, general GARCH (1,1), TGARCH, GJR-GARCH, PGARCH, and EGARCH models. The findings suggest that return seasonality among different value premium portfolios explains the economically and statistically significant magnitude of small firm effect. The current research also analyzed average stock returns with cross-sectional variation. It confirmed the relationship of size with daily seasonality. Furthermore, it also determined that a weak form of efficiency exists in the Pakistani stock market. Thus, the findings indicate that the investors are able to earn abnormal returns on their investments with the help of timing strategies.

Keywords: Day-of-the-Week (DOW) effect, GARCH, information processing hypothesis, Pakistan Stock Exchange (PSX), value premium portfolios

Introduction

Value stocks produce greater expected returns than growth stocks. This difference in returns is known as value premium. Rendering the conventional understanding, growth options depend on upcoming financial conditions and tend to be uncertain for assets in place (Jackson & Orr, 2019). If the value premium from growth opportunities is affected by seasonal components, then it is a point of concern for investors. Value premium does not disappear over time in contrast to the size effect. Even after many years of investigation, researchers have still not found any widely accepted explanation. However, theoretical facets suggest that

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outstanding behavior of such stocks may be instantly arbitraged away as identified or may not occur (Liu, 2021).

The existence of value premium has been supported by a vast range of studies that provide empirical evidences. Additionally, growth and value stock indicators can be identified with different value-growth indicators (Fama & French, 1998, 2006; Gharghori et al., 2013; Kyriazis & Christou, 2013; Loughran, 1997; Novy-Marx, 2013; Petkova & Zhang, 2005). The above researches investigated if the value premiums detected between the types of stocks, which can be either large or small stocks in portfolios, are unlike on Monday and on a different day of the week. This adds to this debate by expanding the test of calendar anomalies in order to assess the predictive power of different value growth indicators used in the formation of portfolios.

Asset pricing in capital markets is considered as a gauge of market efficiency and regarded as a remarkable and dynamic area of research. Over the last few decades, Efficient Market Hypothesis (EMH) has emerged as a phenomenon illustrated by different theories and market pricing models. The existence of calendar anomalies in the capital markets are explored by different researchers around the globe (Anderson et al., 2007; Griffiths & Winters, 2005; Ke & Ramalingegowda, 2005; Lee et al., 1998; Ng & Wang, 2004; Poterba & Weisbenner, 2001; Singal, 2004; Starks et al., 2006).

The calendar effects present in stock returns emphasize on the type of market efficiency however if the market have the weak form of efficiency then the prices cannot randomly move. Therefore, the value of returns can be analyzed by investors using the past patterns of stock that might violate the EMH. However, calendar anomalies allows the markets to tradeoff the stocks and also helps in developing the chances to earn abnormal returns. Moreover, the investors become biased when they know that they can earn abnormal profits in the presence of anomalies (Du Toit et al., 2018). Over time, the presence of anomalies affects the market performance and analysis of the market analysts. During the last two decades, this emphasis has shifted the motivation of emerging markets investors (Mäkelä, 2008).

Fama and French (2006) investigated the existence of value premium and whether the Book to market (BE/ME) effect is represents the Monday effect or Turn of the Month (TOM) effect.

Later, Chou et al. (2011) scrutinized value premium and January effect as well as TOM effect using only one indicator of value premium, that is, size to BE and ME. Recently, Li et al. (2018) tested monthly anomalies using book-to-market portfolios. Harshita et al. (2019) identified the existence of monthly seasonality using price to book ratio (P/B) portfolios. Most of the literature explains portfolio testing in the context of anomalies using just two indicators, that is, BE/ME and E/P. Whereas, the current study uses the return of portfolios based on size and value growth indicators by employing book to market, dividend to price, earning to price, cash flow to price, sales to price, and gross profit to total assets ratio. Thus, the investigation of calendar anomalies in the context of portfolios using different indicators indicates the efficiency of value premium indicators, in addition to different forms of market efficiency.

Calendar anomalies have been tested by many researchers in Pakistan using KSE 100 index data (Anjum, 2020; Shamshir & Baig, 2016; Ullah et al., 2016; Zafar et al., 2012; Zafar et al., 2010) and occasionally, firm level data (Husain, 1998; Mustafa, 2008). However, the current study focuses on the Day of Week (DOW) effect in portfolio weighted returns, sorted on the basis of six value growth indicators (book to market, dividend to price, earning to price, cash flow to price, sales to price ratio, gross profit to total assets). This paper is among the first to examine the DOW effect using Fama and French (2006) weighted portfolio returns, sorted with a variety of indicators while employing GARCH, TGARCH, EGARCH, GJR-GARCH, and PGARCH approach.

