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CALENDAR ANOMALIES IN MAJOR EMERGING COUNTRIES: DAY-OF-THE-WEEK AND MONTH-OF-THE-YEAR EFFECTS

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DECEMBER 2019

CALENDAR ANOMALIES IN MAJOR EMERGING COUNTRIES: DAY-OF-THE-WEEK AND MONTH-OF-THE-YEAR EFFECTS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

KEMAL ARI

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF BUSINESS ADMINISTRATION

DECEMBER 2019

Approval of the Graduate School of Social Sciences

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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Business Administration.

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Business Administration.

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ABSTRACT

CALENDAR ANOMALIES IN MAJOR EMERGING COUNTRIES:
DAY-OF-THE-WEEK AND MONTH-OF-THE-YEAR EFFECTS

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December 2019, 128 pages

Market anomalies have attracted many investors and researchers for several decades as they eagerly seek to either beat the market to generate abnormal profits or gain a thorough understanding of those anomalies. Emerging countries, held in high esteem by the worldwide investment community for their rapid growth and diversification benefits they provide, are the main focus of this study. The market efficiency of the major emerging markets, Brazil, Russia, India, China, South Africa, and Turkey are evaluated in this research through the investigation of the popular calendar anomalies, day-of-the-week effect, and month-of-the year effect. Moreover, the day-of-the-week effect is further examined according to the direction of the previous day's price change. The study has two primary aims:

1. Analyzing and presenting the effects of the days of the week and months of the year on stock and stock index returns in the major emerging countries
2. Determining whether the day-of-the-week and the month-of-the-year effects that would possibly be revealed by the empirical findings of this research are consistent over time

Data from a total of 20 stock market indices and 600 individual stocks from the six emerging countries are used in the analyses for the time period of 1992 – 2018.

GARCH (1,1) model is used in the analyses, and the results reveal that all six countries have the day-of-the-week effects on the market returns, however, after the 2008 financial crisis, those effects disappear for the markets of Brazil, Russia, and India. Regarding the month-of-the-year anomaly, for Brazilian, Russian, South African, and Turkish markets, the monthly effects are apparent.

Keywords: Calendar Anomalies, GARCH, BRICS, Turkey

ÖZ

GELİŞMEKTE OLAN ÜLKELERDE TAKVİM ANOMALİLERİ:
HAFTANIN GÜNÜ VE YILIN AYI ETKİLERİ

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Tez Yöneticisi: Doç. Dr. Adil Oran

Aralık 2019, 128 sayfa

Piyasa anomalileri, ortalama üstü getiri elde etmek isteyen yatırımcıların ve bu anomalileri çözümleyebilmek isteyen araştırmacıların ilgisini uzunca bir süredir çekmektedir. Bu çalışmanın odağı, yüksek büyüme hızları ve sundukları portföy çeşitlendirme avantajları ile uluslararası yatırımcıların dikkatini üzerlerine toplayan gelişmekte olan ülkelerdir. Bu araştırmada, gelişmekte olan başlıca ülkelerden Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye'nin piyasa etkinlikleri, en yaygın olarak bilinen takvim anomalilerinden olan haftanın günü etkisi ve yılın ayı etkisinin incelenmesi yoluyla değerlendirilmektedir. Bununla birlikte, haftanın günü etkisi, bir önceki günün fiyat değişim yönüne göre de analiz edilmektedir. Bu çalışmanın iki temel amacı bulunmaktadır:

a. Gelişmekte olan başlıca ülkelerde, hisse senedi ve hisse senedi endeks getirileri üzerindeki haftanın günü ve yılın ayı etkilerini analiz etmek ve sunmak
b. Gözlemlenen haftanın günü ve yılın ayı etkilerinin örneklem periyodu boyunca tutarlı olup olmadığının belirlenmesi

Bu doğrultuda, bahsi geçen altı ülkeden 20 borsa endeksi ve 600 hisse senedi için 1992 – 2018 dönemine ait veriler kullanılmıştır. Analizlerde GARCH (1,1) modeli kullanılmıştır. Bulgular, altı ülkenin hepsinde haftanın günü etkisi bulunduğunu, fakat 2008 finansal krizinden sonraki dönemde bu etkilerin Brezilya, Rusya ve Hindistan için ortadan kalktığını ortaya koymaktadır. Yılın ayı etkisi ise, Brezilya, Rusya, Güney Afrika ve Türkiye pazarlarında görülmektedir.

Anahtar Kelimeler: Takvim Anomalileri, GARCH, BRICS, Türkiye

To My Family

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my advisor Assoc. Prof. Dr. Adil Oran for the continuous support throughout my study, for his valuable guidance and motivation. He provided lots of good advices and ideas and gave me encouragement during the research.

I would also like to thank Prof. Dr. Uğur Soytaş for his useful suggestions and comments.

I am grateful to my friends for helping and motivating me.

I am forever indebted to my parents for their love, caring and for giving me the opportunities and experiences that have made me who I am. I am thankful to my brother for always being there for me as a friend. I also express my thanks to my family-in-law for their support.

I must express my very profound gratitude to my wife for providing me with unwavering support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This journey would not have been possible without her support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

EMH	Efficient market hypothesis
BRICS	Brazil, Russia, India, China and South Africa
BRICS-T	Brazil, Russia, India, China, South Africa and Turkey
DoW	Day-of-the-week
MoY	Month-of-the-year
ToM	Turn-of-the-month
CLNY	Chinese lunar new year
IMF	International Monetary Fund
MSCI	Morgan Stanley Capital International
GDP	Gross domestic product
PPP	Purchasing power parity
ANOVA	Analysis of variance
OLS	Ordinary least squares
ARCH	Autoregressive conditional heteroskedasticity
GARCH	Generalized autoregressive conditional heteroskedasticity
TGARCH	Threshold GARCH
EGARCH	Exponential GARCH
SC	Serial correlation
LM	Lagrange multiplier
B3	Brasil, Bolsa, Balcão (Brazilian Stock Exchange)
MOEX	Moscow Stock Exchange
BSE	Bombay Stock Exchange
NSE	National Stock Exchange of India
SSE	Shanghai Stock Exchange
SZSE	Shenzhen Stock Exchange
JSE	Johannesburg Stock Exchange
ISE	Istanbul Stock Exchange
NYSE	New York Stock Exchange

CHAPTER 1

INTRODUCTION

Market anomalies have been powerful attractions for many researchers as well as investors for several decades. As investors make every effort to discover and exploit them to gain abnormal returns, researchers constantly strive towards gaining a thorough understanding of what they are and why they occur. Market anomalies are unusual patterns in returns of securities that cannot be explained by the efficient market hypothesis (EMH) developed by Fama in 1965. The EMH states that the financial markets are efficient and that prices of securities reflect all available information and adjust to any new information quickly so that it is impossible to beat the market consistently by doing research and selecting the right securities to invest in. Although the EMH is widely accepted by the academic finance community, several researches are suggesting the opposite that anomalies exist in financial markets.

Market anomalies can be classified into two categories, cross-sectional and time-series anomalies or calendar anomalies, as they are also called. Cross-sectional market anomalies refer to the superior performance of particular securities in comparison with others, such as size effect, value effect, and neglected stock effect. Calendar anomalies, which are the main focus of this research, refer to the significant calendar-related differences in returns of securities. Day-of-the-week (DoW) effect, month-of-the-year (MoY) effect, Monday effect, January effect, turn-of-the-month effect are some of the most researched calendar anomalies.

One of the earlier studies on the calendar anomalies is Godfrey, Granger, and Morgenstern's study in 1964, which examines London and New York markets in the period of 1951 – 1963. Godfrey et al. conclude that the differences between daily high and low prices are only weakly correlated with the daily trading volume, and no correlation exists between the observed daily prices and the daily trading volume. In another study, Fama (1965), analyzing daily prices of stocks in the Dow Jones Industrial Average between 1957 and 1962, suggests that Monday's variance is 22% higher than the rest of the week. Cross (1973) and French (1980) observe statistically significant negative Monday returns in the S&P Composite Index between 1953 – 1970 and 1953 – 1977, respectively. In 1981, Gibbons and Hess confirmed the previously found negative Monday effect using daily return data for S&P 500 index and two other portfolios from 1962 through 1978.

Emerging markets attract considerable interest from not only domestic investors but also international investors. According to the International Monetary Fund (IMF) report in April 2019, emerging countries have grown two to three times faster than the advanced countries in the last 20 years. Furthermore, it reveals that the emerging countries are expected to keep growing faster in the future. In the same report, it is indicated that the GDP per capita, in terms of purchasing power parity (PPP), of Brazil, Russia, India, China, South Africa, and Turkey have increased 86%, 580%, 305%, 196%, 86% and 185%, respectively, between 1999 and 2018. In the meantime, the rates of increase for the USA, Japan, Germany, France, the United Kingdom are 81%, 72%, 85%, 70% and 81%, respectively. International investors choose to invest in where the growth is, as corporate profits tend to grow faster when the economy is growing faster. Apart from that, emerging markets provide international investors with diversification benefits since correlations between developed and emerging markets are still weak due to incomplete integration of emerging markets into world markets, according to Bekaert and Harvey (2017).

There is a considerable number of studies focusing on the calendar anomalies in developed markets; however, the number of studies investigating calendar effects in emerging markets, especially the BRICS countries and Turkey, which represent almost every continent in the world, is quite few. Since there is even growing interest from international investors in those fast-growing markets for the reasons mentioned earlier in this study, and there are not many comprehensive researches covering the six emerging countries in question, calendar anomalies in the BRICS countries and Turkey are the main topics of this research.

In this study, the market efficiency of Brazil, Russia, India, China, South Africa, and Turkey stock markets are evaluated through the investigation of the popular calendar anomalies, day-of-the-week effect, and month-of-the year effect. The study has two main aims:

1. Analyzing and presenting the effects of the days of the week and months of the year on stock and stock index returns in the emerging BRICS-T countries
2. Determining whether the DoW and MoY effects that would possibly be revealed by the empirical findings of this research are consistent over time

A total of 20 stock market indices and 600 individual stocks from the six countries are used in the analyses. The daily and monthly closing price data have been collected so that they not only are comprehensive but also cover a long time span. This research first seeks to identify whether the DoW effect exists in these markets by analyzing the daily returns of stocks and indices. Then, it analyzes the daily index returns further in order to asses the influence of previous day returns on the DoW effect. In the meantime, the MoY effects are examined using the monthly index returns. Moreover, average weekly returns and average yearly returns are included in the analyses of the DoW and MoY anomalies to remove trend effects in the data and have a better grasp of the return patterns. Another contribution to the literature is the usage of the trinomial test, developed by Bian, McAleer, and Wong (2009), to make interpretations of the individual stock analyses of the DoW effect.

The rest of this study is organized as follows: Chapter 2 describes literature review on the subjects regarding the emerging markets, market efficiency, and calendar anomalies and discusses previous studies analyzing developed markets and emerging markets. Chapter 3 describes the data and explains the methodology used in the study. Chapter 4 provides the empirical findings of the research. Finally, conclusions drawn from the empirical analyses and further research issues are presented in Chapter 5.

CHAPTER 2

LITERATURE REVIEW

Emerging markets have been attracting increasing attention of investors from all over the world, and these countries have been drawing new foreign investments. A recent IMF study in April 2019 (Figure 2.1) indicates that the contribution of emerging countries to world GDP based on purchasing power parity has increased from 42% in 1992 to 60% in 2019. On the other hand, by 2019, the stock market capitalization of emerging countries corresponds to only 11,8% of world total stock market capitalization, according to Morgan Stanley Capital International (MSCI) June 2019 data. Additionally, the Index Performance section of the MSCI (2019) data shows that annualized gross returns since 1987 are 10.60% for emerging markets index and 7.85% for developed markets index and annualized standard deviations since 2009 are 17.50% for emerging and 13.48% for developed markets. Prior research by Bekaert and Harvey (2017) investigates the foreign investment levels in emerging markets and evaluates the future of investments in those markets. Their research implies that despite the increase in correlation in the past twenty years, emerging markets are not completely integrated into world markets, and they have smaller equity market capitalization and higher individual country volatility than developed countries; hence, investing in emerging markets provide considerable diversification benefits to investors.

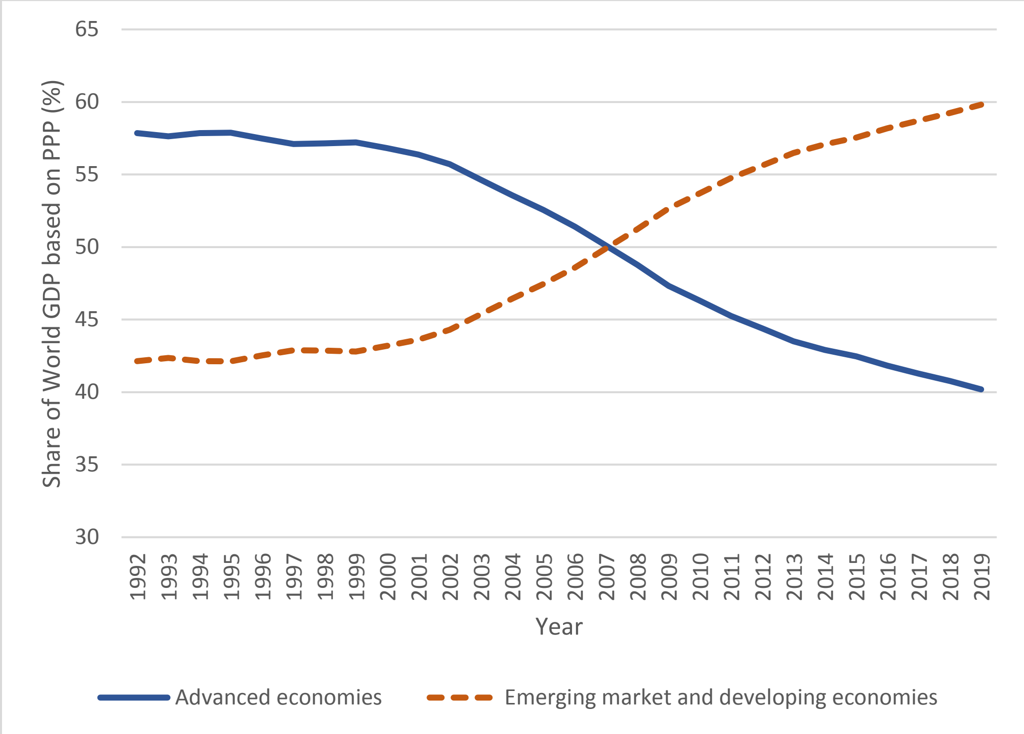

Figure 2.1 GDP share of emerging and developed countries in the world total GDP, based on PPP. From IMF. Retrieved June 28, 2019, from https://www.imf.org/external/datamapper/PPPSH@WEO/OEMDC/ADVEC

According to Fama (1970), in efficient markets, market prices fully reflect all available information, and it is impossible for investors to beat the market and achieve abnormal returns. However, many investors are constantly in search of a way to beat the Efficient Market Hypothesis (EMH), and much of these efforts focus on market anomalies. Keim (2008) defines financial market anomalies as unpredictable cross-sectional or time-series patterns in security prices or returns, which contradict commonly accepted theories, such as the EMH. Market anomalies are important indicators for inefficiency in markets as they imply that those markets can be beaten, and investors can achieve high profits with low risk. There are a significant number of researches on time-series predictability or calendar anomalies such as day-of-the-week effect, Monday effect, turn-of-the-month effect, month-of-the-year effect, January effect, holiday effect, and so on, in the emerging markets and more in the developed markets. The day-of-the-week effect refers to the significant differences in returns of a security or a group of securities on different days of the week. Monday effect is a specific type of the DoW effect where returns on Mondays are lower than the rest of the days. Turn-of-the-month anomaly is defined as the superior returns in the last trading day of the month and early days of the following month in comparison to the rest of the month. The month-of-the-year effect is that there is considerable variability in returns across months of the year. January effect is a phenomenon that returns in January are higher than returns in the rest of the year.

2.1. Calendar anomalies in developed markets

Fama (1965) investigates all stocks in the Dow Jones Industrial Average index between 1957 and 1962 in order to detect any day-of-the-week effect on stock return variances. Fama demonstrates that Monday's variance is 22% higher than the other days of the week.

Cross (1973) examines the S&P Composite Index for Monday effect in the time period of 1953 – 1970, and Monday returns are found to be significantly lower than Friday returns. The author also reveals the dependence of Monday returns on the directions of Friday's price changes, as there is a significant difference between Monday returns after positive returns on the preceding Friday and Monday returns after negative returns on the preceding Friday. French (1980) also observe statistically significant negative Monday returns in the S&P Composite Index between 1953 and 1977.

Gibbons and Hess (1981) investigate the-day-of-the-week anomalies in the S&P 500 index and The Center for Research in Security Prices (CRSP) portfolios for the time period 1962-1978 and subperiods. Test results indicate that for the whole time period and all subperiods except 1974-1978, a statistically significant day-of-the-week effect exists with Monday returns being the lowest, and the returns on Wednesday and Friday are highest among all days of the week. Kato and Schallheim (1985) examine the Tokyo Stock Exchange (TSE) of Japan for the presence of January and size effects. For the twenty-nine-year period of 1952 to 1980, authors show that a statistically significant and positive month-of-the-year effect in January and June exists for the Japanese market through Analysis of Variance (ANOVA) and Kruskal - Wallis nonparametric test. The authors also specify that the firm-size effect exists in the TSE.

Another previous study (Barone, 1989) focuses on various calendar anomalies, namely, day-of-the-week, weekend, turn-of-the-month, holiday, and month-of-the-year effects on the MIB Storico stock index of the Milan Stock Exchange using daily closing values from 1975 to 1989. ANOVA and t-test results indicate that following calendar anomalies are present in the MIB Storico stock index: positive end-of-month returns, positive January returns, negative Tuesday and positive Friday returns, and positive returns on the preceding days of the Easter holiday and the Christmas day (December 25).

In a 2002 research by Mehdian and Perry, the January effect on stock market indices in the US is examined for the time period 1964 – 1998 and two subperiods. Daily closing values from the Dow Jones Composite, the New York Stock Exchange Composite and the S&P 500 indices are analyzed by Mehdian and Perry using regression model, and the results indicate that statistically significant positive January effects exist for all three stock market indices for the whole sample period and the subperiod from 1964 to 1987; however, after 1987 the January effect disappears. In a similar research, Davidsson (2006) examines the market efficiency of the US market through the S&P 500 index between 1970 and 2005. Day-of-the-week (DoW), month-of-the-year (MoY), and quarter-of-the-year (QoY) anomalies are analyzed using dummy variable regression. Results of the regression for the DoW effect indicate that there is a positive Wednesday effect on the index, whereas Monday has the lowest return, although it is not statistically significant. Moreover, for the months of January, November, and December, statistically significant positive returns show that MoY anomaly is present in the S&P 500 index. As for the quarter analysis, Davidsson specifies that Quarter 4 has the highest return and the statistical significance, whereas Quarter 3 is the only quarter with a negative return; however, this is not statistically significant. Sharma and Narayan (2014) investigate the New York Stock Exchange (NYSE) for the presence of the turn-of-the-month (ToM) effect by employing time-series data for 560 companies from 14 sectors listed on the NYSE from 2000 to 2008. Estimating the GARCH model, the authors show that there is a statistically significant positive ToM effect for the aggregate NYSE returns. As for the sectoral analysis, the authors find that a significant and positive ToM effect exists in the financial sector (60% of firms), the real estate sector (44% of firms), the engineering sector (42% of firms) and the computer sector (40% of firms). On the other hand, although ToM effect on aggregate return volatility for NYSE is statistically insignificant, for 12 of 14 sectors, more than 50% of the firms have significant ToM effects.