This research adds to the existing literature on calendar anomalies for value premium portfolios keeping in view the DOW effect. It is beneficial to both the individual and institutional investors, as well as for the fund managers of the capital market of Pakistan, who aim to receive more returns upon their investments. Furthermore, it helps investors and traders to speculate how calendar anomalies may affect their investments in value premium portfolios. This research also guides the international and domestic investors regarding how to make useful investment strategies and manage their returns. Moreover, financial experts can come to understand how these anomalies affect the capital market conditions and help them to make financial decisions according to the existing conditions.

The information regarding the existence of calendar anomalies in portfolios using different value-growth indicators is missing from the

literature. Investors would like to know whether the value premium portfolios create growth opportunities which may be affected by seasonal components. Due to the absence of any comprehensive study on the said topic, the current study remains a pioneer study on the existence of calendar effects in portfolios, such as value premium portfolios constructed on the basis of different growth indicators for value creation in Pakistan (which is an emerging market of Asia). These anomalies can benefit investors in realizing abnormally high stock returns by executing predetermined and planned strategies in the market (Guo & Wang, 2008). This study offers a description of the value premium puzzle. It focuses on the DOW effect on value premium for large firms concerning small stocks in order to identify the institutional window-dressing behavior in investment.

Literature Review

An extensive review of literature related to calendar anomalies in Pakistan is presented in this section. It discusses the methodologies, time frame, patterns, and types of anomalies to accentuate the research gap. Nishat and Mustafa (2002) were the first to investigate the weekday effect in the Karachi stock market for the period 1991 to 2001, using the mean and median approach. Overall, stock returns and conditional variance provided no significant evidence of the weekday effect. Although, the third sub-sample period showed Tuesday and Wednesday effect on volatility, exhibiting a significant positive variance. Hussain et al. (2011) analyzed the daily seasonality in the KSE 100 index over the period 2006-2010, when the trading week was changed to five days. The empirical findings indicated a significant and positive Tuesday effect with an average return greater than the rest of the days, although these days were also highly volatile. According to EMH, the market shows constant returns on all trading days (Naz et al., 2021). However, in the above study, the presence of Tuesday anomaly violated the assumption of market efficiency.

The presence of January effect can be tested to identify the calendar anomaly in the KSE 100 index results (Blahun et al., 2022). This objective can be achieved by employing the daily index data. In addition to the traditional dummy variable in the regression model, the test of calendar anomalies was amplified using the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. During the sample period, the findings showed a statistically positive January effect. However, it remains doubtful that the identified anomaly substantially contributed to profitable arbitrage

prospects, since abnormal returns were scaled between 1-3%, which was not sufficiently significant to compensate for transaction costs. Abbas and Javid (2015) extended the market efficiency analysis by using the GARCH model in mean specification to test the weekday effect. In this regard, the indices of four major SAARC countries, that is, Bangladesh, India, Pakistan, and Sri Lanka were considered. The findings indicated the presence of the DOW effect in the countries' returns and volume. Pakistan showed positive Wednesday and Friday returns together with negative returns for Monday. Sri Lanka reported positive Thursday and Wednesday returns besides negative Monday returns. Bangladesh reported positive Tuesday and Thursday returns and negative Monday returns. Whereas, the Indian stock market presented no significant return patterns, although Monday showed positive volatility. At the same time, the rest of the days, except for Friday, showed negative volatility.

Claesson (1987) performed a groundbreaking study on the DOW effect in Sweden, employing OMXS30 stock return. This study was the first of its kind as it utilized listed individual stocks of the Stockholm Stock Exchange. The results indicated that settlement effects could logically explain the DOW effect, precisely due to the stock purchase payment system. Although the findings confirmed the DOW effect due to transaction costs, it was suggested that this anomaly is likely to be relatively weak and impractical. The DOW anomaly can also be observed using the market and industry returns. Marrett and Worthington (2008) observed negative Monday in Australian stock market as an emblematic appearance of daily seasonality only in the healthcare industry. Whereas, at the market level, the returns exhibited no such evidence. However, a possible relation to the information processing hypothesis is credited to small-cap returns that showed a positive weekday effect of Thursday and Friday. The entire sample period presented a significant DOW effect in the banking industry. The Australian stock market exhibited a weak-form of efficiency due to a low level of daily seasonality. Numerous underlying aspects included derivative market development, increased globalization and widening of the local stock market, augmented institutional trading, and drastic reduction in transaction costs, particularly taxation brokerage costs and information processing (Oluseyi, 2022).

Yat et al. (2011) focused on the post financial crisis period in Asian countries to examine stock market anomalies in Malaysia. Based on the

GARCH (1,1) model, positive and significant January, July, October, and November returns were examined in seven sectors that are Constructions, Consumer Products, Finance, Industrial products, Plantation, Property, Services that results the positive Friday effect. The highest returns were in plantation, consumer products, and industrial products, based on the average of daily sector indices returns. Overall, the analysis of seven sector indices confirmed the presence of month-of-the-year and DOW effect with a significant January and Monday effect. The Malaysian stock market empirically proved inefficient and did not follow a random walk pattern. Thus, investors may still be capable of taking advantage of these anomalies.

Haug and Hirschey (2006) reaffirmed the existence of the January effect in the stock market. This effect is most significantly evident in small-cap companies. The study proved that despite introducing the Tax Reform Act of 1986, small-cap companies largely retain the January effect. Therefore, tax loss cannot be attributed to this effect. It also indicated that behavioral factors should be considered to determine the actual causes behind the January effect, specifically in small-cap companies. Agnani and Aray (2011) studied January effect on stock returns, which were analyzed using the Markov switching model. Stock returns were analyzed under two volatility regimes: high and low. The study concluded that January effect exists irrespective of the volatility regimes. Secondly, January effect persists irrespective of the portfolio size. An exciting finding is that prior literature on the calendar anomaly of January effect supports the finding of this study that this effect is most commonly found in small-cap companies (Al-Khazali, 2001). Thirdly, the study concluded that January effect tends to decline over time, which indicates that the market moves towards efficiency. However, the decline in small-cap companies is smaller as compared to large-cap companies.

The DOW effect tested in developed and emerging markets confirmed the presence of a Friday effect upon the attainment of higher returns as compared to other weekdays (Nguyen, 2022). By analyzing risks in the market provides information for the daily returns determinants. A secondary analysis showed decreased positive Friday returns in response to the freely fluctuating market risk throughout the week. This result proved that fluctuation is a consequence of market risks in Romanian market is not an anomaly (Ţilică & Oprea, 2014).

Chan and Woo (2012) investigated the existence of DOW effect using EGARCH model to establish the risk adjusted returns for Monday and Friday. On the other hand, risk adjustment may show variation for Monday while making analysis for DOW effect. However, Monday returns can be adjusted against risks that might occur due to the higher volatility present on that day (Pandey & Samanta, 2022). Yet, Monday returns were observed as normal with modified transaction costs. Cabello and Ortiz (2005) investigated the negative yet low Monday returns for the Latin American countries.

Data and Methodology

This research used the daily closing prices of the firms listed on PSX indices for the period January 2009 to December 2019. Firms were selected on the basis of the following criteria:

1. Only non-financial firms were included.
2. All firms for which the relevant data was not available were excluded.
3. Only active firms that had traded for at least 30 days were selected, instead of only considering the firm's listing status on PSX.
4. Six different samples were selected based on the proposed value-growth indicators for portfolio construction.
5. Firms showing negative value-growth indicators were also excluded.

Portfolio formation was based on the methodology of Fama and French that uses size and value growth indicators. For this purpose, six indicators were chosen including book to market, dividend to price, earning to price, cash flow to price, sales to price, and gross profit to total assets ratio (Fama & French, 1998). Whereas, the calculation of the size of the firm was based on the number of shares outstanding multiplied by the yearly closing price of the stock. The methodology of Fama and French (1995) was adopted for the analysis of equally weighted portfolios.

Methodology

The current research was conducted to check the effective implementation of the DOW effect in the developing economy of Pakistan. For this purpose, OLS regression, GARCH, TARCH, EGARCH, GJRGARCH, and PARCH models were used to measure the calendar effect on the stock market using secondary data from the PSX data portal. The models were applied to

observe volatility in the fields of asset pricing and optimal selection of portfolios and to manage the associated risks. Thus, the current researchers analyzed the model developed by Engle (1982) to model volatility forecasting in financial markets. For this purpose, PSX indices including KSE-100, KSE-30, and KSE-All Share daily closing prices were obtained for the period January 2009 to December 2018. The selection of stocks made using non-financial active companies that must be traded at least 30 days in order to calculate the regularity in the returns for the stock market.

Previous studies measured the calendar effect by using least square regression and the GARCH model presented by Zhang et al. (2017) in order to generate its impact on the trading patterns of the stock market. Muhammad et al. (2010) added the effect of the log different method to evaluate returns. Furthermore, they used the OLS method to present the DOW effect on the stock market. Thus, this study is novel in terms of the fact that it employed GARCH and its subsequent models on the daily closing prices to assess the impact of calendar anomalies on the three indices using logarithmic returns and volatility of the market. The aim was to organize the sub-period returns when the study sample was large enough to manage each factor that might affect the results.

The calculation for the single period and its sub-periods rate of return was required to estimate the average over the periods. The formula used to calculate the returns is as follows:

$$R_t = 100 * Ln[\frac{P_t}{P_{t-1}}] \quad (1)$$

Here, R_t is the rate of change in returns, Ln is the natural log of closing prices, P_t is the current closing price at time t, and P_{t-1} is the previous day's closing price of the stock. This equation was used to generate continuous compounding in order to measure the change in the rate of returns. It also provided the patterns which would help to observe the results more logically and to connect the returns over periods and their sub-periods.