Liu and Li (2010) examine the day-of-the-week effect in Australian stock exchange using daily returns of the top 50 individual stocks from different industries between January 2001 and June 2010. T-test results indicate that the highest weekday returns are on Monday for 15 companies, while the lowest returns take place on Friday for 15 companies. Moreover, the research indicates that Monday returns are significantly larger than that on other days for only six companies. Liu and Li conclude that there is no strong evidence of the Monday effect in the Australian market.

A study on Asian countries (Yuan & Gupta, 2014) investigates eight major Asian stock markets (i.e., Japan, South Korea, Singapore, Malaysia, China, Hong Kong, Taiwan and India) for Chinese Lunar New Year (CLNY) holiday effect using daily stock index returns for the period of 1999 to 2012. Results from the ARMA(1,1)-GARCH(1,1) model show the presence of pre-CLNY holiday effect with significantly positive returns in all countries examined, except India. However, when the ARMA(1,1)-GARCH(1,1)-M model is used in order to include conditional risk, the pre-CLNY holiday effect disappeared for the Chinese stock market, and therefore, it is inferred that high pre-CLNY returns for China are rewards for high risk unlike other countries investigated.

Month-of-the-year (MoY) anomaly in Baltic stock markets is examined (Norvaisiene, Stankeviciene, & Lakstutiene, 2015) using daily return data of the stock market indices Nasdaq OMX Tallinn of Estonia, Nasdaq OMX Riga of Latvia and Nasdaq OMX Vilnius of Lithuania for the period of 2003-2014. Results of the regression display the presence of MoY effect in Estonia with a significant positive return in January and significant negative return in October and Lithuania with significant positive returns in January, August, and November and significant negative return in October. However, the results imply that MoY anomaly does not exist in the Latvian market.

Zhang, Lai, and Lin (2017) examine 28 indices from 25 countries for the day-of-the-week (DoW) anomaly between 1990 and 2016. Daily closing prices of 15 indices from emerging stock markets and 13 indices from developed stock markets are investigated by applying the GARCH model and rolling sample method. Results of the tests indicate that stock markets of 24 countries experience the day-of-the-week effects; however, different rolling sample intervals produce different results in the French market (e.g., significant Monday effect with a sample interval of 500 days and significant Tuesday effect with a sample interval of 1500 days). Six countries (USA, China, Argentina, Poland, Italy, and Singapore) have Monday anomalies, two countries (the USA and Canada) have Tuesday anomalies, seven countries (Mexico, Indonesia, Germany, Switzerland, Australia, Japan, and New Zealand) have Wednesday anomalies, two countries (the Czech Republic and the Philippines) have Thursday anomalies and eight countries (Brazil, Chile, Turkey, India, Malaysia, Russia, Spain, and Hong Kong) have Friday anomalies.

Sawitri and Astuty (2018) analyze stock index returns of France, Germany, England, Spain, and Indonesia for the existence of the monthly effect for the period of 2010-2016 and two subperiods of 2010-2013 and 2014-2016. Using OLS and GARCH (1,1) models, Sawitri and Astuty show that OLS/2010-2016 displays a positive October effect on Germany, GARCH/2010-2013 displays May effect on Spain, OLS/2010-2013 displays May effect on Spain and October effect on Germany, GARCH/2014-2016 displays February effect on the UK. For Indonesia, the GARCH (1,1) model displays statistically significant month of the year effect, that is, positive September effect for 2010-2016 and 2010-2013 periods and negative April effect for the 2013-2016 time period.

Abrahamsson and Creutz (2018) examine the weak-form efficiency level in the Swedish stock market through investigation of the day-of-the-week (DoW) effect on the OMXS30 stock index between 2000 and 2017. Although t-statistic and the OLS regression analyses show the presence of a day-of-the-week effect, the Breusch-Pagan test result implies that heteroskedasticity should be taken into consideration for the samples used in the study. Thus, GARCH and TGARCH methods are employed, and they indicate that there is no day-of-the-week effect in the OMXS30 stock index, and this index can be concluded as weak-form efficient.

2.2. Calendar anomalies in emerging markets

Fountas and Segredakis (2002) investigate stock index returns of 18 emerging countries for the January effect for the time period 1987-1995 using regression. The sample contains weekly and monthly data. It shows that there is a significant seasonality of monthly returns for Chile, Colombia, India, Malaysia, Mexico, Nigeria, and Zimbabwe (at 1% significance level) and Argentina, Greece, Korea, Philippines, Portugal, Thailand, and Turkey (at 5% significance level). Chile is the only country that displays the January effect, which is significantly positive. However, Jordan, Pakistan, Taiwan, and Venezuela do not display any significant seasonality of monthly returns.

Oran and Guner (2003) analyze stock prices on the Istanbul Stock Exchange (BIST) of Turkey for the day-of-the-week (DoW) effect, session effect, and DoW effect conditional on the previous day's return. Authors use returns of individual stocks from 1991 to 2002 with daily returns separated into returns in the Morning and Afternoon trade sessions, and they also examine subsamples (i.e., 1991-1994, 1995-1998, 1999-2002). Test results show that BIST displays a "low-beginning-of-week and high-end-of-week" pattern, and the low-Monday effect is caused by the Afternoon session. Additionally, all Afternoon session returns are found to be lower than their respective Morning session returns. When the daily returns are broken down depending on the previous day's return being negative or non-negative, the study displays that low-beginning-of-week returns are only observed when the previous day's returns are negative. On the other hand, high-end-of-week returns seem to be present irrespective of the previous day's returns. Yet, when the analysis is performed on subperiods, the high-Friday effect seems to be the only consistent and significant daily return pattern.

Lyroudi, Subeniotis, and Komisopoulos (2002) examine whether the day-of-the-week anomaly appears in the Athens Stock Exchange using daily returns of Composite Index between 1994 and 1999 and two subperiods (1994-1996 and 1997-1999). Results of the study display statistically significant positive returns on Mondays, Wednesdays, and Fridays. One possible explanation the authors suggest is that positive economic news related with the fact that the Greek economy tries to meet the Maastricht Convergence Criteria for entering Economic and Monetary Union (EMU) and adopting the EURO as their currency is revealed on the weekends and this could explain the optimistic behavior on Mondays.

Mexican Stock Exchange is investigated (Cabello and Ortiz, 2003) for day-of-the-week and month-of-the-year effects for the period of 1986-2001 and two subperiods (1986-1993 and 1994-2001). Findings of this study show that Monday returns are significantly negative, while Thursday returns are significantly high; however, for the most recent subperiod, those effects are diminished. Concerning monthly returns, authors indicate negative January returns for the whole period, while returns of January, February, August, and September are negative for the 1994-2001 subperiod.

A research on the Indian stock market (Raj and Kumari, 2006) examines the presence of day-of-the-week, weekend, January, and April effects in the Bombay Stock Exchange Index and National Stock Exchange Index for the periods of 1979-1998 and 1990-1998, respectively. Daily data are used for analyzing the day-of-the-week and weekend effects while weekly data are used for analyzing January and April effects as the financial year ending in India is March 31. Using ANOVA and t-test, Raj and Kumari show that Monday returns are statistically significantly higher than the other days of the week, Tuesday returns are negative but not significant, January returns are not statistically different and even though April returns are higher than nine other months, March returns are not significantly low which does not support the tax-loss selling hypothesis.

Rahman (2009) examines the Dhaka Stock Exchange (DSE) of Bangladesh for the day-of-the-week anomaly for the period of 2005-2008. Analyzing the DSE all share prices index (DSI), the DSE general index (DGEN) and the DSE top 20 index (DSE20) using dummy-variable regression and GARCH model, the author indicates that index returns on Thursday, the last weekday in Bangladesh, are significantly positive according to both tests and Sunday and Monday returns are significantly negative according to the results of the GARCH model only.

A research on the Romanian market (Diaconasu, Mehdian, and Stoica, 2012) investigates Bucharest Exchange Trading (BET) and Bucharest Exchange Trading-Composite (BET-C) indices for the day-of-the-week and the month-of-the-week anomalies for the period of 2000-2011 and two subperiods 2000-2007 and 2007-2011.

Diaconasu et al. analyze the data using dummy variable regression and first-order autoregressive process, and test results indicate that significant positive Thursday effect exists for the whole period and the first subperiod and significant positive Friday effect exists for the first subperiod only. For the second subperiod, however, the day-of-the-week effect is not observed. As for the monthly analysis, both indices have significant positive April and June effects. Besides, the BET index has a positive December effect.

Mobarek and Fiorante (2014) investigate the day-of-the-week effect in the stock markets of the BRIC countries, namely Brazil, Russia, India, and China, using samples of stock indices covering from 1995 to 2010 and three subsamples for the periods of 1995-1999, 2000-2005 and 2006-2010. With regards to the DoW analysis using the GARCH(1,1) model, the authors specify that despite the presence of the DOW effect in the earlier two subperiods, the anomaly disappears in the third subperiod for all the countries examined. Another study on the BRIC countries (Singh, 2014) investigates stock market returns of the four countries, for the existence of day-of-the-week (DoW) and month-of-the-year (MoY) effects between 2003 and 2013. Singh utilizes a dummy variable regression model and concludes that DoW and MoY anomalies are not present for Brazil, Russia, and India, whereas the Chinese stock market has statistically significant negative returns on Tuesdays, but it has no MoY anomaly.

Pakistani stock market is examined (Halari, Tantisantiwong, Power and Helliar, 2015) for the month-of-the-year anomaly using Karachi Stock Exchange (KSE) data between 1995 and 2011 by adjusting to the Islamic calendar and employing return and volatility data for 106 companies listed on the KSE. Results of the TGARCH model indicate that the month of Zil Qa'ad has the highest and month of Rajab month has the lowest return; however, these are not statistically significant. On the other hand, results show that the calendar anomaly for return volatility exists for the Pakistani market as the months Jamatul Awwal and Ramadan have significantly lower, and Shawwal has significantly higher volatility among all months.

Halil (2016) investigates the January effect and the firm size effect in Borsa Istanbul (BIST) using simple regression. The sample covers BIST stock index returns for

1988-2015. The results of the analyses display a statistically significant 1.7% higher return in January compared to other months. Moreover, Halil specifies with regards to the weekly analysis that returns on the 2nd week of January are significantly higher than those of other weeks in January. Another research on the Turkish market (Inan, 2017) examines BIST for the Monday effect on stock index returns and volatility for the time period 2009-2016. Using simple regression and EGARCH, Inan concludes that return volatility on Monday is significantly higher than other weekdays, but the return is not affected by the day-of-the-week anomaly.

Caporale and Zakirova (2017) investigate the Russian stock market for calendar anomalies (January effect, day-of-the-week effect, and turn-of-the-month effect) using daily data for the MICEX stock index over the period 1997 – 2016. Estimating OLS, GARCH, EGARCH, and TGARCH models, Caporale and Zakirova show that calendar anomalies exist in the MICEX index; however, after taking transaction costs into account, they suggest that the calendar anomalies disappear.

Seif, Docherty and Shamsuddin (2017) examine several calendar anomalies, namely day-of-the-week, week-of-the-month, month-of-the-year, holiday and other January effect in nine emerging markets (Brazil, the Czech Republic, Hungary, Malaysia, Mexico, Poland, South Africa, Taiwan and Turkey) for different time periods for different countries, such as, 1994-2014 for Brazil, 1988-2014 for Turkey and 1973-2014 for South Africa. Utilizing ANOVA and GARCH models, Seif, Docherty, and Shamsuddin state that the other January effect is not present, but significantly positive Friday, pre-holiday and post-holiday returns exist. Moreover, positive abnormal returns appear in the 44th week of the year when weekly returns are examined, and December returns tend to be higher than returns in other months.

CHAPTER 3

DATA AND METHODOLOGY

3.1. Data

The data employed in this research are daily and monthly adjusted closing prices of stocks and stock market indices from six emerging countries, namely, Brazil, Russia, India, China, South Africa, and Turkey. 20 stock market indices (BVSP, IBRX and IBX50 from Brazilian market, IRTS, IMOEX and MOEX10 from Russian market, BSE500, SENSEX, NIFTY50 and NIFTY500 from Indian market, SSE180, SSEC, CSI300, SZS100 and SZSC from Chinese market, JALSH and JTOPI from South African market and XU030, XU100 and XUTUM from Turkish market) and 600 stocks (100 stocks from each market) are selected and Thomson Reuters Eikon database is used to gather daily and monthly closing prices for stock indices and daily closing prices for selected stocks.

Two selection criteria are used for selecting 100 stocks from each country: market capitalization and sample size. In order for the analysis to have appropriate accuracy, the minimum sample size is determined to be 1,250 samples, which corresponds approximately to 5 years of data. After all, the top 100 stocks by market cap, satisfying the sample size criterion from each of the six countries, are used in the analyses. The time periods vary from stock to stock, but the final date is the same for all stocks, December 31, 2018. The initial date varies from January 1991 to November 2013.

Symbols of stocks used in this study and the starting and ending dates of their data samples are provided in Appendix A.

All the closing price data used in the analyses are adjusted for any corporate actions so that they reflect the true values accurately. Moreover, the data used in this study cover a large time span, for which the details are provided in Table 3.1.

In the analyses, close-to-close daily and monthly returns are used for the DoW effect and the MoY effect, respectively. The daily (monthly) return on the day (month) t is calculated as:

$$R_t = ln\ (P_t \,/\, P_{t-1}), \qquad (1)$$

where Pt is the adjusted closing price of a stock or index on the day (month) t and $Pt-1$ is the adjusted closing price of a stock or index on the day (month) t-1.

Table 3.1

Details of the sample data

Index Name	Country	Composition	Time Period
BVSP	Brazil	The top 66 companies by market cap and trade volume	08 Jun 1992 - 31 Dec 2018
IBRX	Brazil	The 100 most traded companies	10 Mar 1997 - 31 Dec 2018
IBX50	Brazil	The 50 most traded companies	02 Jan 2003 - 31 Dec 2018
RTSI	Russia	The top 40 most liquid companies, dollar-denominated	01 Sep 1995 - 31 Dec 2018
IMOEX	Russia	The 40 most liquid companies, ruble-denominated	22 Sep 1997 - 31 Dec 2018
MOEX10	Russia	The 10 most liquid companies	20 Mar 2001 - 31 Dec 2018
SENSEX	India	The 30 largest, most liquid and financially sound companies on the BSE	08 Jun 1992 - 31 Dec 2018
BSE500	India	The top 500 companies on the BSE, based on market cap	10 Apr 2000 - 31 Dec 2018
NIFTY50	India	The top 50 companies from 13 sectors on the NSE, based on market cap	03 Nov 1995 - 31 Dec 2018
NIFTY500	India	The top 500 companies on the NSE, based on market cap	08 Jun 1992 - 31 Dec 2018
SSEC	China	All the companies listed on the SSE	08 Jun 1992 - 31 Dec 2018
SSE180	China	The 180 largest and most liquid A-share companies on the SSE	01 Jul 1996 - 31 Dec 2018
SZSC	China	All the companies listed on the SZSE	08 Jun 1992 - 31 Dec 2018
SZS100	China	The 100 A-share companies listed on the SZSE	02 Jan 2003 - 31 Dec 2018
CSI300	China	The 300 largest and most liquid A-share companies listed on the SSE and the SZSE	03 Jan 2005 - 31 Dec 2018
JALSH	South Africa	The 164 largest companies by market cap	30 Jun 1995 - 31 Dec 2018
JTOPI	South Africa	The 40 largest companies by market cap	30 Jun 1995 - 31 Dec 2018
XU100	Turkey	The 100 companies by market cap and trade volume	08 Jun 1992 - 31 Dec 2018
XU030	Turkey	The 30 companies by market cap and trade volume	02 Jan 1997 - 31 Dec 2018
XUTUM	Turkey	All the shares listed on the ISE	02 Jan 1997 - 31 Dec 2018

Number of companies in the BVSP and JALSH indices may change in time as their compositions are specified periodically by the B3, and Johannesburg Stock Exchange, respectively.

Table 3.2 presents descriptive statistics on the daily index returns. Means, medians, maximum and minimum values, standard deviations, skewness, kurtosis, Jarque-Bera statistics, and Breusch-Godfrey serial correlation LM test statistics and Engle's (1982) ARCH LM test statistics are shown in the table. Jarque-Bera statistics of all the indices are statistically significant at the 0.01 level; therefore, the return data of the indices do not have a normal distribution. The first-order serial correlation test statistic shows whether there is autocorrelation in residuals, and it is calculated using the residuals of linear regression. For most of the indices, serial correlation LM test statistics are statistically significant at 0.05 significance level, which suggests that, for those indices, there are autocorrelations for lag order 1. However, IBX50, MOEX10, SSE180, CSI300, XU100, XU030, XUTUM indices do not have the first-order autocorrelation, as suggested in the table. Engle's ARCH LM test indicates whether there are any ARCH effects in the residuals, and this is also calculated using the residuals of regression. As all the indices have first-order ARCH LM test statistics that are statistically significant at the 0.01 significance level, they all have ARCH effects.

Table 3.2

Summary statistics on the daily return data of stock market indices

Index Name	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev. (%)	Skewness	Kurtosis	Jarque-Bera	SC LM (1)	ARCH LM (1)	Observations
BVSP	0.16	0.14	28.8	-17.2	2.38	0.44	12.12	22,487***	16.99***	324.39***	6,429
IBRX	0.05	0.09	24.1	-15.7	1.87	0.12	15.82	35,965***	5.45**	279.59***	5,254
IBX50	0.05	0.10	13.8	-12.9	1.68	-0.08	8.97	5,669***	0.59	137.55***	3,818
RTSI	0.04	0.11	20.2	-21.2	2.54	-0.37	10.92	14,872***	103.39***	474.8***	5,646
IMOEX	0.06	0.10	27.5	-23.3	2.57	0.12	19.60	59,008***	38.42***	496.45***	5,137
MOEX10	0.06	0.08	31.3	-23.5	2.06	0.03	27.49	114,945***	0.52	31.74***	4,600
SENSEX	0.04	0.08	16.0	-11.8	1.54	-0.11	8.58	8,203***	58.53***	230.62***	6,317
BSE500	0.04	0.15	14.6	-12.4	1.45	-0.57	10.94	12,047***	65.43***	416.32***	4,498
NIFTY50	0.04	0.08	16.3	-13.1	1.52	-0.13	10.54	13,273***	27.02***	231.02***	5,595
NIFTY500	0.04	0.10	15.0	-12.9	1.50	-0.39	9.96	12,907***	113.55***	385.2***	6,316
SSEC	0.02	0.05	28.9	-17.9	2.17	1.10	23.53	112,616***	4.44**	162.83***	6,341
SSE180	0.03	0.04	9.5	-10.5	1.75	-0.27	7.69	4,940***	1.74	266.64***	5,318
SZSC	0.03	0.11	27.2	-18.9	2.12	0.34	15.53	41,522***	12.92***	115.97***	6,329
SZS100	0.05	0.10	8.9	-9.7	1.80	-0.50	6.20	1,754***	7.9***	102.27***	3,745
CSI300	0.04	0.10	8.9	-9.7	1.77	-0.53	6.80	2,114***	3.32*	95.64***	3,262
JALSH	0.04	0.07	7.3	-12.6	1.20	-0.45	9.13	9,176***	19.64***	518.38***	5,731
JTOPI	0.04	0.08	8.4	-14.3	1.32	-0.38	9.22	9,387***	10.59***	526.49***	5,732
XU100	0.12	0.12	24.6	-20.0	2.56	-0.01	10.75	16,256***	1.53	589.95***	6,503
XU030	0.09	0.07	17.6	-22.0	2.50	-0.02	9.93	10,707***	0.92	343.72***	5,358
XUTUM	0.09	0.11	17.7	-21.3	2.29	-0.19	11.16	14,903***	0.9	361.77***	5,357

Jarque-Bera refers to the test statistic for normality test, where the null hypothesis is that the data are from a normal distribution. SC LM refers to the Breusch-Godfrey Serial Correlation LM test statistic and the null hypothesis is that there is no serial correlation for lag order 1. ARCH LM refers to the test statistics for ARCH effects in the residuals of the linear regression and the null hypothesis is that there is no ARCH for lag order 1. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Descriptive statistics on the monthly index returns are given in Table 3.3. Means, medians, maximum and minimum values, standard deviations, skewness, kurtosis, Jarque-Bera statistics, and Breusch-Godfrey serial correlation LM test statistics and Engle's ARCH LM test statistics are shown in the table. Jarque-Bera statistics of almost all the indices, with the exception of MOEX10 index, are statistically significant at the 0.01 level, and the test statistic of MOEX10 is significant at the 0.05 significance level. Hence, the return data of the indices do not have a normal distribution. For eight indices, namely BVSP, IBX50, RTSI, MOEX10, NIFTY500, SZSC, SZS100, and CSI300 serial correlation LM test statistics are statistically significant at 0.05 significance level, which indicates that, for those indices, there are autocorrelations for lag order 1. On the other hand, the remaining twelve indices do not have the first-order autocorrelation, as can be seen in the table. Unlike the daily return data, monthly return data of only six of the indices, i.e., BVSP, RTSI, IMOEX, MOEX10, SENSEX, and SZSC have first-order ARCH LM test statistics that are statistically significant at the 0.01 significance level, therefore, rest of the indices do not have ARCH effects for lag order 1.

Table 3.3

Summary statistics on the monthly return data of stock market indices

Index Name	**Mean (%)**	**Median (%)**	**Max (%)**	**Min (%)**	**Std. Dev. (%)**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**SC LM (1)**	**ARCH LM (1)**	**Observations**
BVSP	3.92	2.07	67.9	-50.3	13.20	1.21	7.86	402***	64.49***	50.35***	327
IBRX	1.11	1.35	20.4	-49.4	7.94	-1.37	9.60	553***	0	0.17	260
IBX50	1.19	1.19	17.2	-29.9	6.43	-0.58	4.96	41***	4.11**	0.86	191
RTSI	0.90	1.29	44.5	-82.4	13.45	-1.09	9.06	483***	11.16***	11.69***	279
IMOEX	1.24	1.67	42.6	-58.3	11.18	-0.83	8.35	333***	3.82*	13.87***	255
MOEX10	1.32	1.55	27.0	-27.3	8.24	-0.17	3.90	8**	5.96**	38.47***	213
SENSEX	1.11	1.13	35.1	-27.3	7.91	0.15	4.80	49***	3.5*	16.89***	352
BSE500	1.00	1.66	28.8	-31.6	7.23	-0.68	5.89	95***	1.84	1.45	224
NIFTY50	0.91	1.43	24.7	-30.7	6.84	-0.48	4.63	41***	0.06	0.11	277
NIFTY500	0.97	1.38	44.7	-32.5	8.40	-0.10	6.38	160***	4.45**	3.39*	335
SSEC	0.88	0.63	102.0	-37.3	12.39	2.44	22.38	5,595***	0.85	1.05	336
SSE180	0.42	0.37	31.0	-30.4	8.30	-0.09	4.97	44***	3.15*	2.35	269
SZSC	0.80	0.28	60.9	-31.2	11.11	0.95	7.15	288***	4.61**	10.71***	332
SZS100	0.83	1.68	26.4	-27.5	9.20	-0.45	3.77	10***	4.22**	0.11	167
CSI300	0.66	0.99	24.6	-29.9	8.90	-0.46	4.40	20***	4.23**	0.04	168
JALSH	0.84	1.03	13.2	-35.1	5.31	-1.17	9.88	620***	0.41	0.21	282
JTOPI	0.81	1.04	13.8	-34.0	5.57	-0.96	7.97	333***	0.97	0.49	282
XU100	2.63	2.26	58.7	-49.5	13.26	0.49	5.85	134***	0.18	0.14	352
XU030	1.60	1.49	58.6	-48.3	11.89	0.27	6.90	170***	0.04	1.39	263
XUTUM	1.55	1.78	58.4	-49.3	11.26	0.17	7.77	250***	0.2	2.13	263

Jarque-Bera refers to the test statistic for normality test, where the null hypothesis is that the data are from a normal distribution. SC LM refers to the Breusch-Godfrey Serial Correlation LM test statistic and the null hypothesis is that there is no serial correlation for lag order 1. ARCH LM refers to the test statistics for ARCH effects in the residuals of the linear regression and the null hypothesis is that there is no ARCH for lag order 1. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

3.2. Methodology

For stocks and stock market indices, the day-of-the-week effect is examined by using daily returns calculated as log returns. The day-of-the-week effect is also analyzed for indices depending on the previous day's index returns being negative or non-negative. Furthermore, the month-of-the-year anomaly is investigated in monthly index returns. As the linear regression requires that the error term must be serially uncorrelated, homoscedastic and normally distributed, and not fulfilling these requirements would reduce the precision of the OLS estimates and lead to unreliable results, GARCH (1,1) model, developed by Robert F. Engle in 1982, is used in this study in order to address the issues of autocorrelation and heteroscedasticity indicated by Tables 3.2 and 3.3.

3.2.1. GARCH (1,1) Test

The GARCH (1,1) model, which includes one ARCH term and one GARCH term in the variance equation, is used to deal with the effects of autocorrelation and heteroscedasticity. Modeling the volatility, the GARCH model improves the efficiency of parameter estimation, especially in the presence of volatility clustering in the data.

To examine the DoW effect and determine whether returns on each day of the week are statistically significant, the model is as follows:

$$Rt = a_1W_t + b_1D_{1t} + b_2D_{2t} + b_3D_{3t} + b_4D_{4t} + b_5D_{5t} + e_t, \qquad (2)$$

where

$$e_t|\psi_{t-1} \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \beta_1 \sigma_{t-1}^2, \qquad (3)$$

where R_t denotes the daily logarithmic return of an index or a stock on day t, W_t is the average logarithmic return for the week that contains day t, D_{1t} through D_{5t} are dummy variables such that D_{it} is 1 for the ith day of the week and 0 otherwise. a_1 and b_1 through b_5 are the coefficients to be estimated. The estimated coefficient b_i will be statistically significantly different from zero for those stocks or indices that exhibit an ith day of the week effect. e_t is the error term, which is assumed to be normally distributed with mean zero and conditional variance σ_t^2. In Equation 3, e_{t-1}^2 is the ARCH term and σ_{t-1}^2 is the GARCH term, and α_0, α_1 and β_1 are the coefficients to be estimated in this model.

The GARCH (1,1) model of the month-of-the-year effect is as follows:

$$Rt = a_1Y_t + b_1D_{1t} + b_2D_{2t} + b_3D_{3t} + \ldots + b_{12}D_{12t} + e_t, \qquad (4)$$

where

$$e_t|\psi_{t-1} \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \beta_1 \sigma_{t-1}^2, \qquad (5)$$

where R_t denotes the monthly logarithmic return of an index in month t, Y_t is the average logarithmic return for the year that contains month t, D_{1t} through D_{12t} are dummy variables such that D_{it} is 1 for the ith month of the year and 0 otherwise. a_1 and b_1 through b_{12} are the coefficients to be estimated. The estimated coefficient b_i will be statistically significantly different from zero for those indices that exhibit an ith month of the year effect. e_t is the error term, which is assumed to be normally distributed with mean zero and conditional variance σ_t^2. In Equation 5, e_{t-1}^2 is the ARCH term and σ_{t-1}^2 is the GARCH term, and α_0, α_1 and β_1 are the coefficients to be estimated in this model.

In Equations 2 and 4, the average weekly return term, W_t, and the average yearly return term, Y_t, are included in order to detrend the return data and paint a clearer picture of the return patterns.

3.2.2. GARCH (1,1) Test Conditional on the Previous Day's Return

For the day-of-the-week analysis depending on the previous day's return, historical data is sorted into two subsamples on the basis of the previous day's return being negative or non-negative, and these two subsamples are examined separately by using the GARCH (1,1) model defined in Equations 2, 3, 4 and 5.

3.2.3. Binomial Test

It is a statistical significance test that compares the observed test result to what is theoretically expected. It is used when a test has two outcomes, such as the number of successes in a number of trials, number of females in a sample group of people, the number of significant positive results in a number of GARCH estimation results. In this study, the excess number of significant positive (or negative) results is used, which refers to the number of significant positive results over the number of significant negative results, if there are more positive results than negative results, and vice versa. Total number of GARCH estimation results, the excess number of observed significant positive (or negative) results, and the probability of observing a significant positive (or negative) result are employed in Equation 6 to obtain a p-value in order to determine whether the number of observed significant results differs significantly from what is expected.

In this research, the GARCH (1,1) test is done on each individual stock from each country, and then the results of each country are combined into separate tables so that they show the number of significantly positive results, the number of significantly negative results and the number of insignificant results for each day of the week, separately. After that, for each day of the week, binomial tests are done in order to determine if the number of significantly positive (or negative, whichever is larger) results are significant at the 0.05 significance level. This way, 100 separate results of a country are gathered up to produce a statistically interpretable result.

The p-value of binomial test is equal to the probability of observing the excess number of statistically positive (or negative) returns in the combined table or a higher number and it is calculated by adding up probabilities of getting the exact number in the table and also higher numbers up to the total number of significant and insignificant results in the table, which is 100 in this case. Assuming that the number of statistically significant results follows a binomial distribution, the probability of observing exactly *x* significant results in *n* GARCH model estimations is calculated as follows:

$$P(x) = \frac{n!}{(n-x)!x!} p^x (1-p)^{n-x}, \tag{6}$$

where *p* is the probability of getting statistically significant (either positive or negative) results, which is the 0.05 level of significance in this case. For example, in order to find the p-value of binomial test for having an excess of 9 statistically positive results in 100, the probabilities of getting 9 of them, *P(9)* and more, *P(10), P(11),…, P(100)* are added up to arrive at 0.063. The p-values for binomial test at the 0.05 probability of observing significant results are provided in Appendix B.

3.2.4. Trinomial Test

As there are three outcomes of the GARCH model estimations, namely positive significance, negative significance, and insignificance, the binomial test is not totally adequate for making interpretations in this case. In 2009, Bian, McAleer, and Wong developed a new test, trinomial test, for ordinal data samples in order to determine whether probabilities of two outcomes at the opposite ends are statistically different from each other. The trinomial test also includes the zero terms, number of insignificant results in this study, in calculations to prevent loss of information and improve the statistical power of the test.

Equation 7 presents the probability of observing exactly n_d number of excess significant positive (or negative) in *n* GARCH model estimations:

$$\mathrm{P}(n_d) = \sum_{k=0}^{(n-n_d)/2} \frac{n!}{(n_d+k)!k!(n-n_d-2k)!} \left(\frac{1-p_0}{2}\right)^{n_d+2k} p_0^{n-n_d-2k}, \quad (7)$$

where

$$n_d = \begin{cases} n_+ - n_-, & n_+ \geq n_- \\ n_- - n_+, & n_- < n_+. \end{cases}$$

In Equation 7, p_0 is the probability of observing insignificant results, and together with p_+ and p_-, probabilities of observing significant positive and negative results, respectively, they sum up to 1. In the equation, *k* ensures that all possible combinations of n_+, n_0 and n_-, numbers of positive, insignificant and negative observations, respectively, are included in the calculation, provided that the total of n_+, n_0 and n_- is equal to n. For instance, when n = 10, n_d = 5 and $n_+ > n_-$, the combinations of n_+, n_0 and n_- included in the calculation are (5, 5, 0), (6, 3, 1), (7, 1, 2).

The p-value of the trinomial test is calculated by adding up probabilities of observing the exact number of n_d and higher numbers of n_d up to the total number of significant and insignificant results in the table, which is 100 in this study. The null hypothesis of this test, H_0, is that p_+ and p_- are not statistically different from each other. The alternative hypothesis, on the other hand, is that p_+ is statistically higher than p_- for $n_+ > n_-$ or vice versa. To illustrate, in order to find the p-value of trinomial test for having an excess of 5 statistically negative results in 100, the probabilities of getting 5 of them, *P(5)* and more, *P(6), P(7), ..., P(100)* are added up to arrive at 0.022, which suggests that the number of negative results is statistically higher than the number of positive results at the 0.05 significance level. The p-values for the trinomial test at the 0.05 probability of observing a significant difference in numbers between the two opposite outcomes are provided in Appendix B.

3.2.5. Quandt – Andrews Breakpoint Test

It is used to test whether there is a structural breakpoint in the sample or a structural change in the equation parameters. The Quandt – Andrews Breakpoint Test tests multiple dates so that it reports the date with the maximum test statistic and minimum p-value, which is the most likely breakpoint location.

CHAPTER 4

RESULTS

4.1. Day-of-the-week effect in stock market indices

In this section, daily returns of stock market indices are examined for the presence of the day-of-the-week (DoW) effects using the GARCH (1,1) model. Additionally, the sample of the daily return data for each index is divided into two subsamples based on the direction of price changes in the previous day in order to assess the correlations between successive trading days.

4.1.1. Brazil

IBOVESPA Index (BVSP), the benchmark index comprising the top companies in the market by market capitalization and traded volume, Brazil Index (IBRX), which includes the top 100 most traded equities, and Brazil 50 Index (IBX50), which involves the top 50 most traded equities in the market, are examined for the day-of-the-week effect and DoW effect conditional on the previous day's return in the time periods of 1992-2018, 1997-2018 and 2003-2018, respectively.

For the BVSP index, ANOVA results are given in Table 4.1. As the p-value of ANOVA, 0.0014, is less than the significance level of 0.05, the null hypothesis that the average returns on each day of the week are not different from that of other weekdays is rejected. The results of the analysis for the BVSP are given in the table. The coefficient of Monday is negative, and its p-value is below 0.05; thus, there is a negative Monday effect in the BVSP index with an average Monday return of -0.10%.

BVSP displays different patterns when the analysis of the DoW effect is done conditional on the previous day's return. When the previous day's return is non-negative, the p-value of ANOVA is higher than the significance level of 0.05 (Table 4.1), which means that the null hypothesis of equal returns on each day of the week cannot be rejected. The analysis employing the GARCH model implies that Wednesday return is positive but statistically insignificant at the 0.05 significance level.

When the BVSP is examined for the DoW effect while the previous day's return is negative, the p-value of ANOVA comes out to be 0.0002; hence, the null hypothesis is rejected for the 0.05 significance level (Table 4.1). The return on Monday is -0.21% and statistically significant. On the other hand, the coefficient for Wednesday is statistically positive, which is 0.15%. Therefore, according to the model, the DoW effect, in this case, is negative on Monday and positive on Wednesday.

Table 4.2 shows the ANOVA result for the IBRX index. The p-value of ANOVA being 0.0071 means that the null hypothesis of no difference among average returns on weekdays can be rejected at the 0.05 significance level. Like the BVSP index, the results of the analysis suggest that IBRX has a statistically significant and negative Monday return with a coefficient of -0.08%. The other days of the week do not have statistically significant returns.

For the IBRX subsample with non-negative previous day's returns, the null hypothesis of equal mean returns on every weekday cannot be rejected since the p-value of ANOVA is 0.797, and it higher than the level of significance (Table 4.2). The results suggest that the IBRX subsample exhibits a positive Wednesday effect with a return of 0.13%. Monday, Thursday, and Friday also have positive returns, but, statistically, they are not different from zero.

Table 4.1

Results of the day-of-the-week effect analysis of the BVSP Index

	BVSP	+ Previous day return	− Previous day return
Variables			
Monday	-0.0010***	0.0004	-0.0021***
	(0.0032)	(0.4487)	(0.0030)
Tuesday	-0.0001	-0.0007	0.0008
	(0.8609)	(0.2264)	(0.2598)
Wednesday	0.0006	0.0011*	0.0015**
	(0.1345)	(0.0711)	(0.0340)
Thursday	-0.0003	0.0004	-0.0008
	(0.4270)	(0.5372)	(0.2323)
Friday	0.0006	0.0005	0.0007
	(0.1750)	(0.4292)	(0.3476)
ANOVA			
F-stat	4.4383	0.6951	5.5812
	(0.0014)	(0.5953)	(0.0002)
Goodness-of-fit statistics			
SIC	-5.3271	-5.1096	-4.9496

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

IBRX index displays a similar pattern to the BVSP index when the analysis is carried out on the subsample with a negative previous day's return. The p-value of ANOVA is less than the significance level of 0.05, and the null hypothesis is rejected (Table 4.2). Regarding the results, Monday and Wednesday have statistically significant returns with -0.16% and 0.14%, respectively.

Table 4.2

Results of the day-of-the-week effect analysis of the IBRX Index

	IBRX	+ Previous day return	− Previous day return
Variables			
Monday	-0.0008**	0.0006	-0.0016***
	(0.0193)	(0.3342)	(0.0095)
Tuesday	-0.0002	-0.0006	0.0004
	(0.5160)	(0.2609)	(0.4990)
Wednesday	0.0006	0.0013**	0.0014**
	(0.1419)	(0.0299)	(0.0305)
Thursday	0.0000	0.0007	-0.0005
	(0.9699)	(0.1510)	(0.4387)
Friday	0.0002	0.0009	0.0001
	(0.6842)	(0.1378)	(0.9155)
ANOVA			
F-stat	3.5189	0.4159	3.4111
	(0.0071)	(0.7973)	(0.0086)
Goodness-of-fit statistics			
SIC	-5.7017	-5.4980	-5.3203

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Results of ANOVA for the Brazil 50 index (IBX50) show that the p-value is 0.444, which is above the significance level of 0.05; thus, the null hypothesis that the mean returns on each day of the week are equal cannot be rejected (Table 4.3). The results are rather different from BVSP and IBRX indices, as none of the days have statistically significant returns. It can be inferred that the DoW effect does not exist on the IBX50 index of Brazil, according to the analysis with the GARCH model.

IBX50 is then examined for the DoW effect when the previous day's return is non-negative. ANOVA results suggest that the mean returns of the days of the week are not statistically different from each other, with a p-value of 0.724 (Table 4.3). The results show no DoW effect for this subsample.

ANOVA for the DoW effect on IBX50 when the previous day's return is negative brings about a similar result to the analysis with non-negative previous day's return, shown in Table 4.3. The p-value of ANOVA is 0.108, and again, the null hypothesis cannot be rejected. The coefficient of Monday returns is -0.13%, but it is statistically insignificant. Therefore, none of the days have statistically significant returns.