GARCH Model

The model proposed by Bollerslev (1986) to deal with volatility in time-series returns is useful to check the large lagged values in the dataset. This is a generalized extension of the ARCH model which introduced conditional variance to control the volatility of the dataset in order to estimate the changes in results. The GARCH equation can be represented as follows:

$$R_t = \varphi_1 + \sum_{i=2}^{5} \varphi_i D_{it} + \sum_{i=1}^{n} \theta_i R_{t-1} + \varepsilon_t \quad (2)$$

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \quad (3)$$

In the equation above, R_t represents rate of return which involves continuous compounding, φ1 is the constant term, φ_1 is the difference of mean returns, R_{t-1} is the explanatory variable defined in terms of the lagged series of returns, θ_i provides the lagged return term, while D_{it} provides dummy variables for the days of the week with values zero and one assigned to variables on the basis of the returns for the day. Moreover, the conditional variance equation for the GARCH model includes the functions of past variances which also involve the past shocks of returns. Here, 'α' employs the short-run shocks variation over its persistence, while 'β' indicates the long-run variation in shocks persistence.

TARCH (Threshold GARCH)

TARCH model is used to evaluate the asymmetry effect of market behavior while analyzing the securities exchange market. Therefore, this model, which was advanced by Zakoian and control (1994), was used to generate the good and bad news that would occur while processing. Following is the conditional variance of the TARCH model:

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \gamma \varepsilon_{t-1}^2 I_{t-1} + \beta h_{t-1} \quad 4$$

In the equation above, ω provides the intercept, *I* is the dummy variable which predicts the value of I, if $\varepsilon_{t-1}<1$ and if not then it is zero. Here, $\varepsilon_{t-1}<0$ shows the bad news and $\varepsilon_{t-1}>0$ shows the good news under the assumptions of conditional variance. For good news, the impact can be found through α and for bad news the impact can be found through (α+ γ). Thus, γ shows the significance of the results. If it is positive and significant, then negative shocks impact highly on h_t in comparison to positive shocks.

EGARCH Model

Nelson (1991) proposed the EGARCH model, that is, the Exponential GARCH. It is basically the exponential form of conditional variances and it is used to help analyze asymmetric shocks while observing volatility. Following is the conditional variance equation for the EGARCH model:

$$\log(h_t) = \omega + \alpha \left[\frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right] + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta \log(h_{t-1}) \quad 5$$

The equation above, provides the conditional variance observation which is always positive if either one of the parameters in the equation are negative. So, this model involves the existence of the leverage effect which is to be tested by making the hypothesis $\gamma>0$. On the other hand, if $\gamma \neq 0$ then the interpretation would be the same that neither positive nor negative shocks have the same effect on volatility.

GJR GARCH Model

This model was proposed by Glosten et al. (1993). It follows the ARCH family models in order to analyze the volatility behavior of stock returns. This model helps to analyze the characteristics of leveraged effect and assumes the squared error term for conditional variance, whether these error terms are positive or negative. Thus, GJR functions as it takes the value 0 when there is a positive conditional variance and 1 to show negative variance. The leverage effect arises when unconditional variances are skewed in the data which causes positive / negative estimates in relation to positive / negative skewed returns. This model is relatively similar to the TGARCH model, as mentioned previously. The latter model analyzes the conditional standard deviation for the analysis of returns, instead of conditional variance.

The GJR-GARCH (1, 1) model can be estimated as follows:

$$\delta_t^2 = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \beta_1 \delta_{t-1}^2 + d_1 \mu_{t-1}^2 I_{\mu<0}(\mu_{t-1}) \quad 6$$

where δ_t^2 is the conditional variance for volatility at time *t,* α_0 is constant, and α_1 and β_1 show the first order of ARCH term to analyze the new volatility about the previous period and the first order of the GARCH model with persistent coefficient, respectively. Finally, d_1 is the leverage effect parameter and I is the indicator function.

PGARCH Model

Ding et al. (1993) proposed the model of PGARCH (p, q, δ). This model helps to analyze the asymmetry, volatility, and influence of asymmetric shocks on volatility. Thus, it remains a flexible model in the ARCH family, which allows exogenous variables to explain the dependent variable. In this regard, the equation variance utilizes the conditional standard deviation for the analysis of volatility, instead of the conditional variance. The mean equation of the return series can be analyzed using the autoregressive

process (AR (k)). The conditional variance equation of PGARCH can be processed as follows:

$$h_t^{\delta} = \alpha_0 + \sum_{i=1}^{p} \alpha \left(|\varepsilon_{t-1}| - \gamma_i \varepsilon_{t-1}\right)^{\delta} + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^{\delta} + \varepsilon_t \quad 7$$

where α_0 shows the lagged error term, β_j shows the lagged conditional variance effect, γ_i is the leverage effect coefficient, and δ is the power parameter with a positive value. Furthermore, $\delta > 0$ is the negative shock with a higher significant effect representing conditional volatility, instead of positive shock.

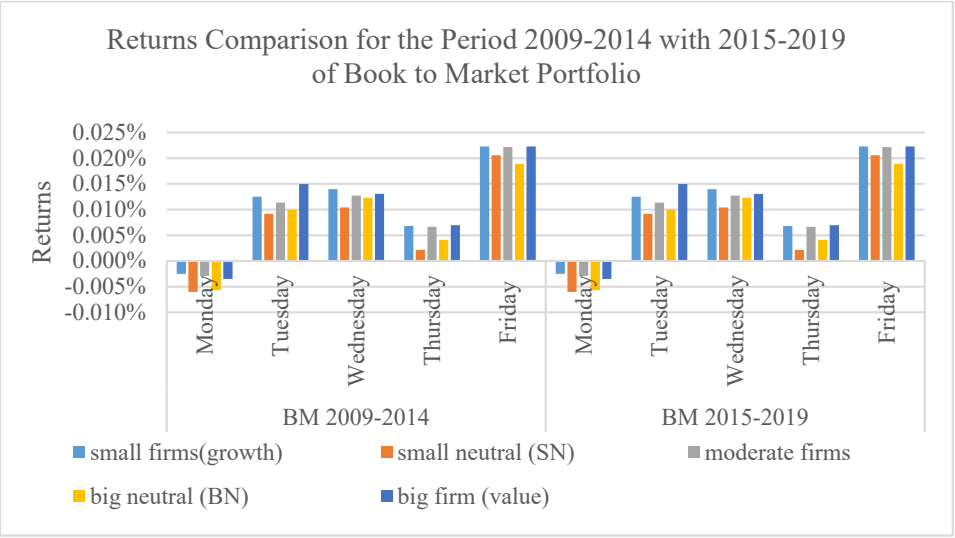
Results and Discussion

Descriptive Analysis Daily Portfolio Weighted Returns

Figure 1 displays the daily returns configuration of B/M portfolios showing Monday negative and Friday positive returns in both sample periods with a similar magnitude. These results are consistent with the studies of (Chai et al., 2020; Fama & French, 2021; Novy-Marx, 2013).

Figure 1

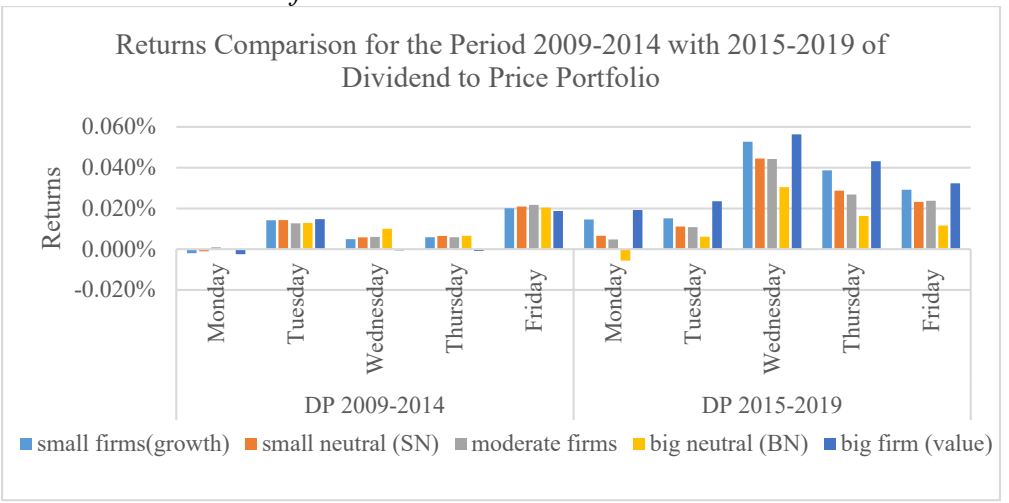
Book to Market Portfolio



While, D/P portfolios in Figure 2 show a negative Monday and a positive Friday return rate. Moreover, an inverse pattern of returns is observed in the second sample period with the highest Wednesday and the lowest but positive Monday returns.

Figure 2

Dividend to Price Portfolio



In the case of earning to price portfolios (depicted in Figure 3), the value firms show negative Monday with the lowest returns and the highest returns contribution for Friday. The second sample period appears with low Monday returns, while Wednesday returns are the highest in this sample period. Interestingly, growth firm's returns input is more significant than the value firm in this period. These results are consistent with the findings of (Fama & French, 2021; Khan et al., 2022).