Table 4.3

Results of the day-of-the-week effect analysis of the IBX50 Index

	IBX50	+ Previous day return	− Previous day return
Variables			
Monday	-0.0006	0.0007	-0.0013*
	(0.5602)	(0.2690)	(0.0925)
Tuesday	0.0004	-0.0006	0.0007
	(0.7026)	(0.3216)	(0.3707)
Wednesday	0.0004	0.0008	0.0008
	(0.7319)	(0.2017)	(0.2478)
Thursday	-0.0005	0.0003	-0.0004
	(0.6335)	(0.6266)	(0.5810)
Friday	0.0003	0.0002	0.0002
	(0.8350)	(0.8177)	(0.7704)
ANOVA			
F-stat	0.9320	0.5158	1.8994
	(0.4442)	(0.7241)	(0.1080)
Goodness-of-fit statistics			
SIC	-5.4285	-5.6354	-5.4318

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.1.2. Russia

Russian Trading System Index (RTSI) and Moscow Exchange Russia Index (IMOEX) are capitalization-weighted composite indices comprising around 50 Russian stocks, which are the most liquid companies with economic activities related to the main sectors of the Russian economy. Although their components are only slightly different, the main difference is that IMOEX is ruble-denominated, while RTSI is dollar-denominated. Moscow Exchange 10 Index (MOEX10) is an equally weighted index consisting of the ten most liquid shares traded on the Moscow Exchange. The three stock market indices from Russia are examined for the DoW effect and DoW effect depending on the previous day's return being negative or non-negative in the periods of 1995-2018, 1997-2018, and 2001-2018, respectively.

ANOVA for the DoW effect on the RTSI index suggests that the null hypothesis cannot be rejected as the p-value, 0.17, is above the significance level of 0.05 (Table 4.4). The GARCH estimation results show that Tuesday has a statistically significant and negative mean return of -0.08%.

RTSI is then examined for the DoW effect by using the subsample for non-negative previous day's return. The p-value of ANOVA, 0.126, implies that the null hypothesis of equal mean returns on every day of the week cannot be rejected at the 0.05 significance level, as can be seen in Table 4.4. Results of the analysis show that Monday and Thursday have statistically significant positive returns, 0.31%, and 0.27%, respectively. The other days also have positive coefficients; however, statistically, they are not different from zero.

RTSI is finally investigated for the DoW effect under negative previous day's return condition. Like the analysis with non-negative previous day's returns, the ANOVA suggests that the null hypothesis cannot be rejected as the p-value of 0.205 is above the significance level of 0.05, as can be seen in Table 4.4. The coefficients of all days of the week are negative. However, only the returns on Monday (-0.18%) and Wednesday (-0.16%) are statistically significant.

Table 4.4

Results of the day-of-the-week effect analysis of the RTSI Index

	RTSI	+ Previous day return	− Previous day return
Variables			
Monday	0.0004	0.0031***	-0.0018***
	(0.2683)	(0.0000)	(0.0086)
Tuesday	-0.0008**	0.0004	-0.0014*
	(0.0370)	(0.5132)	(0.0673)
Wednesday	-0.0006	0.0007	-0.0016**
	(0.1220)	(0.3281)	(0.0260)
Thursday	0.0005	0.0027***	-0.0014*
	(0.2214)	(0.0001)	(0.0501)
Friday	-0.0002	0.0009	-0.0004
	(0.5975)	(0.2132)	(0.6497)
ANOVA			
F-stat	1.6065	1.8001	1.4804
	(0.1697)	(0.1260)	(0.2054)
Goodness-of-fit statistics			
SIC	-5.2211	-5.0027	-4.7604

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

ANOVA result for the DoW effect on IMOEX is given in Table 4.5. The p-value of the ANOVA comes out to be above the significance level; thus, the null hypothesis cannot be rejected. Unlike the RTSI index, results of the analysis reveal that none of the days of the week have returns that are statistically significant.

ANOVA result for IMOEX, under the condition that previous day's return is non-negative, implies that the null hypothesis of equal mean returns cannot be rejected as the p-value of ANOVA is higher than the 0.05 significance level. Results of the analysis are given in Table 4.5. Even though coefficients of all days of the week are positive, only Monday has a statistically significant return of 0.24%.

Analysis of DoW effect on IMOEX subsample with negative previous day's return implies that the null hypothesis cannot be rejected as the p-value of ANOVA is 0.515 and it is above the 0.05 significance level. The results indicate that none of the days of the week has statistically significant returns, as shown in Table 4.5.

Table 4.5

Results of the day-of-the-week effect analysis of the IMOEX Index

	IMOEX	+ Previous day return	− Previous day return
Variables			
Monday	0.0001	0.0024***	-0.0028
	(0.6677)	(0.0001)	(0.2099)
Tuesday	-0.0004	0.0001	-0.0010
	(0.3352)	(0.9130)	(0.7394)
Wednesday	-0.0003	0.0002	-0.0032
	(0.4490)	(0.7326)	(0.2330)
Thursday	0.0002	0.0007	-0.0011
	(0.4996)	(0.2442)	(0.6709)
Friday	-0.0003	0.0004	-0.0013
	(0.4786)	(0.5172)	(0.6401)
ANOVA			
F-stat	1.2114	1.8739	0.8153
	(0.3036)	(0.1122)	(0.5152)
Goodness-of-fit statistics			
SIC	-5.4193	-5.2249	-4.3726

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Results of the ANOVA for the DoW effect on MOEX10 are given in Table 4.6. As the p-value of the ANOVA is above the 0.05 significance level, the null hypothesis of equal mean returns on each weekday cannot be rejected. The GARCH model estimation results suggest that the coefficients of all the days of the week are statistically insignificant.

When MOEX10 is examined for the DoW effect for non-negative previous day's return, ANOVA result implies that the null hypothesis cannot be rejected since the p-value of 0.101 is higher than the level of significance. According to the results in Table 4.6, among days of the week, only the positive return on Monday is statistically significant and it is 0.24%.

Conversely, MOEX10 contains a negative Monday effect when it is examined for the negative previous day's return. Table 4.6 shows that the p-value of ANOVA is 0.898 which is above the 0.05 significance level. The GARCH estimation show that the coefficient of Monday is -0.14% and it is statistically significant.

4.1.3. India

The Bombay Stock Exchange Sensitive Index (SENSEX) is a free-float market-weighted index that consists of the 30 largest, most liquid, and financially sound companies listed on BSE, according to the website of BSE. The BSE 500 Index comprises the top 500 companies listed on the BSE by market cap. The National Stock Exchange 50 Index (NIFTY 50) consists of diversified 50 companies from 13 sectors of the Indian economy. It is calculated using a free-float capitalization method. The NIFTY 500 Index includes the top 500 companies based on full market capitalization and represents about 96.1% of the free-float market capitalization of all stocks listed on NSE as of March 2019, according to the National Stock Exchange (NSE) India data. Analyses are done in order to detect the presence of DoW effect and DoW effect depending on the previous day's return being negative or non-negative on those four stock market indices from India, namely SENSEX, BSE500, NIFTY50 and NIFTY500 in the time periods of 1992-2018, 2000-2018, 1995-2018 and 1992-2018, respectively.

Table 4.6

Results of the day-of-the-week effect analysis of the MOEX10 Index

	MOEX10	+ Previous day return	− Previous day return
Variables			
Monday	0.0000	0.0024***	-0.0014**
	(0.9962)	(0.0006)	(0.0428)
Tuesday	-0.0007*	-0.0001	-0.0010
	(0.0736)	(0.7998)	(0.2259)
Wednesday	0.0003	0.0007	0.0003
	(0.5354)	(0.2462)	(0.6310)
Thursday	-0.0001	0.0007	-0.0004
	(0.8375)	(0.2583)	(0.4935)
Friday	-0.0003	0.0000	0.0006
	(0.4793)	(0.9598)	(0.4594)
ANOVA			
F-stat	0.7661	1.9405	0.2685
	(0.5472)	(0.1011)	(0.8984)
Goodness-of-fit statistics			
SIC	-5.5971	-5.3928	-5.2090

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The results of the ANOVA for the DoW effect on the SENSEX index are given in Table 4.7. The p-value, 0.439, suggests that the null hypothesis cannot be rejected. The results show that none of the coefficients are statistically significant, and there is no DoW effect on the index.

SENSEX is then analyzed for the DoW effect when the return on the previous day is non-negative. ANOVA result indicates that mean returns of all days of the week are not equal, since the p-value is less than 0.05, as can be seen in Table 4.7. Results of the GARCH model estimates indicate that there are statistically significant positive returns on Monday (0.20%) and Friday (0.14%).

When the SENSEX is examined for the DoW effect with the subsample having a negative previous day's return, the p-value of the ANOVA is less than 0.05 significance level, and thus, the null hypothesis of equal mean returns is rejected. In the analysis, given in Table 4.7, a negative Monday effect is observed with a mean return of -0.20%. Although the other days of the week also have negative coefficients, they are not statistically different from zero.

ANOVA on the BSE500 for the DoW effect concludes that the null hypothesis of equal mean returns cannot be rejected with a p-value of 0.587 at 0.05 significance level, as shown in Table 4.8. Results of the GARCH estimation imply that there is no DoW effect on the index.

Being analyzed for the DoW effect under the condition of non-negative previous day's returns, ANOVA result of BSE500 shows that the p-value is below the 0.05 significance level; thus, the null hypothesis is rejected. Similar to SENSEX, the GARCH estimation suggests that Monday and Friday have statistically significant and positive returns of 0.21% and 0.14%, respectively.

Table 4.7

Results of the day-of-the-week effect analysis of the SENSEX Index

	SENSEX	+ Previous day return	− Previous day return
Variables			
Monday	0.0002	0.0020***	-0.0020***
	(0.4081)	(0.0000)	(0.0000)
Tuesday	-0.0005*	-0.0003	-0.0001
	(0.0712)	(0.5189)	(0.8542)
Wednesday	0.0000	0.0008*	-0.0003
	(0.9743)	(0.0643)	(0.5728)
Thursday	-0.0001	0.0002	-0.0006
	(0.6857)	(0.6015)	(0.1694)
Friday	0.0004	0.0014***	-0.0007
	(0.1699)	(0.0000)	(0.1443)
ANOVA			
F-stat	0.9402	5.9935	3.5778
	(0.4394)	(0.0001)	(0.0064)
Goodness-of-fit statistics			
SIC	-6.0924	-5.9048	-5.6747

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

BSE500 is investigated lastly for the presence of any DoW effect by using its subsample having negative previous day’s returns and ANOVA result is shown in Table 4.8. The p-value of ANOVA, 0.011, suggests that the null hypothesis of equal mean returns is rejected at the 0.05 significance level. The analysis shows that, among days of the week, only Monday has a statistically significant mean return of -0.21%.

Table 4.8

Results of the day-of-the-week effect analysis of the BSE500 Index

	BSE500	+ Previous day return	− Previous day return
Variables			
Monday	0.0003	0.0021***	-0.0021***
	(0.2703)	(0.0000)	(0.0000)
Tuesday	-0.0006*	0.0000	-0.0006
	(0.0594)	(0.9312)	(0.3109)
Wednesday	-0.0001	0.0006	-0.0003
	(0.7394)	(0.1937)	(0.5633)
Thursday	-0.0002	0.0001	-0.0005
	(0.5030)	(0.7922)	(0.3282)
Friday	0.0001	0.0014***	-0.0007
	(0.7293)	(0.0004)	(0.1464)
ANOVA			
F-stat	0.7072	4.2540	3.2893
	(0.5869)	(0.0020)	(0.0107)
Goodness-of-fit statistics			
SIC	-6.2976	-6.2025	-5.7733

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

As for the National Stock Exchange of India, NIFTY50 index is analyzed for the DoW effect and ANOVA result is given in Table 4.9. The p-value of ANOVA being less than the 0.05 significance level implies that the null hypothesis of equal mean returns is rejected. But, GARCH model demonstrates that there is no DoW effect on the index.

When the NIFTY50 index is examined for the DoW effect while the previous day’s return is non-negative, ANOVA result implies that mean returns of all days of the week are not statistically equal, as its p-value, 0.0004, is less than the 0.05 significance level. According to the GARCH estimation results, given in Table 4.9, Monday, Wednesday and Friday are the days with statistically significant and positive mean returns of 0.18%, 0.11%, and 0.13%, respectively.

Analysis of the DoW effect is then performed on the NIFTY50 subsample with negative previous day's return. In Table 4.9, the p-value of ANOVA is less than the 0.05 significance level and the null hypothesis of equal mean returns on every day of the week is rejected. The results suggest that the mean return on Monday is statistically significant with a coefficient of -0.20%.

Table 4.9

Results of the day-of-the-week effect analysis of the NIFTY50 Index

	NIFTY50	+ Previous day return	− Previous day return
Variables			
Monday	-0.0001	0.0018***	-0.0020***
	(0.7280)	(0.0000)	(0.0000)
Tuesday	-0.0006*	-0.0002	-0.0001
	(0.0596)	(0.5605)	(0.7811)
Wednesday	0.0006*	0.0011***	0.0003
	(0.0525)	(0.0085)	(0.6252)
Thursday	-0.0001	0.0001	-0.0004
	(0.7040)	(0.7948)	(0.4740)
Friday	0.0001	0.0013***	-0.0006
	(0.7262)	(0.0004)	(0.2910)
ANOVA			
F-stat	7.8208	5.1042	9.0641
	(0.0000)	(0.0004)	(0.0000)
Goodness-of-fit statistics			
SIC	-6.1048	-5.9689	-5.6505

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

ANOVA of the DoW effect on the NIFTY500 index is given in Table 4.10. The p-value (0.007) of the ANOVA suggests that the null hypothesis is rejected at the 0.05 significance level. The GARCH estimation reveals that the return on Tuesday is statistically significant and negative with a coefficient of -0.09%.

When NIFTY500 index is analyzed for the DoW effects on its subsample with non-negative previous day's returns, ANOVA result suggests that the null hypothesis of equal mean returns on all weekdays is rejected with a p-value below the significance level of 0.05. Results of the analysis show that Monday, Wednesday and Friday have statistically significant returns of 0.24%, 0.11% and 0.19%, respectively.

NIFTY500 is then examined for the DoW effects using the subsample for which the previous day's returns are negative. As can be seen in Table 4.10, the null hypothesis is rejected at the 0.05 significance level, since the p-value of the ANOVA is less than 0.05. GARCH model estimation results demonstrate that, although all days have negative coefficients, statistically significant negative returns are on Monday (-0.22%), Tuesday (-0.16%), Thursday (-0.11%) and Friday (-0.13%).

4.1.4. China

Shanghai Stock Exchange Composite Index (SSE C) consists of all the companies listed on the Shanghai Stock Exchange (SSE), that is, over 1500 stocks, and it is a free-float capitalization-weighted index. SSE 180 Index comprises the 180 largest and most liquid A-share companies listed on the SSE. Shenzhen Stock Exchange Composite Index (SZS C) includes all the stocks listed on the Shenzhen Stock Exchange (SZSE). SZSE 100 Index consists of 100 largest A-share companies listed on the SZSE, and it is a free-float capitalization-weighted index. China Securities 300 Index (CSI 300) is a free-float capitalization-weighted index that comprises the 300 largest and most liquid A-share stocks listed on the SSE and SZSE. In order to investigate the presence of DoW effect and DoW effect depending on the previous day's return being negative or non-negative in Chinese market, these five stock market indices, i.e., SSEC, SSE180, SZSC, SZS100 and CSI300 in the time periods of 1992-2018, 1996-2018, 1992-2018, 2003-2018 and 2005-2018, respectively.

Table 4.10

Results of the day-of-the-week effect analysis of the NIFTY500 Index

	NIFTY500	+ Previous day return	− Previous day return
Variables			
Monday	0.0002	0.0024***	-0.0022***
	(0.2849)	(0.0000)	(0.0000)
Tuesday	-0.0009***	-0.0001	-0.0016***
	(0.0011)	(0.8186)	(0.0013)
Wednesday	0.0002	0.0011***	-0.0006
	(0.5377)	(0.0087)	(0.1806)
Thursday	-0.0003	0.0004	-0.0011**
	(0.3442)	(0.3396)	(0.0144)
Friday	0.0004	0.0019***	-0.0013***
	(0.1726)	(0.0000)	(0.0036)
ANOVA			
F-stat	3.4849	8.0201	4.9088
	(0.0075)	(0.0000)	(0.0006)
Goodness-of-fit statistics			
SIC	-6.1742	-6.0073	-5.7452

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The results of the ANOVA for the DoW effect on the SSEC index is given in Table 4.11. The p-value of ANOVA is 0.0007; therefore, the null hypothesis is rejected at the 0.05 significance level. Results of the GARCH model analysis state that Thursday has a statistically significant and negative return of -0.14%.

When the SSEC index is analyzed for the presence of the DoW effect when the return on the previous day is non-negative, the p-value of the ANOVA is less than the 0.05 significance level, and the null hypothesis of equal mean returns on all weekdays is rejected. In the analysis, a positive Monday effect and a negative Thursday effect are observed with coefficients of 0.24% and -0.14%, as seen in Table 4.11.

Analysis of the DoW effect on the SSEC subsample with a negative previous day's return implies that the null hypothesis of equal mean returns is rejected since the p-value of ANOVA is below the 0.05 significance level. According to the GARCH model estimation, Monday and Thursday have statistically negative mean returns of -0.32% and -0.12%, and Wednesday has a statistically positive mean return of 0.13%.

Table 4.11

Results of the day-of-the-week effect analysis of the SSEC Index

	SSEC	+ Previous day return	− Previous day return
Variables			
Monday	0.0000	0.0024***	-0.0032***
	(0.9569)	(0.0000)	(0.0000)
Tuesday	0.0003	-0.0005	0.0008
	(0.2994)	(0.3546)	(0.1343)
Wednesday	0.0004	0.0000	0.0013**
	(0.2622)	(0.9899)	(0.0227)
Thursday	-0.0014***	-0.0014***	-0.0012**
	(0.0000)	(0.0038)	(0.0182)
Friday	0.0002	-0.0004	0.0010*
	(0.5470)	(0.4842)	(0.0639)
ANOVA			
F-stat	4.8588	6.5444	7.5976
	(0.0007)	(0.0000)	(0.0000)
Goodness-of-fit statistics			
SIC	-5.6353	-5.3938	-5.2877

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

In Table 4.12, ANOVA results of the DoW effect on the SSE180 index is given. Since the p-value of ANOVA is 0.0025, the null hypothesis is rejected at the 0.05 significance level. Like SSEC index, the GARCH model shows that there is a negative Thursday effect as the mean return on this weekday is -0.15%.

When the analysis is done on the subsample with non-negative previous day's returns, Table 4.12 shows that the null hypothesis of equal mean returns on each day of the week is rejected as the p-value of the ANOVA is less than 0.05. GARCH estimation results indicate that Monday has a positive mean return of 0.21% and Thursday has a negative mean return of -0.17%, which are statistically significant.

When the SSE180 subsample with negative previous day's return is examined for the DoW effect, the null hypothesis is rejected since the p-value of ANOVA is 0.005 and it is less than the level of significance. The analysis shows that negative Monday and Thursday effects are present for the index with returns of -0.28% and -0.11%, respectively.

Results of the ANOVA for the SZSC is given in Table 4.13. As the p-value of ANOVA is 0.005 and less than the 0.05 significance level, the null hypothesis of equal mean returns on each day of the week is rejected. GARCH estimation, given in the table, indicates that there is a negative Thursday effect on the index as the coefficient of Thursday is -0.20%, which is statistically significant.

When the SZSC is examined for the DoW effect with the subsample having non-negative previous day's return, the p-value of the ANOVA is less than 0.05 significance level, and therefore, the null hypothesis is rejected. Regarding the analysis, a positive Monday effect and a negative Thursday effect are observed with mean returns of 0.37% and -0.14%, respectively.

Table 4.12

Results of the day-of-the-week effect analysis of the SSE180 Index

	SSE180	+ Previous day return	− Previous day return
Variables			
Monday	0.0000	0.0021***	-0.0028***
	(0.9903)	(0.0000)	(0.0000)
Tuesday	0.0004	0.0003	0.0001
	(0.2817)	(0.5942)	(0.8008)
Wednesday	0.0002	-0.0001	0.0004
	(0.6048)	(0.8865)	(0.5587)
Thursday	-0.0015***	-0.0017***	-0.0011**
	(0.0000)	(0.0016)	(0.0361)
Friday	0.0005	0.0007	0.0005
	(0.1295)	(0.2032)	(0.3043)
ANOVA			
F-stat	4.1096	8.0248	4.2727
	(0.0025)	(0.0000)	(0.0019)
Goodness-of-fit statistics			
SIC	-5.7928	-5.5298	-5.5283

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

SZSC is lastly examined for the DoW effects using the subsample for which the previous day's returns are negative. The null hypothesis is rejected at the 0.05 significance level, since the p-value of the ANOVA is less than 0.05, as shown in Table 4.13. Mean return on Monday is statistically significant and Monday has a negative coefficient of -0.47%.

Table 4.13

Results of the day-of-the-week effect analysis of the SZSC Index

	SZSC	+ Previous day return	− Previous day return
Variables			
Monday	-0.0003	0.0037***	-0.0047***
	(0.2701)	(0.0000)	(0.0034)
Tuesday	0.0002	0.0002	-0.0001
	(0.6247)	(0.6767)	(0.9797)
Wednesday	0.0006	0.0004	0.0023
	(0.1227)	(0.4831)	(0.2516)
Thursday	-0.0020***	-0.0014***	-0.0017
	(0.0000)	(0.0087)	(0.3580)
Friday	0.0002	0.0002	0.0000
	(0.5895)	(0.7665)	(0.9975)
ANOVA			
F-stat	3.7060	9.0696	8.5753
	(0.0051)	(0.0000)	(0.0000)
Goodness-of-fit statistics			
SIC	-5.4691	-5.2778	-4.6914

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Result of the ANOVA for the SZS100 index in Table 4.14 shows that the p-value of ANOVA is 0.006 and below the significance level of 0.05, and therefore, the null hypothesis is rejected. According to the results of the GARCH model estimation, a negative Thursday effect is present for the SZS100 index.

SZS100 is then investigated for the DoW effect by using the subsample for non-negative previous day's return. The p-value of ANOVA implies that the null hypothesis of equal mean returns on each day of the week is rejected at the 0.05 significance level. Results of the analysis show that Monday has a statistically significant and positive return of 0.30%, whereas Thursday has a statistically significant and negative return of -0.22%, given in Table 4.14.

ANOVA of the SZS100 index, under the condition that previous day's return is negative, concludes that the null hypothesis of equal mean returns is rejected as the p-value of ANOVA is 0.013, less than the significance level. The analysis suggests a negative Monday effect, as the statistically significant coefficient of Monday dummy variable is -0.30%.

Table 4.14

Results of the day-of-the-week effect analysis of the SZS100 Index

	SZS100	+ Previous day return	− Previous day return
Variables			
Monday	0.0003	0.0030***	-0.0030***
	(0.4804)	(0.0000)	(0.0000)
Tuesday	0.0004	0.0000	0.0011
	(0.3481)	(0.9864)	(0.2183)
Wednesday	0.0007	0.0003	0.0016*
	(0.1486)	(0.6303)	(0.0564)
Thursday	-0.0021***	-0.0022***	-0.0015*
	(0.0000)	(0.0028)	(0.0556)
Friday	-0.0002	0.0000	-0.0001
	(0.6879)	(0.9563)	(0.8988)
ANOVA			
F-stat	3.6234	8.1799	3.1668
	(0.0059)	(0.0000)	(0.0132)
Goodness-of-fit statistics			
SIC	-5.6594	-5.4548	-5.3209

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Result of the ANOVA of CSI300 for the presence of the DoW effect is given in Table 4.15. The null hypothesis of equal mean returns is rejected with a p-value of 0.007 at 0.05 significance level and the results of the analysis show that there is a negative Thursday effect for CSI300 index with a mean return of -0.18%.

When CSI300 is examined for the DoW effect for non-negative previous day's return, ANOVA result implies that the null hypothesis is rejected since the p-value is less than the 0.05 significance level, as seen in Table 4.15. The results suggest that positive Monday effect and negative Thursday effect exist with coefficients of 0.23% and -0.19%, respectively.

When the CSI300 is analyzed for the DoW effect using the subsample having negative previous day's return, the p-value of the ANOVA, 0.044, is below the 0.05 significance level, hence the null hypothesis of equal mean weekday returns is rejected, as can be seen in Table 4.15. The GARCH estimation results suggest that the mean return on Monday, -0.23%, is statistically significant.

4.1.5. South Africa

FTSE/JSE All Share Index (JALSH) consists of the 164 listed companies by market cap out of the roughly 400 shares listed on the Johannesburg Stock Exchange (JSE), and that corresponds to the 99% of the full market capitalization as of August 2019, according to the website of the JSE. It is a capitalization-weighted index. FTSE/JSE Top 40 Index (JTOPI) comprises 40 of the largest listed companies by market cap, and it is also a capitalization-weighted index. JALSH and JTOPI are investigated for the presence of the DoW effect and DoW effect, depending on the previous day's return being negative or non-negative in the period of 1995-2018.

Table 4.15

Results of the day-of-the-week effect analysis of the CSI300 Index

	CSI300	+ Previous day return	− Previous day return
Variables			
Monday	0.0005	0.0023***	-0.0023***
	(0.1141)	(0.0000)	(0.0004)
Tuesday	0.0002	0.0001	0.0003
	(0.7085)	(0.9197)	(0.6826)
Wednesday	0.0001	-0.0004	0.0008
	(0.7832)	(0.5086)	(0.2793)
Thursday	-0.0018***	-0.0019***	-0.0011
	(0.0000)	(0.0023)	(0.1335)
Friday	0.0003	0.0004	0.0006
	(0.4324)	(0.6107)	(0.3892)
ANOVA			
F-stat	3.5438	8.4605	2.4586
	(0.0068)	(0.0000)	(0.0438)
Goodness-of-fit statistics			
SIC	-5.7967	-5.5384	-5.4655

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

ANOVA results of the JALSH index for the DoW effect is given in Table 4.16. The p-value, 0.25, comes out to be higher than the 0.05 significance level; thus, the null hypothesis of equal mean returns on all days of the week cannot be rejected. The results of the analysis indicate that the coefficient of Monday, 0.06%, is statistically significant.

When the JALSH index is investigated for the presence of the DoW effect when the previous day’s return is non-negative, the p-value of the ANOVA is less than the 0.05 significance level, which means the null hypothesis is rejected. As can be seen in

Table 4.16, positive Monday and Thursday effects are observed with Monday having a higher return, according to the analysis.

JALSH exhibits negative Wednesday and Friday effects when it is examined using its subsample having a negative previous day's return. Table 4.16 shows that the p-value of ANOVA is 0.428, which means the null hypothesis cannot be rejected at the 0.05 significance level. Although all the days seem to have negative coefficients, only Wednesday and Friday have significant returns of -0.10% and 0.11%, respectively.

Table 4.16

Results of the day-of-the-week effect analysis of the JALSH Index

	JALSH	+ Previous day return	− Previous day return
Variables			
Monday	0.0006***	0.0016***	-0.0008*
	(0.0075)	(0.0000)	(0.0662)
Tuesday	-0.0003*	-0.0003	-0.0004
	(0.0875)	(0.3382)	(0.3808)
Wednesday	-0.0004*	0.0004	-0.0010**
	(0.0732)	(0.2131)	(0.0237)
Thursday	0.0002	0.0012***	-0.0007*
	(0.3328)	(0.0004)	(0.0929)
Friday	-0.0003	0.0004	-0.0011**
	(0.1785)	(0.2843)	(0.0172)
ANOVA			
F-stat	1.3459	3.9943	0.9606
	(0.2503)	(0.0031)	(0.4279)
Goodness-of-fit statistics			
SIC	-6.5495	-6.3878	-6.0664

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Table 4.17 shows the ANOVA results for the JTOPI index. The p-value of ANOVA being 0.247 means that the null hypothesis of equal average returns on all days of the week cannot be rejected at the 0.05 significance level. With regard to the analysis, JTOPI has a statistically significant and positive Monday return of 0.07% with a p-value of 0.002.

When JTOPI index is analyzed for the DoW effects on its subsample with non-negative previous day's returns, ANOVA result indicates the rejection of the null hypothesis as the p-value is below the significance level of 0.05. Similar to JALSH index, Monday, and Thursday have statistically significant positive returns of 0.20% and 0.13%, respectively, according to the GARCH model estimation.

JTOPI is then examined for the presence of the DoW effect using its subsample having negative previous day's return. The p-value of ANOVA is 0.388, therefore, the null hypothesis cannot be rejected at the 0.05 level of significance. The analysis implies that there are negative Thursday and Friday effects for this subsample of JTOPI.

4.1.6. Turkey

Istanbul Stock Exchange National 100 Index (XU100) is a free-float capitalization-weighted index that consists of 100 stocks listed on the Istanbul Stock Exchange (BIST), which are selected based on pre-determined criteria. It is the main index of BIST. BIST National 30 Index (XU030) consists of the 30 largest companies that are included in the XU100 index. BIST All Index (XUTUM) comprises all companies traded on BIST markets, except Investment trusts. The three indices from the Turkish stock market are examined for the DoW effect and DoW effect conditional on the previous day's return in the time periods of 1992-2018, 1997-2018, and 1997-2018, respectively.

Table 4.17

Results of the day-of-the-week effect analysis of the JTOPI Index

	JTOPI	+ Previous day return	− Previous day return
Variables			
Monday	0.0007***	0.0020***	-0.0007
	(0.0024)	(0.0000)	(0.1348)
Tuesday	-0.0004*	-0.0006*	-0.0002
	(0.0821)	(0.0925)	(0.6531)
Wednesday	-0.0004	0.0004	-0.0008
	(0.1425)	(0.2760)	(0.1038)
Thursday	0.0002	0.0013***	-0.0010**
	(0.3640)	(0.0003)	(0.0219)
Friday	-0.0004*	0.0003	-0.0013***
	(0.0998)	(0.4065)	(0.0084)
ANOVA			
F-stat	1.3562	4.2464	1.0338
	(0.2466)	(0.0020)	(0.3882)
Goodness-of-fit statistics			
SIC	-6.3499	-6.1808	-5.8869

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The results of the ANOVA for the XU100 is given in Table 4.18. As the p-value of ANOVA is less than the significance level of 0.05, the null hypothesis of equal mean returns on all days of the week is rejected. Regarding the GARCH estimation, Tuesday has a statistically significant and negative return of -0.10%; therefore, there is a negative Tuesday effect on XU100 Index.

When the XU100 index is examined for the DoW effect while the return on the previous day is non-negative, ANOVA result in Table 4.18 suggests the rejection of the null hypothesis at 0.05 significance, as its p-value is 0.001. According to the

GARCH estimation, a negative Tuesday effect and a positive Thursday effect are present, as their coefficients are -0.17% and 0.18%, respectively.

XU100 is then examined for the DoW effects using the subsample, where the previous day's return is negative. As can be seen in Table 4.18, the null hypothesis is rejected at the 0.05 significance level, since the p-value of the ANOVA is 0.004. The results indicate that the mean return on Monday is statistically significant and negative, which is -0.15%.

Table 4.18

Results of the day-of-the-week effect analysis of the XU100 Index

	XU100	+ Previous day return	− Previous day return
Variables			
Monday	-0.0002	0.0008	-0.0015**
	(0.6437)	(0.1788)	(0.0268)
Tuesday	-0.0010**	-0.0017**	0.0008
	(0.0133)	(0.0101)	(0.2992)
Wednesday	0.0001	0.0003	0.0005
	(0.8104)	(0.5989)	(0.4933)
Thursday	0.0006	0.0018***	0.0000
	(0.1139)	(0.0027)	(0.9845)
Friday	0.0002	0.0002	0.0004
	(0.5925)	(0.7536)	(0.5983)
ANOVA			
F-stat	5.4784	4.7216	3.8017
	(0.0002)	(0.0008)	(0.0044)
Goodness-of-fit statistics			
SIC	-5.1672	-4.9266	-4.7584

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Result of ANOVA for the DoW effect on the XU030 index is given in Table 4.19. The p-value of the ANOVA, 0.008, suggests that the null hypothesis of equal mean returns on all days of the week is rejected at the 0.05 significance level. The GARCH estimation suggests that Tuesday has a statistically significant and negative return of -0.10%.

When XU030 index is examined for the presence of the DoW effect where the previous day's return is non-negative, the p-value of the ANOVA, 0.004, is less than the 0.05 significance level, which means the null hypothesis is rejected. Like XU100 index, the analysis reveals that there are statistically significant negative Tuesday return of -0.18% and positive Thursday return of 0.18%.

XU030 is then investigated for the DoW effect when the previous day's return is negative. The ANOVA result suggests that mean returns are not statistically different from each other, as the p-value is 0.197 (Table 4.19). Furthermore, the GARCH estimation confirms that the DoW effect is not present for this case.

In Table 4.20, ANOVA result of the DoW effect analysis on the XUTUM index is given. Since the p-value of ANOVA is 0.002, the null hypothesis is rejected at the 0.05 significance level. The GARCH estimation shows that Tuesday has a statistically significant mean return of -0.10%.

ANOVA of the XUTUM index, under the condition that the previous day's return is non-negative, implies that the null hypothesis of equal mean returns on all days of the week is rejected, as the p-value of ANOVA is less than the 0.05 significance level (Table 4.20). According to the results, there are negative Tuesday and positive Thursday effects on this subsample of XUTUM.

Table 4.19

Results of the day-of-the-week effect analysis of the XU030 Index

	XU030	+ Previous day return	− Previous day return
Variables			
Monday	0.0003	0.0002	0.0000
	(0.4943)	(0.8113)	(0.9784)
Tuesday	-0.0010**	-0.0018**	0.0008
	(0.0219)	(0.0115)	(0.3163)
Wednesday	0.0000	-0.0003	0.0003
	(0.9466)	(0.7206)	(0.7547)
Thursday	0.0008*	0.0018**	-0.0002
	(0.1000)	(0.0138)	(0.8374)
Friday	0.0000	0.0003	-0.0002
	(0.9334)	(0.7260)	(0.8479)
ANOVA			
F-stat	3.4501	3.7951	1.5083
	(0.0080)	(0.0044)	(0.1970)
Goodness-of-fit statistics			
SIC	-5.1723	-4.8971	-4.8072

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

When XUTUM is examined for the presence of the DoW effect using its subsample with negative previous day’s return, the p-value of ANOVA is 0.042; therefore, the null hypothesis that the mean returns on each day of the week are equal is rejected at the 0.05 level of significance. Similar to the XU030 index, none of the days have statistically significant returns.

Table 4.20

Results of the day-of-the-week effect analysis of the XUTUM Index

	XUTUM	+ Previous day return	− Previous day return
Variables			
Monday	0.0002	0.0007	-0.0004
	(0.6609)	(0.2035)	(0.5265)
Tuesday	-0.0010**	-0.0015**	0.0006
	(0.0103)	(0.0131)	(0.4532)
Wednesday	-0.0002	-0.0003	0.0004
	(0.6622)	(0.6509)	(0.5504)
Thursday	0.0006	0.0016***	0.0001
	(0.1755)	(0.0061)	(0.8622)
Friday	0.0001	0.0001	0.0003
	(0.7627)	(0.8398)	(0.7252)
ANOVA			
F-stat	4.1348	3.5844	2.4855
	(0.0024)	(0.0064)	(0.0417)
Goodness-of-fit statistics			
SIC	-5.3804	-5.1395	-4.9436

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "+ Previous day return" and "− Previous day return" refer to the subsamples of the index data containing days with positive previous day returns and negative previous day returns, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. The null hypothesis of the ANOVA is that all the mean returns on different days of the week are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2. Time consistency of day-of-the-week effect analyses of stock market indices

In this section, daily returns of stock market indices are examined for the presence of the DoW effects using the GARCH (1,1) model for different time periods. For this purpose, two breakpoints are determined for each stock market index, and the daily return data sample for each index is divided into subsamples so that each covers a time period either before or after one of the specified breakpoints. One breakpoint is September 15, 2008, the day Lehman Brothers filed for bankruptcy during the 2008 financial crisis. The other one is found by applying the Quandt-Andrews breakpoint test on each of the indices, separately.

4.2.1. Brazil

For the BVSP index, January 28, 1999, is determined as the breakpoint and the pre-post analysis for the two breakpoints are given in Table 4.21. Results of the analysis show that there is a negative Monday effect in the pre-January 29, 1999 period, but there are negative Monday and positive Wednesday effects in the more recent time period. In the second analysis, negative Monday and positive Wednesday and Friday effects observed before September 15, 2008, disappears after this date.

Table 4.21

Results of the day-of-the-week effect analysis of the BVSP Index before and after breakpoints

Start date End date	09.06.1992 28.01.1999	28.01.1999 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0026***	-0.0008**	-0.0020***	-0.0002
	(0.0034)	(0.0439)	(0.0001)	(0.7478)
Tuesday	0.0019*	-0.0004	-0.0001	0.0000
	(0.0632)	(0.3327)	(0.8257)	(0.9861)
Wednesday	-0.0005	0.0009**	0.0012**	0.0002
	(0.6726)	(0.0473)	(0.0449)	(0.6778)
Thursday	-0.0006	-0.0003	-0.0006	0.0000
	(0.5414)	(0.5515)	(0.2966)	(0.9278)
Friday	0.0018*	0.0003	0.0013**	-0.0001
	(0.0641)	(0.4724)	(0.0336)	(0.8123)
Goodness-of-fit statistics				
SIC	-4.4822	-5.6062	-5.0353	-5.7795

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Like the BVSP index, Quandt-Andrews test gives January 28, 1999 as the breakpoint for the IBRX index (Table 4.22). Although there is no DoW effect before this date, a negative Monday effect emerges afterwards. Again, the DoW effects observed before September 15, 2008 disappear after this date.

Table 4.22

Results of the day-of-the-week effect analysis of the IBRX Index before and after breakpoints

Start date End date	11.03.1997 28.01.1999	28.01.1999 31.12.2018	11.03.1997 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0028	-0.0007**	-0.0017***	-0.0001
	(0.1943)	(0.0405)	(0.0014)	(0.7473)
Tuesday	0.0028	-0.0003	-0.0002	-0.0002
	(0.1996)	(0.3510)	(0.7501)	(0.7092)
Wednesday	0.0002	0.0007*	0.0013**	0.0001
	(0.9368)	(0.0701)	(0.0226)	(0.8529)
Thursday	-0.0006	-0.0002	-0.0002	0.0001
	(0.7726)	(0.6717)	(0.6927)	(0.8965)
Friday	-0.0012	0.0003	0.0004	-0.0001
	(0.5342)	(0.4463)	(0.5081)	(0.8936)
Goodness-of-fit statistics				
SIC	-4.4103	-5.8324	-5.4918	-5.9318

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

As for the IBX50 index, the breakpoint is found out to be September 27, 2016. Before this date, there is no DoW effect. However, a negative Thursday effect is observed thereafter. Regarding the breakpoint on September 15, 2008, no DoW effect is observed before or after, as seen in Table 4.23.