Figure 3

Earnings to Price Portfolio

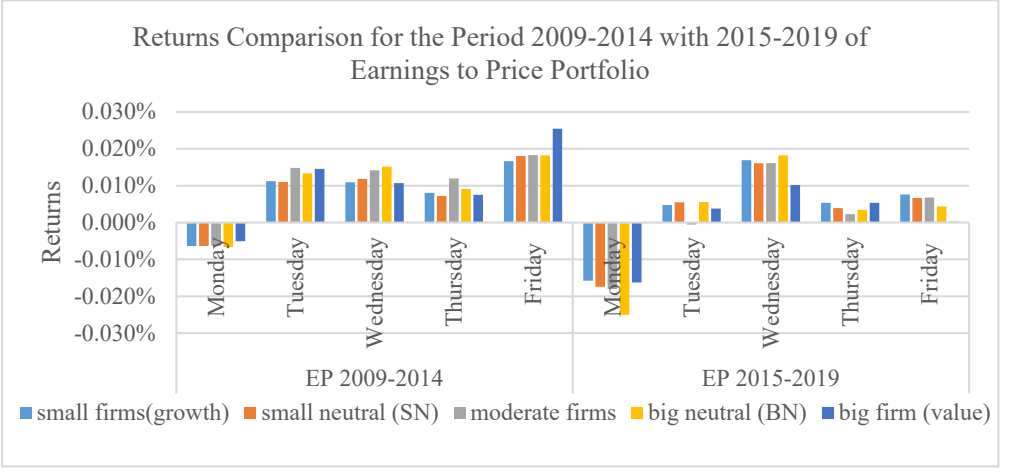


Figure 4 highlights a similar return pattern with the lowest Monday and positive Friday, which enhances the influence of growth firms in gross profit to total assets portfolio. In contrast, the figure shows that value firms share a more significant low Monday and high Wednesday returns in the second sample period.

Figure 4

Gross Profit to Asset Portfolio

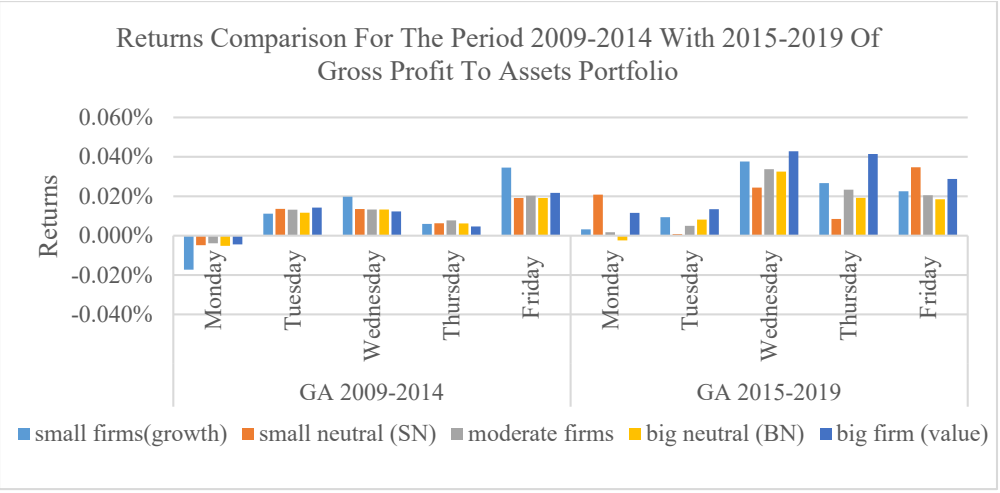
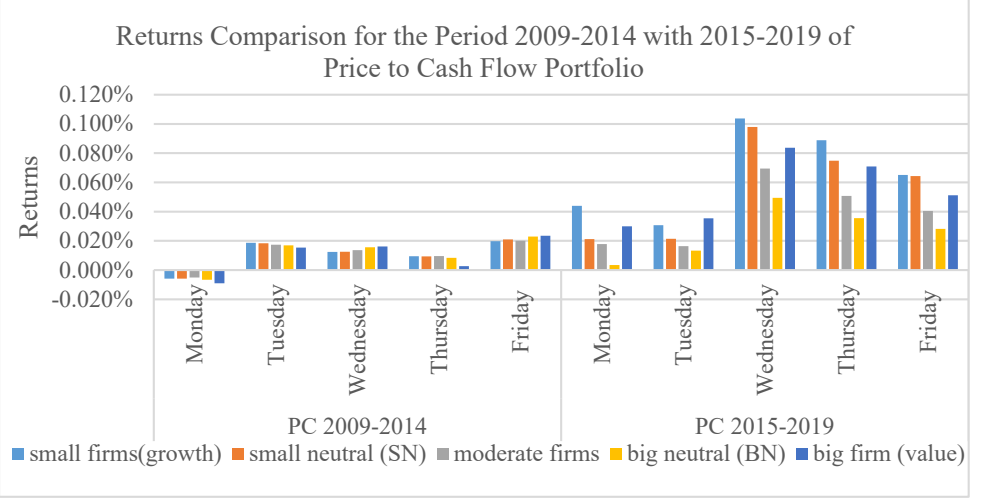