Table 4.23

Results of the day-of-the-week effect analysis of the IBX50 Index before and after breakpoints

Start date End date	03.01.2003 27.09.2016	27.09.2016 31.12.2018	03.01.2003 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0006	0.0003	-0.0011	-0.0001
	(0.1883)	(0.7029)	(0.1315)	(0.7966)
Tuesday	-0.0003	0.0011	0.0001	-0.0001
	(0.4958)	(0.2361)	(0.8836)	(0.8327)
Wednesday	0.0005	-0.0005	0.0011	0.0002
	(0.2866)	(0.6496)	(0.1582)	(0.7311)
Thursday	0.0003	-0.0034***	-0.0012	0.0000
	(0.5555)	(0.0042)	(0.1464)	(0.9283)
Friday	0.0000	0.0012	0.0008	-0.0002
	(0.9821)	(0.3427)	(0.3412)	(0.7564)
Goodness-of-fit statistics				
SIC	-5.7541	-5.9754	-5.6870	-5.8315

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2.2. Russia

For the RTSI index of the Moscow Stock Exchange, Quandt-Andrews test shows that the breakpoint is on June 14, 2006. Although there seems to be positive Monday and negative Tuesday and Wednesday effects before this breakpoint, no DoW effect is observed after this date. Similar to the other breakpoint, negative Tuesday and Wednesday effects disappear after September 15, 2008.

Table 4.24

Results of the day-of-the-week effect analysis of the RTSI Index before and after breakpoints

Start date End date	04.09.1995 14.06.2006	14.06.2006 31.12.2018	04.09.1995 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0014**	-0.0002	0.0008	0.0000
	(0.0247)	(0.6269)	(0.1287)	(0.9733)
Tuesday	-0.0016**	-0.0004	-0.0018***	0.0000
	(0.0119)	(0.4858)	(0.0013)	(0.9458)
Wednesday	-0.0025***	0.0005	-0.0015**	0.0002
	(0.0002)	(0.3166)	(0.0118)	(0.7007)
Thursday	0.0009	0.0003	0.0009	0.0002
	(0.1912)	(0.6045)	(0.1494)	(0.7203)
Friday	0.0007	-0.0008	0.0004	-0.0010*
	(0.3047)	(0.1205)	(0.4987)	(0.0741)
Goodness-of-fit statistics				
SIC	-4.8966	-5.4905	-5.0336	-5.4503

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The breakpoint for the IMOEX index is given as October 23, 1998, by the breakpoint test. There is a positive Monday effect before this date. However, it disappears in the post-breakpoint period, as seen in Table 4.25. For the breakpoint on September 15, 2008, results are the same as the RTSI index, i.e., negative Tuesday and Wednesday effects observed before the breakpoint is not present in the time period after that.

Table 4.25

Results of the day-of-the-week effect analysis of the IMOEX Index before and after breakpoints

Start date End date	23.09.1997 23.10.1998	23.10.1998 31.12.2018	23.09.1997 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0081***	0.0001	0.0009	-0.0001
	(0.0023)	(0.7308)	(0.1461)	(0.8955)
Tuesday	0.0040	-0.0002	-0.0017***	0.0003
	(0.3220)	(0.5070)	(0.0066)	(0.5531)
Wednesday	-0.0025	-0.0003	-0.0017**	0.0002
	(0.6174)	(0.4324)	(0.0151)	(0.6384)
Thursday	0.0019	0.0001	0.0011	-0.0002
	(0.6537)	(0.8213)	(0.1126)	(0.6160)
Friday	-0.0002	-0.0003	0.0010	-0.0008*
	(0.9759)	(0.4482)	(0.2350)	(0.0969)
Goodness-of-fit statistics				
SIC	-3.1562	-5.5428	-4.9213	-5.9538

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the MOEX10 index, Quandt-Andrews test produces the breakpoint as September 10, 2008, very close to the other breakpoint, September 15, 2008. Therefore, for both breakpoints, the results reveal that a negative Tuesday effect exists in the older time period and that effect vanishes in the recent time period.

Table 4.26

Results of the day-of-the-week effect analysis of the MOEX10 Index before and after breakpoints

Start date End date	21.03.2001 09.10.2008	09.10.2008 31.12.2018	21.03.2001 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0002	0.0001	0.0002	0.0001
	(0.8301)	(0.8498)	(0.7846)	(0.8616)
Tuesday	-0.0028***	0.0001	-0.0028***	0.0001
	(0.0001)	(0.8598)	(0.0001)	(0.8646)
Wednesday	0.0000	0.0003	0.0000	0.0003
	(0.9638)	(0.5550)	(0.9830)	(0.5621)
Thursday	0.0007	-0.0003	0.0006	-0.0003
	(0.4380)	(0.4462)	(0.4430)	(0.4387)
Friday	0.0006	-0.0007	0.0006	-0.0007
	(0.5183)	(0.1651)	(0.5239)	(0.1696)
Goodness-of-fit statistics				
SIC	-5.1765	-5.9085	-5.2247	-5.8787

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2.3. India

Quandt-Andrews test gives the breakpoint date as March 31, 1995 for the SENSEX index of the Bombay Stock Exchange. As seen in Table 4.27, Positive Friday effect observed before this date does not exist after the breakpoint. For the other breakpoint, September 15, 2008, there is no DoW effect, before or after.

Table 4.27

Results of the day-of-the-week effect analysis of the SENSEX Index before and after breakpoints

Start date End date	09.06.1992 31.03.1995	31.03.1995 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0003	0.0002	0.0000	0.0005
	(0.7258)	(0.3325)	(0.9310)	(0.1080)
Tuesday	-0.0006	-0.0005*	-0.0007	-0.0005
	(0.5527)	(0.0929)	(0.1134)	(0.2175)
Wednesday	-0.0024*	0.0001	-0.0001	0.0001
	(0.0550)	(0.6014)	(0.8864)	(0.8165)
Thursday	-0.0010	-0.0001	0.0001	-0.0002
	(0.4001)	(0.8288)	(0.9029)	(0.5580)
Friday	0.0044***	0.0001	0.0008*	0.0000
	(0.0000)	(0.8005)	(0.0614)	(0.9324)
Goodness-of-fit statistics				
SIC	-5.7013	-6.1272	-5.7945	-6.5517

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the BSE500 index, September 4, 2001 is found to be the breakpoint, given in Table 4.28. According to the results in the table, there is a negative Friday effect before this date. However, no DoW effect is observed after it. Regarding September 15, 2008, there is no DoW effect before or after it.

Table 4.28

Results of the day-of-the-week effect analysis of the BSE500 Index before and after breakpoints

Start date End date	11.04.2000 04.09.2001	04.09.2001 31.12.2018	11.04.2000 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0002	0.0001	0.0001	0.0005*
	(0.8796)	(0.9265)	(0.7991)	(0.0980)
Tuesday	0.0027	-0.0003	-0.0008	-0.0005
	(0.2001)	(0.7730)	(0.1375)	(0.1477)
Wednesday	0.0016	0.0003	-0.0002	0.0000
	(0.3602)	(0.7647)	(0.6443)	(0.9787)
Thursday	0.0000	-0.0004	0.0001	-0.0003
	(0.9897)	(0.6595)	(0.8827)	(0.3357)
Friday	-0.0038**	0.0004	0.0002	0.0000
	(0.0187)	(0.7117)	(0.6436)	(0.9866)
Goodness-of-fit statistics				
SIC	-5.3832	-5.8787	-5.9408	-6.5888

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The breakpoint test shows that the breakpoint is on April 3, 2001, for the NIFTY50 index of the National Stock Exchange. Negative Monday and Tuesday effects and positive Wednesday effects observed before this date are not present in the more recent time period, as seen in Table 4.29. For the other breakpoint, September 15, 2008, there are negative Monday and positive Wednesday effect before this date. However, no DoW effect is observed thereafter.

Table 4.29

Results of the day-of-the-week effect analysis of the NIFTY50 Index before and after breakpoints

Start date End date	06.11.1995 03.04.2001	03.04.2001 31.12.2018	06.11.1995 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0024***	0.0003	-0.0009**	0.0005*
	(0.0004)	(0.2891)	(0.0135)	(0.0931)
Tuesday	-0.0025**	-0.0003	-0.0009*	-0.0005
	(0.0108)	(0.2700)	(0.0623)	(0.1985)
Wednesday	0.0068***	-0.0002	0.0016***	0.0000
	(0.0000)	(0.5307)	(0.0006)	(0.9073)
Thursday	-0.0005	-0.0001	0.0002	-0.0003
	(0.5707)	(0.7819)	(0.6716)	(0.4069)
Friday	-0.0013	0.0002	0.0000	0.0001
	(0.2356)	(0.5439)	(0.9756)	(0.8696)
Goodness-of-fit statistics				
SIC	-5.5155	-6.3081	-5.7758	-6.5268

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the NIFTY500 index, January 17, 1995 is determined as the breakpoint by the Quandt-Andrews test and the pre-post analysis for the two breakpoints are given in Table 4.30. Results of the analysis show that there are negative Wednesday and positive Friday effects in the older period, but there is a negative Tuesday effect after January 17, 1995. As for the second analysis, negative Tuesday effect observed before September 15, 2008 disappears after this date.

Table 4.30

Results of the day-of-the-week effect analysis of the NIFTY500 Index before and after breakpoints

Start date End date	09.06.1992 17.01.1995	17.01.1995 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0003	0.0002	0.0001	0.0005
	(0.6845)	(0.3014)	(0.8257)	(0.1146)
Tuesday	-0.0012	-0.0008***	-0.0012***	-0.0006
	(0.2531)	(0.0020)	(0.0020)	(0.1158)
Wednesday	-0.0021**	0.0003	0.0004	0.0000
	(0.0376)	(0.2173)	(0.2470)	(0.9910)
Thursday	-0.0005	-0.0002	-0.0002	-0.0004
	(0.6150)	(0.4169)	(0.6645)	(0.2489)
Friday	0.0041***	0.0000	0.0005	0.0001
	(0.0000)	(0.8968)	(0.1920)	(0.6808)
Goodness-of-fit statistics				
SIC	-6.0556	-6.1805	-5.9175	-6.5722

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2.4. China

For the SSEC index of the Shanghai Stock Exchange, the Quandt-Andrews test gives the breakpoint date as July 8, 1996, given in Table 4.31. There are negative Monday and positive Friday effects before this breakpoint. On the other hand, a negative Thursday effect is observed after this date. Regarding the other breakpoint, negative Monday and Thursday effects are observed before September 15, 2008, but the Monday effect disappears, and only the negative Thursday effect is present thereafter.

Table 4.31

Results of the day-of-the-week effect analysis of the SSEC Index before and after breakpoints

Start date End date	09.06.1992 08.07.1996	08.07.1996 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0039***	0.0001	-0.0008**	0.0005
	(0.0010)	(0.7139)	(0.0276)	(0.1275)
Tuesday	-0.0011	0.0004	0.0004	0.0003
	(0.5318)	(0.2299)	(0.3807)	(0.4776)
Wednesday	0.0025*	0.0003	0.0007	-0.0001
	(0.0851)	(0.3168)	(0.1123)	(0.8885)
Thursday	0.0013	-0.0016***	-0.0012***	-0.0015***
	(0.4570)	(0.0000)	(0.0077)	(0.0002)
Friday	0.0033**	0.0002	0.0003	0.0001
	(0.0298)	(0.6154)	(0.4964)	(0.8484)
Goodness-of-fit statistics				
SIC	-4.2992	-5.9011	-5.3170	-6.1362

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Quandt-Andrews test determines the breakpoint date as August 13, 1997 for the SSE180 index. As seen in Table 4.32, although no DoW effect exists before the breakpoint, a negative Thursday effect emerges afterwards. does not exist after the breakpoint. Like the SSEC index, negative Monday and Thursday effects are present before September 15, 2008 and a negative Thursday effect is observed after this date.

Table 4.32

Results of the day-of-the-week effect analysis of the SSE180 Index before and after breakpoints

Start date End date	02.07.1996 13.08.1997	13.08.1997 31.12.2018	02.07.1996 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0047*	0.0000	-0.0008**	0.0007*
	(0.0741)	(0.9497)	(0.0365)	(0.0624)
Tuesday	-0.0068*	0.0004	0.0004	0.0003
	(0.0637)	(0.1944)	(0.4504)	(0.5705)
Wednesday	0.0019	0.0002	0.0008*	-0.0004
	(0.5766)	(0.6178)	(0.0865)	(0.3356)
Thursday	-0.0048	-0.0015***	-0.0015***	-0.0013***
	(0.1943)	(0.0000)	(0.0007)	(0.0029)
Friday	0.0010	0.0005	0.0004	0.0004
	(0.7410)	(0.1348)	(0.4097)	(0.3358)
Goodness-of-fit statistics				
SIC	-4.4810	-5.8671	-5.6349	-5.9736

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the SZSC index of the Shenzhen Stock Exchange, June 6, 2000 is found to be the breakpoint, given in Table 4.33. According to the results in the table, there are negative Tuesday and positive Friday effects before this date. However, there is a different pattern observed after it with Tuesday having a statistically positive return and Thursday a statistically negative return. As for September 15, 2008, there is a negative Thursday effect, both before and after this date.

Table 4.33

Results of the day-of-the-week effect analysis of the SZSC Index before and after breakpoints

Start date End date	09.06.1992 06.06.2000	06.06.2000 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0011*	-0.0002	-0.0007*	0.0001
	(0.0967)	(0.6403)	(0.0678)	(0.7995)
Tuesday	-0.0030***	0.0009**	0.0001	0.0003
	(0.0013)	(0.0391)	(0.9040)	(0.5414)
Wednesday	0.0009	0.0004	0.0008	0.0003
	(0.3388)	(0.2916)	(0.1058)	(0.6576)
Thursday	0.0000	-0.0023***	-0.0015***	-0.0025***
	(0.9594)	(0.0000)	(0.0012)	(0.0001)
Friday	0.0028***	-0.0005	0.0006	-0.0003
	(0.0023)	(0.2261)	(0.2422)	(0.6188)
Goodness-of-fit statistics				
SIC	-4.8984	-5.7348	-5.3110	-5.7048

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the SZS100 index, the Quandt-Andrews test reveals that the breakpoint is on April 25, 2011, given in Table 4.34. There seem to be positive Wednesday and negative Thursday effects before this breakpoint. On the other hand, positive Tuesday and negative Thursday effects are observed after this date. Concerning the other breakpoint, positive Wednesday and negative Thursday effects are observed before September 15, 2008, but the Wednesday effect disappears, and only the negative Thursday effect exists thereafter.

Table 4.34

Results of the day-of-the-week effect analysis of the SZS100 Index before and after breakpoints

Start date End date	03.01.2003 25.04.2011	25.04.2011 31.12.2018	03.01.2003 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0008	-0.0001	0.0004	0.0003
	(0.1754)	(0.7851)	(0.6076)	(0.5515)
Tuesday	-0.0009	0.0014**	0.0003	0.0005
	(0.2029)	(0.0247)	(0.7658)	(0.3435)
Wednesday	0.0016**	-0.0001	0.0019**	0.0001
	(0.0147)	(0.8342)	(0.0228)	(0.9056)
Thursday	-0.0023***	-0.0020***	-0.0019**	-0.0022***
	(0.0007)	(0.0013)	(0.0136)	(0.0002)
Friday	-0.0007	0.0001	-0.0010	0.0002
	(0.3788)	(0.8321)	(0.2321)	(0.7882)
Goodness-of-fit statistics				
SIC	-5.4499	-5.8623	-5.5333	-5.7097

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The breakpoint test results in the same day as SZS100 index for CSI300 Composite Index, April 25, 2001. Before the breakpoint, positive Monday and negative Tuesday and Thursday effects are revealed by the analysis in Table 4.35. However, positive Tuesday and negative Thursday effects are observed after April 25, 2001. For the second analysis, CSI300 index contains a negative Thursday effect, both before and after September 15, 2008.

Table 4.35

Results of the day-of-the-week effect analysis of the CSI300 Index before and after breakpoints

Start date End date	04.01.2005 25.04.2011	25.04.2011 31.12.2018	04.01.2005 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0021***	0.0001	0.0012	0.0005
	(0.0037)	(0.7172)	(0.1624)	(0.2125)
Tuesday	-0.0025***	0.0010**	-0.0012	0.0004
	(0.0023)	(0.0376)	(0.2473)	(0.3644)
Wednesday	0.0014*	-0.0004	0.0015	-0.0002
	(0.0667)	(0.4330)	(0.1875)	(0.5976)
Thursday	-0.0033***	-0.0013***	-0.0036***	-0.0015***
	(0.0000)	(0.0047)	(0.0001)	(0.0010)
Friday	0.0005	0.0002	0.0002	0.0003
	(0.6066)	(0.6404)	(0.8623)	(0.5418)
Goodness-of-fit statistics				
SIC	-5.3590	-6.1430	-5.3371	-5.9478

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2.5. South Africa

The breakpoint for the JALSH index of Johannesburg Stock Exchange is given as October 29, 1997, by the Quandt-Andrews breakpoint test. Even though there is no DoW effect before this date, positive Monday and negative Wednesday effects are observed in the post-breakpoint period. For the breakpoint on September 15, 2008, there is no DoW effect before it, but a positive Monday effect exists thereafter, as seen in Table 4.36.

Table 4.36

Results of the day-of-the-week effect analysis of the JALSH Index before and after breakpoints

Start date End date	03.07.1995 29.10.1997	29.10.1997 31.12.2018	03.07.1995 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0001	0.0007***	0.0005*	0.0007**
	(0.9066)	(0.0031)	(0.0844)	(0.0487)
Tuesday	-0.0003	-0.0003	-0.0005*	-0.0002
	(0.4351)	(0.1709)	(0.0695)	(0.5595)
Wednesday	0.0003	-0.0006**	-0.0005	-0.0003
	(0.6141)	(0.0203)	(0.1490)	(0.3419)
Thursday	-0.0002	0.0003	0.0003	0.0001
	(0.7199)	(0.2664)	(0.3159)	(0.6941)
Friday	-0.0008	-0.0002	-0.0002	-0.0005
	(0.1224)	(0.3764)	(0.4827)	(0.1944)
Goodness-of-fit statistics				
SIC	-7.3076	-6.4589	-6.4996	-6.5916

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For the JTOPI index, the results of the analysis are quite similar. The breakpoint test, again, gives October 29, 1997 as the breakpoint. The index does not have any DoW effect before this date, however, after October 29, 1997, positive Monday and negative Wednesday effects are shown by the analysis in Table 4.37. Regarding September 15, 2008, there is no DoW effect before it. On the other hand, a positive Monday effect is observed in the more recent time period.

Table 4.37

Results of the day-of-the-week effect analysis of the JTOPI Index before and after breakpoints

Start date End date	03.07.1995 29.10.1997	29.10.1997 31.12.2018	03.07.1995 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	0.0001	0.0009***	0.0006*	0.0009**
	(0.8174)	(0.0013)	(0.0584)	(0.0216)
Tuesday	-0.0003	-0.0004	-0.0005*	-0.0002
	(0.5087)	(0.1572)	(0.0737)	(0.5265)
Wednesday	0.0003	-0.0005**	-0.0004	-0.0003
	(0.5730)	(0.0497)	(0.2208)	(0.4710)
Thursday	-0.0001	0.0003	0.0004	0.0001
	(0.8834)	(0.3227)	(0.2505)	(0.8648)
Friday	-0.0011*	-0.0003	-0.0004	-0.0006
	(0.0732)	(0.2742)	(0.3148)	(0.1590)
Goodness-of-fit statistics				
SIC	-6.9558	-6.2748	-6.2871	-6.4083

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.2.6. Turkey

For the XU100 index of the Istanbul Stock Exchange, the Quandt-Andrews test gives the breakpoint date as March 18, 2003. There are negative Monday and positive Thursday effects before this breakpoint, given in Table 4.38. However, those effects disappear afterwards. Concerning September 15, 2008, negative Monday and Tuesday and positive Thursday and Friday effects are observed before it. On the other hand, a positive Monday effect exists after September 15, 2008.

Table 4.38

Results of the day-of-the-week effect analysis of the XU100 Index before and after breakpoints

Start date End date	09.06.1992 18.03.2003	18.03.2003 31.12.2018	09.06.1992 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0039***	0.0006	-0.0024***	0.0012***
	(0.0000)	(0.1291)	(0.0000)	(0.0078)
Tuesday	-0.0020*	-0.0008*	-0.0017**	-0.0006
	(0.0708)	(0.0585)	(0.0150)	(0.2299)
Wednesday	0.0012	-0.0001	0.0007	-0.0003
	(0.2298)	(0.7907)	(0.2599)	(0.5796)
Thursday	0.0029***	0.0003	0.0015**	0.0001
	(0.0061)	(0.5426)	(0.0275)	(0.7956)
Friday	0.0016	0.0000	0.0016**	-0.0006
	(0.1682)	(0.9402)	(0.0367)	(0.2829)
Goodness-of-fit statistics				
SIC	-4.3523	-5.7238	-4.7078	-5.8985

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

For XU030 index, result of the Quandt-Andrews test suggests a breakpoint similar to that of XU100 index, April 7, 2003. For this breakpoint, results of the analysis show that there are negative Monday and positive Thursday effects before it, and those effects do not exist thereafter, as seen in Table 4.39. As for the second analysis, negative Monday and Tuesday and positive Thursday effects are demonstrated for the time period before September 15, 2008. Nevertheless, those effects disappear and a positive Monday effect exists after this date.

Table 4.39

Results of the day-of-the-week effect analysis of the XU030 Index before and after breakpoints

Start date End date	03.01.1997 07.04.2003	07.04.2003 31.12.2018	03.01.1997 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0054***	0.0007*	-0.0019***	0.0012**
	(0.0000)	(0.0967)	(0.0043)	(0.0136)
Tuesday	-0.0020	-0.0008*	-0.0019**	-0.0006
	(0.2155)	(0.0845)	(0.0207)	(0.2846)
Wednesday	0.0004	-0.0001	0.0003	-0.0003
	(0.8170)	(0.8673)	(0.7223)	(0.6538)
Thursday	0.0046***	0.0004	0.0018**	0.0003
	(0.0037)	(0.4188)	(0.0394)	(0.6111)
Friday	0.0011	-0.0001	0.0015	-0.0006
	(0.5058)	(0.8831)	(0.1042)	(0.2933)
Goodness-of-fit statistics				
SIC	-4.1265	-5.5940	-4.6505	-5.7647

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The breakpoint for the XUTUM index, April 7, 2003, is the same as that of XU030, according to the Quandt-Andrews test. There seem to be negative Monday and positive Thursday effects before this breakpoint. On the contrary, a negative Tuesday effect is observed after April 7, 2003. For the breakpoint of September 15, 2008, results are the same as the XU030 index. There are negative Monday and Tuesday and positive Thursday effects before this date. However, a positive Monday effect is revealed by the analysis given in Table 4.40 for the time period after September 15, 2008.

Table 4.40

Results of the day-of-the-week effect analysis of the XUTUM Index before and after breakpoints

Start date End date	03.01.1997 07.04.2003	07.04.2003 31.12.2018	03.01.1997 15.09.2008	15.09.2008 31.12.2018
Variables				
Monday	-0.0054***	0.0006	-0.0021***	0.0012***
	(0.0000)	(0.1212)	(0.0005)	(0.0067)
Tuesday	-0.0019	-0.0008**	-0.0018**	-0.0006
	(0.1955)	(0.0420)	(0.0119)	(0.1929)
Wednesday	-0.0001	-0.0002	0.0001	-0.0003
	(0.9703)	(0.6517)	(0.9315)	(0.5276)
Thursday	0.0044***	0.0002	0.0016**	0.0001
	(0.0027)	(0.5975)	(0.0325)	(0.8961)
Friday	0.0014	0.0000	0.0015*	-0.0005
	(0.3578)	(0.9898)	(0.0605)	(0.3013)
Goodness-of-fit statistics				
SIC	-4.3028	-5.8162	-4.8564	-5.9771

The variables are the dummy variables in the Equation 2, Monday to Friday representing the 5 days of the week. "Pre" and "Post" refer to the subsamples before and after the specified breakpoints, respectively. The null hypothesis of no DoW effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant DoW effect. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.3. Month-of-the-year effect in stock market indices

In this section, monthly returns of stock market indices are investigated for the presence of the month-of-the-year (MoY) effects using GARCH (1,1) model.

4.3.1. Brazil

BVSP, IBRX, and IBX50 indices are examined for the month-of-the-year effect in the time periods of 1992-2018, 1997-2018, and 2003-2018, respectively.

ANOVA results for the BVSP index are given in Table 4.41. As can be seen, the p-value of ANOVA is 0.108, which indicates that the null hypothesis of equal average returns on each month of the year cannot be rejected at the 0.05 significance level.

Results of the analysis suggest that the mean return in May is statistically significant and negative, i.e., -3.6%.

Table 4.41 shows the ANOVA results for the monthly returns of the IBRX index. The p-value of ANOVA being 0.399 means that the null hypothesis of no difference among average monthly returns cannot be rejected at the 0.05 significance level. According to the results of the GARCH model estimation, May has a statistically significant and negative mean return of -4.1%.

Results of the ANOVA for the MoY effect on the IBX50 index show that the p-value from is 0.554, which is above the significance level of 0.05; thus, the null hypothesis that the mean returns in all months of the year are equal cannot be rejected (Table 4.41). The GARCH estimation implies that there is a negative May effect on the IBX50, as the average return in this month is -4.3%.

4.3.2. Russia

RTSI, IMOEX, and MOEX10 indices are examined for the month-of-the-year effect in the time periods of 1995-2018, 1997-2018, and 2001-2018, respectively.

ANOVA for the MoY effect on the RTSI index concludes that the null hypothesis cannot be rejected as the p-value, 0.170, is higher than the significance level of 0.05, as can be seen in Table 4.42. The results of the analysis demonstrate that the return in May is -3.5%, which is statistically significant.

ANOVA results for the IMOEX index is given in Table 4.42. The p-value of the ANOVA is 0.482, and it is above the significance level; thus, the null hypothesis cannot be rejected. GARCH results suggest that the coefficient of January dummy variable is 2.8%, and the coefficient of May is -3.3, and they are statistically significant.

Table 4.41

Results of the month-of-the-year effect analysis of the indices on the Brazilian stock market

	BVSP	IBRX	IBX50
Variables			
January	0.0008	0.0015	0.0066
	(0.9438)	(0.8862)	(0.5203)
February	0.0153	0.0093	0.0020
	(0.2836)	(0.4556)	(0.8766)
March	0.0088	0.0085	0.0126
	(0.5678)	(0.6026)	(0.4748)
April	0.0125	-0.0071	-0.0077
	(0.3299)	(0.5350)	(0.5093)
May	-0.0364***	-0.0414***	-0.0433***
	(0.0021)	(0.0007)	(0.0013)
June	-0.0199	-0.0234*	-0.0269*
	(0.1830)	(0.0840)	(0.0946)
July	0.0143	0.0116	0.0263*
	(0.3308)	(0.4126)	(0.0949)
August	-0.0064	-0.0104	-0.0015
	(0.6795)	(0.4454)	(0.9206)
September	-0.0033	-0.0012	0.0165
	(0.8052)	(0.9195)	(0.2477)
October	0.0118	0.0166	0.0167
	(0.3169)	(0.1505)	(0.2244)
November	0.0042	-0.0006	-0.0047
	(0.7823)	(0.9728)	(0.8057)
December	0.0079	0.0149	0.0102
	(0.5768)	(0.3338)	(0.5074)
ANOVA			
F-stat	1.5626	1.0543	0.8874
	(0.1082)	(0.3993)	(0.5538)
Goodness-of-fit statistics			
SIC	-1.7525	-2.2508	-2.4583

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

ANOVA of the MOEX10 index for the MoY effect concludes that the null hypothesis of equal mean returns in all months cannot be rejected at the 0.05 significance level as the p-value is 0.830, as shown in Table 4.42. The analysis reveals that there is a negative May effect on the index, as the mean return in May is -2.8% with a p-value of 0.035.

4.3.3. India

SENSEX, BSE500, NIFTY50 and NIFTY500 are examined to detect whether any MoY effect is present in the Indian market, in the time periods of 1992-2018, 2000-2018, 1995-2018 and 1992-2018, respectively.

Table 4.43 shows the ANOVA results for the SENSEX index. The p-value of ANOVA is 0.522, which means that the null hypothesis of equal average returns on all months of the year cannot be rejected at the 0.05 significance level. Regarding the GARCH estimation results, the SENSEX index does not seem to have any MoY effect.

The BSE500 index is examined for the presence of the MoY effect. As can be seen in Table 4.43, the p-value of ANOVA is 0.634, therefore, the null hypothesis cannot be rejected at the 0.05 level of significance. Besides, in the GARCH estimation, none of the coefficients are statistically significant.

Table 4.42

Results of the month-of-the-year effect analysis of the indices on the Russian stock market

	RTSI	IMOEX	MOEX10
Variables			
January	0.0254*	0.0285***	0.0182
	(0.0842)	(0.0024)	(0.1362)
February	0.0117	-0.0090	-0.0073
	(0.5172)	(0.4075)	(0.5372)
March	0.0132	-0.0079	-0.0047
	(0.4569)	(0.5636)	(0.7702)
April	0.0042	0.0022	0.0032
	(0.8245)	(0.8633)	(0.8174)
May	-0.0346**	-0.0329***	-0.0278**
	(0.0149)	(0.0025)	(0.0354)
June	-0.0103	-0.0097	-0.0034
	(0.6999)	(0.6354)	(0.8492)
July	-0.0178	0.0012	-0.0024
	(0.3439)	(0.9352)	(0.8740)
August	0.0028	0.0068	0.0038
	(0.8594)	(0.5275)	(0.7809)
September	0.0075	0.0042	-0.0019
	(0.6288)	(0.6210)	(0.8544)
October	-0.0127	-0.0103	-0.0057
	(0.5301)	(0.3661)	(0.6293)
November	-0.0046	0.0090	0.0027
	(0.8788)	(0.5658)	(0.8809)
December	0.0143	0.0081	0.0005
	(0.4133)	(0.5346)	(0.9674)
ANOVA			
F-stat	1.6065	0.9620	0.5965
	(0.1697)	(0.4818)	(0.8305)
Goodness-of-fit statistics			
SIC	-1.4451	-2.0611	-2.2241

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Table 4.43

Results of the month-of-the-year effect analysis of the indices on the Bombay Stock Exchange of India

	SENSEX	BSE500
Variables		
January	0.0014	-0.0062
	(0.8791)	(0.5634)
February	-0.0041	-0.0222*
	(0.6856)	(0.0948)
March	-0.0026	0.0027
	(0.7940)	(0.8043)
April	0.0023	0.0141
	(0.8381)	(0.3021)
May	-0.0024	-0.0039
	(0.8250)	(0.7467)
June	0.0052	-0.0026
	(0.7402)	(0.8903)
July	0.0146	0.0121
	(0.2807)	(0.4354)
August	-0.0073	-0.0068
	(0.5684)	(0.6153)
September	-0.0044	-0.0085
	(0.6922)	(0.5021)
October	-0.0030	0.0037
	(0.7556)	(0.7514)
November	-0.0035	-0.0004
	(0.7636)	(0.9790)
December	0.0039	0.0068
	(0.7759)	(0.7133)
ANOVA		
F-stat	0.9187	0.8065
	(0.5224)	(0.6336)
Goodness-of-fit statistics		
SIC	-2.2716	-2.3830

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

In Table 4.44, ANOVA results of the NIFTY50 index for the MoY effects are given. Since the p-value of ANOVA is 0.807, the null hypothesis cannot be rejected at the 0.05 significance level. The GARCH estimation does not show any MoY effect on the monthly index returns.

ANOVA for the MoY effect on the NIFTY500 index implies that the null hypothesis cannot be rejected as the p-value, 0.709, is above the significance level of 0.05 (Table 4.44). The GARCH estimation results show that all monthly returns are statistically insignificant.

4.3.4. China

Stock market indices SSEC, SSE180, SZSC, SZS100, and CSI300 are analyzed in order to look for evidence for the MoY effects in the time periods of 1992-2018, 1996-2018, 1992-2018, 2003-2018, and 2005-2018, respectively.

Results of ANOVA for the SSEC index show that the p-value is 0.808, which is above the significance level of 0.05; hence, the null hypothesis that the mean returns in all months of the year are equal cannot be rejected (Table 4.45). Results of the GARCH estimation imply that there is no MoY effect on the SSEC index.

In Table 4.45, ANOVA results of the MoY effect on the SSE180 index is given. Since the p-value of ANOVA is 0.478, the null hypothesis cannot be rejected at the 0.05 significance level. Furthermore, the results of the GARCH model estimation reveal that the MoY effect is not present in the SSE180 index.

Table 4.44

Results of the month-of-the-year effect analysis of the indices on the National Stock Exchange of India

	NIFTY50	NIFTY500
Variables		
January	-0.0011	-0.0028
	(0.9118)	(0.7606)
February	-0.0088	-0.0087
	(0.4406)	(0.3827)
March	0.0025	0.0030
	(0.8101)	(0.7702)
April	0.0039	0.0055
	(0.7380)	(0.6179)
May	-0.0017	-0.0069
	(0.8890)	(0.5317)
June	0.0024	-0.0002
	(0.8805)	(0.9897)
July	0.0106	0.0089
	(0.4578)	(0.5571)
August	-0.0115	-0.0059
	(0.3958)	(0.6567)
September	-0.0066	-0.0076
	(0.5792)	(0.5331)
October	-0.0055	-0.0013
	(0.5936)	(0.9037)
November	-0.0008	-0.0047
	(0.9492)	(0.7257)
December	0.0098	0.0109
	(0.5575)	(0.4941)
ANOVA		
F-stat	0.6250	0.7302
	(0.8070)	(0.7094)
Goodness-of-fit statistics		
SIC	-2.4447	-2.1775

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Table 4.45

Results of the month-of-the-year effect analysis of the indices on the Shanghai Stock Exchange of China

	SSEC	SSE180
Variables		
January	0.0101	0.0124
	(0.4120)	(0.4130)
February	0.0076	0.0102
	(0.6030)	(0.6544)
March	-0.0005	0.0059
	(0.9676)	(0.6760)
April	-0.0210*	0.0152
	(0.0540)	(0.3507)
May	-0.0013	-0.0009
	(0.9153)	(0.9515)
June	-0.0135	-0.0132
	(0.2111)	(0.2882)
July	0.0027	-0.0139
	(0.8228)	(0.2987)
August	-0.0038	-0.0279
	(0.7855)	(0.1186)
September	-0.0165	-0.0091
	(0.2045)	(0.5983)
October	-0.0085	0.0007
	(0.5857)	(0.9720)
November	0.0044	0.0008
	(0.6476)	(0.9552)
December	-0.0003	0.0094
	(0.9776)	(0.4933)
ANOVA		
F-stat	0.6245	0.9656
	(0.8078)	(0.4784)
Goodness-of-fit statistics		
SIC	-1.6218	-2.0890

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

The ANOVA of the SZSC index for the MoY effect infers that the null hypothesis of equal mean returns cannot be rejected with a p-value of 0.393 at 0.05 significance level, as shown in Table 4.46. The results of the GARCH estimation show that there is a positive February effect for the SZSC index with a mean monthly return of 3.5%.

When the SZS100 index is examined for the MoY effect, the ANOVA results imply that the null hypothesis cannot be rejected since the p-value is higher than the 0.05 significance level, as seen in Table 4.46. In addition, the results of the GARCH model estimation show that the monthly returns in all months are, statistically, not different from zero.

Results of the ANOVA of the CSI300 index to detect the presence of the MoY effect suggest that the null hypothesis of equal average monthly returns cannot be rejected with a p-value of 0.315 at 0.05 significance level (Table 4.46). The GARCH estimation concludes that the MoY effect is not present for the CSI300 index.

4.3.5. South Africa

JALSH and JTOPI indices are investigated for the presence of the month-of-the-year effect in the time period of 1995-2018.

ANOVA for the MoY effect on the JALSH index suggests that the null hypothesis cannot be rejected as the p-value, 0.686, is above the significance level of 0.05 (Table 4.47). GARCH estimation results show that there is a positive January effect on the index with a statistically significant mean return of 1.7%.

Table 4.47 shows the ANOVA results for the monthly returns of the JTOPI index. The p-value of ANOVA is 0.698, which implies that the null hypothesis of equal average monthly returns cannot be rejected at the level of significance. GARCH estimation shows that January has a statistically significant and positive monthly return of 1.8%.

Table 4.46

Results of the month-of-the-year effect analysis of the indices on the Shenzhen Stock Exchange of China and the CSI300 index

	SZSC	SZS100	CSI300
Variables			
January	-0.0006	-0.0069	-0.0128
	(0.9637)	(0.7466)	(0.7319)
February	0.0353**	0.0265	0.0189
	(0.0238)	(0.3456)	(0.7480)
March	0.0158	-0.0122	-0.0056
	(0.2059)	(0.5843)	(0.8894)
April	0.0079	0.0135	0.0277
	(0.5768)	(0.5311)	(0.5104)
May	0.0027	0.0068	-0.0011
	(0.8370)	(0.7479)	(0.9850)
June	-0.0074	-0.0306	-0.0443
	(0.5578)	(0.1007)	(0.2488)
July	-0.0082	-0.0013	0.0126
	(0.5653)	(0.9444)	(0.7297)
August	0.0004	-0.0237	-0.0312
	(0.9796)	(0.2948)	(0.4074)
September	-0.0046	0.0007	-0.0004
	(0.7957)	(0.9838)	(0.9957)
October	-0.0040	0.0014	-0.0022
	(0.8179)	(0.9427)	(0.9529)
November	0.0011	-0.0040	0.0045
	(0.9427)	(0.8048)	(0.9005)
December	-0.0211	0.0170	0.0339
	(0.2254)	(0.3238)	(0.3583)
ANOVA			
F-stat	1.0607	1.0647	1.1656
	(0.3928)	(0.3934)	(0.3152)
Goodness-of-fit statistics			
SIC	-1.6948	-1.6677	-1.6677

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

Table 4.47

Results of the month-of-the-year effect analysis of the indices on the South African stock market

	JALSH	JTOPI
Variables		
January	0.0173**	0.0181**
	(0.0362)	(0.0447)
February	0.0036	0.0020
	(0.6131)	(0.7935)
March	0.0021	0.0027
	(0.7946)	(0.7562)
April	0.0102	0.0096
	(0.2536)	(0.3100)
May	-0.0065	-0.0012
	(0.5242)	(0.9095)
June	-0.0043	-0.0052
	(0.6116)	(0.5936)
July	-0.0053	-0.0070
	(0.5648)	(0.4618)
August	0.0011	0.0019
	(0.9120)	(0.8637)
September	-0.0063	-0.0059
	(0.4346)	(0.5074)
October	0.0124*	0.0107
	(0.0806)	(0.1658)
November	-0.0040	-0.0048
	(0.7302)	(0.7279)
December	0.0105	0.0104
	(0.2874)	(0.2848)
ANOVA		
F-stat	0.8203	0.7421
	(0.6198)	(0.6976)
Goodness-of-fit statistics		
SIC	-3.0420	-2.9178

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.3.6. Turkey

The indices XU100, XU030, and XUTUM of the Turkish stock market are examined for the month-of-the-year effect in the time periods of 1992-2018, 1997-2018, and 1997-2018, respectively.