Figure 5

Price to Cash Flow Portfolio



Further, no noticeable change is observed in Figure 5 in the context of daily returns in price to cash flow portfolio except the return pattern behavior, which is high in growth firms for the second sample period. These results are consistent with the findings of (Novy-Marx, 2013).

In Figure 6, sales to price-weighted average daily returns contribution of big neutral firms are highest in the first sample period with low Monday and high Friday returns. While, they are the lowest for growth firms in the second sample period with similar day return patterns. These results are consistent with the study of (Dhatt et al., 1999).

Figure 6

Sales to Price Portfolio

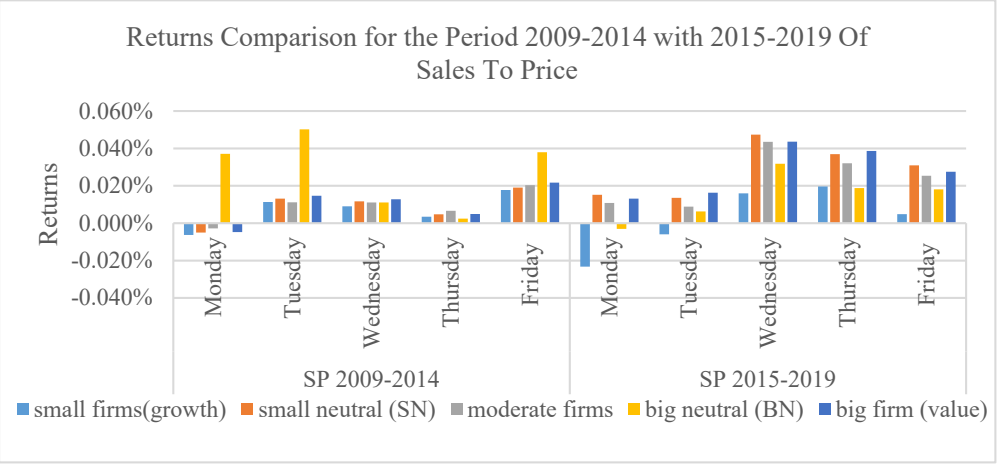


Table 1

Summary Results DOWE (Regression, GARCH, TGARCH, GJR-GARCH, EGARCH, PGARCH)

	Sample Period (2009-2014)			Sample Period (2015-2019)		
			Value Weighted Returns			
KSE-100 Index	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Wednesday (+)
KSE-30 Index	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
			Equal Weighted Returns (On the basis)			
			Panel A: Book to Market			
Small	Monday (-)	Wednesday (+)	Friday(+)	Monday (-)	Tuesday (-)	Wednesday (+)
2	Monday (-)	Wednesday (+)	Friday(+)	Monday (-)	Tuesday (-)	Wednesday (+)
3	Monday (-)	Wednesday (+)	Friday(+)	Monday (-)	Tuesday (-)	Wednesday (+)

	Sample Period (2009-2014)			Sample Period (2015-2019)		
4	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Wednesday(+)
Big	Monday (-)	Wednesday (+)	Friday(+)	Monday (-)	Wednesday(+)	
Panel B: Earning to Price						
Small	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
2	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
3	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Wednesday(+)
4	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
Big	Monday (-)	Wednesday (+)	Friday(+)	Monday (-)	-	-
Panel C: Dividend to Price						
Small	Friday (+)	-	-	Monday (-)	Wednesday(+)	Friday (+)
2	Friday (+)	-	-	Monday (-)	Wednesday(+)	Friday (-)
3	Friday (+)	-	-	Monday (-)	Wednesday(+)	Friday (-)
4	Wednesday (+)	-	-	Monday (-)	Wednesday(+)	Friday (-)
Big	Tuesday(+)	Friday (+)	-	Wednesday(+)	Thursday (-)	Friday (-)
Panel D: Cashflow to Price						
Small	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
2	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
3	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
4	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
Big	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	Thursday (+)
Panel E: Gross Profit to Total Assets						
Small	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	Friday (-)
2	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
3	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Wednesday (+)
4	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
Big	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Thursday (+)
Panel F: Sales to Price						
Small	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	-
2	Monday (-)	Wednesday (+)	-	Monday (-)	Wednesday(+)	-
3	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Thursday (-)
4	Monday (-)	Wednesday (+)	-	Monday (-)	Tuesday (-)	Wednesday(+)
Big	Monday (-)	Wednesday (+)	-	Wednesday(+)	Thursday (-)	Friday (+)

DOW Effect in Portfolio Weighted Returns

Since the data was analyzed utilizing regression and five different GARCH models, it is impossible to present the coefficients and significance of all models. Thus, a summary of all significant findings is presented with the respective coefficient sign.

In Table 1, Panel A and Panel B show similar findings for Book to Market and Earning to Price weighted returns, as the weighted returns were tested using five different GARCH models. The summary of the results comprises a significant returns pattern with 1%, 5%, and 10% significance, respectively. Moreover, 83% of the results showed 1% significance, validating the negative Monday and positive Wednesday effect in both samples, except for Friday positive in the first sample period and Tuesday negative in the second sample period in B/M returns.

The degree of significance shows that returns have been monotonically increasing among the five smallest capitalization stocks across both sample periods in B/M and Earning to Price portfolios. In this regard, growth firms exhibited a smaller coefficient for lower Monday returns, even if the contribution of the value firm return was similar in both periods.

Panel C contains the dividend to price sample sorting. The findings verified the presence of positive Friday only in small and big firms with a smaller coefficient in big firms, although Monday has lower returns in the second sample period with positive Wednesday. Whereas, mix findings for positive Friday are observed. Again, Panel D, E, and F have the more significant Monday negative and Wednesday positive returns. Moreover, the coefficients for Mondays are invariably negative, indicating negative Monday return patterns in portfolio returns.

Furthermore, small firms coherently display a higher absolute value of Monday coefficients than the corresponding coefficients for small firms (growth), small neutrals (SN), moderate firms, big neutrals (BN), and big firms (value). It shows the relationship of size with DOW anomaly. Empirical support for this finding can be found in (Abraham & Ikenberry, 1994; Chatterjee & Maniam, 1997; Fama & French, 2021; Rogalski, 1984).

Conclusion

Equal weighted returns in almost all indicators supported the small firm effect, while cumulative small-cap returns provided ten times higher returns

than other trading days. Keeping in view the indicators, it was observed that only dividend to price and price to cash flow indicators presented substantially higher returns and a momentous DOW effect in the form of positive Wednesday and Friday, coupled with negative Monday and Tuesday effect. It can be suggested that the strong seasonality found in the weighted returns is the sole reason for the same anomaly in the market and in small-cap returns as well, taking into account the structure of weighted returns used in this study, which is explained by the information processing hypothesis and information release hypothesis. The empirical findings provided strong evidence (significant at 1%) of the negative Monday and positive Wednesday effect in firm-level and indices returns during the sample period. The presented results are slightly different from the results of (Anjum, 2020), as the results obtained in this study are based on a different sample period.

It was determined that the beginning of the week is influenced by the previous three days' news concerning the investors' decisions. On the first day of the week, investors are usually hesitant and demand more information. Furthermore, investors often avoid the last day of the week, although estimates are statistically insignificant. Hence, trading activity is high on the last day of the week (Anjum, 2020). At the same time, there is no conclusive reason except for the size of the sector returns for the varying DOW pattern in some sectors' stock returns. For example, the returns on Mondays are more likely to be negative if the returns on the previous Friday were negative, which is depicted in KSE indices and industry returns.

Implications

This research would be helpful for local and international investors, traders, and arbitrageurs who wish to analyze different trading approaches. Moreover, the current study would help to analyze and predict stock behavior if anomalies exist in the capital market. Internationally, calendar anomalies have been studied and reported; however, these anomalies needed to be investigated for the Pakistani stock market, which establishes the relevance of this research. The investigation of calendar anomalies would help the stakeholders to analyze their investments in and outside the Asian countries. Furthermore, this research extends the empirical literature for the value premium portfolios.

Limitations

The methodological contribution of the current study is the formation of industry-wise or sectoral returns for analysis based on a selected sample of companies, as there are no industry-wise indices available for all sectors in PSX. Therefore, this composition might induce selection bias, although selection was made considering all critical factors. The current study employed only the daily data, whereas an intraday analysis could provide an in-depth view of abnormal return patterns. The portfolio returns for 2020 were not analyzed in this research due to the unavailability of data set, which was unavailable due to the COVID-19 pandemic.

Future Recommendations

The results imply that stock market efficiency is directly linked to the allocation of scarce capital and resources. So, effective informational efficiency is required to achieve an efficient pricing mechanism for the productive use of these resources. Similarly, future studies may examine the intraday price movements to predict and recognize returns variation for different trading areas during the day. Furthermore, volatility models should be studied in-depth for each particular DOW effect.

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