Results of the ANOVA for the XU100 index in Table 4.48 show that the p-value of ANOVA is 0.068 and higher than the significance level of 0.05, and therefore, the null hypothesis cannot be rejected. Regarding the GARCH model estimation, only a negative May effect is present with a monthly return of -3.8%.

Results of ANOVA for the MoY effect on the XU030 index is given in Table 4.48. The p-value of the ANOVA, 0.009, implies that the null hypothesis of equal mean returns in all months of the year is rejected at the 0.05 significance level. The GARCH estimation shows that the MoY effect does not exist in the XU030 index.

The results of the ANOVA for the XUTUM index is given in Table 4.48. As the p-value of ANOVA is 0.009 and less than the 0.05 significance level, the null hypothesis is rejected. According to the GARCH estimation, given in the table, returns in May and August are statistically significant and negative, i.e., -3.9% and -3.7%, respectively.

Table 4.48

Results of the month-of-the-year effect analysis of the indices on the Turkish stock market

	XU100	XU030	XUTUM
Variables			
January	0.0165	0.0032	0.0065
	(0.2179)	(0.8478)	(0.6723)
February	-0.0103	-0.0084	-0.0062
	(0.6217)	(0.7337)	(0.7894)
March	0.0145	0.0147	0.0163
	(0.3799)	(0.4060)	(0.3078)
April	0.0207	0.0231*	0.0221*
	(0.1310)	(0.0997)	(0.0811)
May	-0.0376**	-0.0394*	-0.0395**
	(0.0459)	(0.0599)	(0.0273)
June	-0.0072	-0.0145	-0.0158
	(0.7180)	(0.5109)	(0.4414)
July	0.0186	0.0268	0.0193
	(0.3494)	(0.2192)	(0.3660)
August	-0.0353*	-0.0351	-0.0370**
	(0.0686)	(0.1026)	(0.0417)
September	0.0057	0.0055	0.0033
	(0.6038)	(0.6366)	(0.7525)
October	0.0105	0.0201	0.0173
	(0.5014)	(0.2571)	(0.3029)
November	-0.0203	-0.0203	-0.0210
	(0.1364)	(0.1812)	(0.1410)
December	0.0147	0.0151	0.0148
	(0.3888)	(0.4092)	(0.3931)
ANOVA			
F-stat	1.7171	2.3446	2.3430
	(0.0682)	(0.0092)	(0.0092)
Goodness-of-fit statistics			
SIC	-1.4620	-1.6130	-1.7452

The variables are the dummy variables in the Equation 3, January to December representing the 12 months of the year. The null hypothesis of no MoY effect on the index is tested. If it is found that the coefficient for at least one of the dummy variables is significantly different from zero, then we will reject the null and conclude that the index exhibits a significant MoY effect. The null hypothesis of the ANOVA is that all the mean returns on different months of the year are equal. SIC statistics reports goodness-of-fit of the model, the smaller the SIC value, the better the fit of the model. Values in parentheses are p-values. *, ** and *** denote statistical significance at 0.1, 0.05 and 0.01, respectively.

4.4. Day-of-the-week effect in stocks

In this section of the research, the selected 100 companies from each of the six countries are investigated for the presence of the DoW effects, and the results are summarized. For the analysis, the GARCH(1,1) model in Equations 2 and 3 is estimated for each individual stock. Then, the results of 100 stocks from each country are combined into a table so that the number of statistically positive, negative, and insignificant results are shown. The resulting tables are examined using the trinomial test to determine whether the number of positive results is statistically higher than the number of negative results, or vice versa. Besides, the binomial test is done in order to assess the significance of the DoW anomaly for each day of the week for each country investigated. If both p-values are below the 0.05 significance level, it can be concluded that there is a DoW effect on that day of the week.

4.4.1. Brazil

In Table 4.49, resulting table of the DoW effect analysis for the 100 companies selected from the Sao Paolo Stock Exchange according to the criteria defined in Chapter 3 is presented. As can be seen in the table, there are negative Monday and positive Wednesday and Friday returns for the Brazilian market.

Table 4.49

The DoW effect on daily stock returns in the Brazilian stock market

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	2	77	**21**	**{0.0000}**	**(0.0000)**
Tuesday	4	92	4	{1.0000}	(0.7422)
Wednesday	**18**	78	4	**{0.0000}**	**(0.0000)**
Thursday	8	88	4	{0.0568}	(0.1280)
Friday	**28**	72	0	**{0.0000}**	**(0.0000)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

4.4.2. Russia

In Table 4.50, resulting table of the DoW effect analysis for the 100 companies selected from the Moscow Exchange is presented. The table shows that there are positive Wednesday and Friday effects.

Table 4.50
The DoW effect on daily stock returns in the Russian stock market

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	5	91	4	{0.4086}	(0.5640)
Tuesday	2	90	8	**{0.0076}**	(0.1280)
Wednesday	**10**	88	2	**{0.0006}**	**(0.0282)**
Thursday	1	91	8	**{0.0023}**	(0.1280)
Friday	**19**	77	4	**{0.0000}**	**(0.0000)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

4.4.3. India

In Table 4.51, the resulting table of the DoW effect analysis for the 100 companies selected from the National Stock Exchange is presented. There is DoW effect on Tuesday, Wednesday and Friday returns for the National Stock Exchange stocks being analyzed, as the table suggests. The observed DoW effects are negative on Tuesday, positive on Wednesday and Friday.

Table 4.51
The DoW effect on daily stock returns in the Indian stock market

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	6	89	5	{0.4086}	(0.3840)
Tuesday	1	88	**11**	**{0.0000}**	**(0.0115)**
Wednesday	**53**	47	0	**{0.0000}**	**(0.0000)**
Thursday	3	90	7	{0.0568}	(0.2340)
Friday	**13**	84	3	**{0.0000}**	**(0.0015)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

4.4.4. China

In Table 4.52, resulting table of the DoW effect analysis for the 100 companies selected from the Shanghai Stock Exchange and the Shenzhen Stock Exchange is presented. It is shown in the table that positive Tuesday and Friday and negative Thursday effects exist in the Chinese market.

Table 4.52
The DoW effect on daily stock returns in the Chinese stock markets

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	10	84	6	{0.0568}	**(0.0282)**
Tuesday	**12**	87	1	**{0.0000}**	**(0.0043)**
Wednesday	7	92	1	**{0.0076}**	(0.2340)
Thursday	0	45	**55**	**{0.0000}**	**(0.0000)**
Friday	**30**	69	1	**{0.0000}**	**(0.0000)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

4.4.5. South Africa

In Table 4.53, resulting table of the DoW effect analysis for the 100 companies selected from the Johannesburg Stock Exchange is presented. According to the table, returns are affected negatively on Monday and Friday, and positively on Thursday by the DoW anomaly.

Table 4.53
The DoW effect on daily stock returns in the South African stock market

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	2	76	**22**	**{0.0000}**	**(0.0000)**
Tuesday	6	91	3	{0.1268}	(0.3840)
Wednesday	3	94	3	{1.0000}	(0.8817)
Thursday	**11**	89	0	**{0.0000}**	**(0.0115)**
Friday	5	85	**10**	**{0.0221}**	**(0.0282)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

4.4.6. Turkey

In Table 4.54, the resulting table of the DoW effect analysis for the 100 companies selected from the Istanbul Stock Exchange is presented. For the 100 stocks in question, there are positive Monday, Thursday, and Friday and negative Tuesday effects, as can be seen in the table.

Table 4.54
The DoW effect on daily stock returns in the Turkish stock market

	Sig +	Insig	Sig −	Trinomial test	Binomial test
Monday	**14**	82	4	**{0.0000}**	**(0.0000)**
Tuesday	1	89	**10**	**{0.0002}**	**(0.0282)**
Wednesday	2	93	5	{0.1268}	(0.5640)
Thursday	**23**	75	2	**{0.0000}**	**(0.0000)**
Friday	**27**	72	1	**{0.0000}**	**(0.0000)**

"Sig −" and "Sig +" are the numbers of statistically significant coefficients which are negative and non-negative, respectively. "Insig" is the number of statistically insignificant coefficients. Values in brackets are p-values for trinomial test. Values in parentheses are p-values for binomial test. Bold values are significant at a level of 0.05.

CHAPTER 5

CONCLUSION

According to the results of the DoW effect analyses with full samples, stock market indices BVSP and IBRX of Brazil exhibit a negative Monday effect, and, on the other hand, the other index from Brazil, IBX50, does not display any DoW effect. Analyses using different time periods conclude that none of the three indices have any DoW effects between September 2008 and December 2018, and this result supports the findings of Singh (2014), Khanna and Mittal (2016), and Carlucci, Junior, Lima, and Gaio (2014) which suggest that there is no DoW effect on the Brazilian market. When the individual stocks from the Brazilian market are examined, negative Monday and positive Wednesday and Friday effects. Similarly, the analysis shows that, between 1992 and 2008, there are negative Monday and positive Wednesday and Friday effects on BVSP, which are partially aligned with the studies of Fajardo and Pereira (2008), Kristjanpoller Rodriguez (2012) and Soares, Herling, Lima and Oliveira Moritz (2013) indicating that positive Wednesday and Friday effects are observed on the returns of Brazilian stock market indices.

When the previous day returns are taken into consideration, the observed pattern changes for the Brazilian market. If the previous day returns are negative, BVSP and IBRX show a negative Monday effect and a positive Wednesday effect, and IBX50 does not have a significant effect. When the previous day returns are positive, only IBRX exhibits a positive Wednesday effect. On the other hand, the other two indices imply that there is no DoW effect after positive returns on the previous day.

Regarding the Russian stock market indices, RTSI displays a negative Tuesday effect, but IMOEX and MOEX10 do not exhibit any DoW effect. The analyses of indices before and after breakpoints reveal that none of the indices contain any DoW anomaly for the time period of 2008 – 2018. These results confirm the findings of Singh in 2014 using a sample comprising 2003 – 2013 data, and Khanna and Mittal in 2016, which examines the time period of 2001 – 2014, demonstrating that there is no DoW effect on the Russian stock market returns. RTSI and IMOEX have negative Tuesday and Wednesday effects before 2008, and MOEX10 has a negative Tuesday effect for the same period. All three indices seem to become efficient markets in terms of the DoW anomaly after the breakpoints obtained by the Quandt – Andrews Test. Between 1995 and 2006, RTSI exhibits positive Monday and negative Tuesday and Wednesday effects, and these findings partially support the study of Mcgowan and Ibrihim in 2011, which uses a sample from a similar time period and shows positive Monday and Friday and negative Wednesday effects on the index. The individual stock analysis of the Moscow Exchange states that positive Wednesday and Friday are present.

When the daily index data of the Russian stock market is divided into two groups according to the previous day returns being negative and non-negative, it is revealed that there is a positive correlation of Monday returns with the previous Friday returns. Apart from that, the RTSI index displays negative Wednesday returns after negative Tuesday returns, and it also has positive Thursday returns after positive Wednesday returns.

Both stock exchanges of India, namely, the BSE and the NSE, display no DoW effects, except the NIFTY500 index, which shows a negative Tuesday effect. On the other hand, the individual stock analysis reveals that negative Tuesday and positive Wednesday and Friday anomalies are present in the Indian market. In addition, after the financial crisis of 2008, all four indices seem efficient as none of them have any DoW anomaly between 2008 and 2018. These findings are not consistent with the study of Srinivasan and Kalaivani in 2013, which examines the DoW effects over the period of 1997 to 2012 and finds positive Monday and Wednesday effects on the Indian stock market, and Aziz and Ansari (2015), who use data from 1990 to 2013 and demonstrate the same DoW effects. However, those findings confirm the studies of Singh (2014), Khanna and Mittal (2016), and Mitra (2016), showing that the DoW anomaly does not exist in the market.

Analyses of the Indian market also show that daily prices on Mondays move the same way as the previous Fridays, i.e., there is a positive correlation of Monday returns with the previous Friday returns. Moreover, positive Friday returns for both stock exchanges and positive Wednesday returns for the NSE are observed when the prices go up in the trading day before them.

The Chinese market displays a negative Thursday effect according to the analyses done on the full sample of the five stock market indices. In addition, when the samples are divided into subperiods, all five indices have negative Thursday returns for the time period of 2008 to 2018. The results of the analysis, including the top 100 stocks from both markets, suggest that there are positive Tuesday and Friday and negative Thursday anomalies. Those findings are consistent with the study of Khanna and Mittal (2016), demonstrating the negative Thursday effect, partially consistent with the study of Kling and Gao (2005), which shows a positive Friday effect between 1990 and 2002. However, the empirical findings are inconsistent with the studies of Chia, Liew, and Wafa (2011), showing the absence of any DoW effect for the period of 2000 – 2006 and Singh (2014), which reveals a negative Tuesday effect between 2003 and 2013.

Analyses using the data according to the previous day returns imply that returns on Mondays are positive after positive-return days and negative after negative-return days for both Chinese stock exchanges. Moreover, analyses of all five indices display negative Thursday returns after Wednesday returns are positive.

The two stock market indices of South Africa, JALSH, and JTOPI have a positive Monday effect for the analysis with full samples. The analyses of the indices before and after breakpoints reveal that there is no DoW effect between 1995 and 2008, and there is a positive Monday effect between 2008 and 2018. The findings on the positive Monday effect supports the studies of Alagidede (2008) and Cifuentes and Cordoba (2013), and partially supports the studies of Du Toit, Hall and Pradhan (2018), which displays positive Monday, Tuesday and negative Friday returns between 1995 and 2016. When the returns of individual stocks are examined, negative Monday and Friday, and positive Thursday effects are present in the market.

Positive previous day returns lead to positive returns on Monday and Thursday for both indices of the South African market. On the other hand, negative Friday returns are observed after Thursdays with negative returns.

The Turkish stock market indices used in this research exhibit a negative Tuesday effect. However, when the samples are divided into subperiods using breakpoints, the patterns are different from the analysis with the full samples. Between 2008 and 2018, a positive Monday effect is observed for all three indices. However, before 2008, negative Monday, Tuesday, and positive Thursday returns are revealed, and a positive Friday effect is also observed for the XU100 index only. The empirical findings confirm the study of Oran and Guner (2003) suggesting negative Monday and positive Thursday and Friday effects, or "a low-beginning-of-week and a high-end-of-week pattern" as they describe, in the Istanbul Stock Exchange between 1991 and 2002. The results of the analysis of the individual stock returns reveal that positive Monday, Thursday and Friday, and negative Tuesday anomalies exist in the Turkish stock market. The empirical findings of the study support the findings of Cifuentes and Cordoba (2013), which presents the results of the Monday Effect analysis for the period of 1998 – 2012 and shows that Thursday and Friday's returns are significantly higher than that on Monday. The results also confirm the findings of Oncu, Unal, and Demirel (2017) that the returns on Monday and Thursday are significant and positive between 2005 and 2015.

When the previous day returns are positive, all three indices of the Turkish stock market display negative Tuesday and positive Thursday effects. On the other hand, when the previous day returns are negative, the XU100 index exhibits a negative Monday effect, whereas XU030 and XUTUM indices show no DoW anomaly in this case. These findings are partially aligned with the study of Oran and Guner (2003), which explains that positive Thursday and Friday effects are observed after positive-return day, and negative Monday and positive Friday effects after negative-return days.

As for the MoY effect analyses, stock market indices of Brazil display a negative May effect. The results contradict the studies of Singh (2014), which claims that there is no MoY effect on the Brazilian stock market for the time period of 2003-2013, Vatrushkin (2017), which indicates positive January returns between 1968 and 2015, and Giovanis (2009), which states that positive May, November and December effects are observed between 1993 and 2008.

The Russian stock market displays a negative May effect on the three indices examined. Moreover, there is a positive January effect on the IMOEX index. The findings partially comply with the studies of Vatrushkin (2017), which suggests positive January, February, and October effects on the IMOEX index, and Caporale and Zakirova (2017) that presents positive January and February effects. The research contradicts the claims of no MoY effect in the Russian market of Singh (2014), and Khanna and Mittal (2016).

The Bombay Stock Exchange and the National Stock Exchange of India do not exhibit any MoY effects, according to the results of the analysis. The empirical findings do not confirm the studies of Singh (2014) suggesting positive September and December effects, Giovanis (2009), which indicates positive November and December returns between 1997 and 2008, and Vatrushkin (2017) suggesting positive June, September, November and December effects.

Regarding the Chinese stock market, four of the investigated indices, SSEC, SSE180, SZS100, and CSI300, do not contain any MoY anomalies. However, the SZSC index displays a positive February effect. These results are partially aligned with the findings of Vatrushkin (2017), showing the market has positive February, November, and December effects, and Kling and Gao (2005) suggesting positive February and November anomalies.

Analyses of the South African indices suggest a positive January effect. The findings of this study do not support the studies of Vatrushkin (2017), which implies positive October and December effects on the JTOPI index, and Alagidede (2008) suggesting a positive February effect.

The three Turkish stock market indices, XU100, XU030, and XUTUM, appear to have a negative May effect, according to the analyses, with XUTUM having a negative August effect, as well. The findings contradict the studies of Fountas and Segredakis (2002) suggesting positive January and July effects, and Giovanis (2009) that the XU100 index has positive April, July, and December effects.

This research is conducted with the purpose of analyzing and presenting the effects of two types of calendar anomalies, the day-of-the-week effect and the month-of-the-year effect, on the returns of stock market indices and individual stocks on the stock exchanges of six major emerging countries, namely, Brazil, Russia, India, China, South Africa and Turkey, since presence of these anomalies would imply inefficiency in that market so that investors could generate abnormal returns by doing research and selecting securities to invest in accordingly.

The empirical findings of this research suggest that, regarding the day-of-the-week analysis, all countries display DoW effects on the returns of at least one day of the week for the analysis with the full samples. On the other hand, considering the analysis with breakpoints, Brazil, Russia, and India do not exhibit any DoW effects after the financial crisis of 2008 and appear as efficient markets in terms of the day-of-the-week anomalies. On the contrary, the markets of China, South Africa, and Turkey are found to be inefficient, as DoW anomalies are observed both in full samples and post-2008 data samples of these markets.

As for the monthly analyses, both exchanges of India and the Shanghai Stock Exchange of China seem to be the efficient markets, as they do not display any MoY anomalies. On the other hand, the analyses lead to the conclusion that Brazil, Russia, South Africa, and Turkey can be considered as inefficient markets regarding the monthly seasonal anomalies since they each have at least one month that has a MoY effect.

In future work, investigating the calendar anomalies in these six countries further by using other statistical models could be quite beneficial to the literature. In this research, close-to-close returns are examined, and therefore, an interesting future study would be the examination of intraday (open-to-close) and overnight (close-to-open) returns to acquire an understanding about the sources of the calendar anomalies. Another recommendation for future research on the seasonal anomalies could be taking transaction costs into consideration in order to determine whether the day-of-the-week and the month-of-the-year effects presented in this research disappear when the returns are adjusted using transaction costs.

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APPENDICES

A. INFORMATION ON STOCKS USED IN THE ANALYSES

Table A.1

Start and end dates for data samples of Brazilian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ABEV3	21.09.1999	28.12.2018	CPLE3	19.04.1994	28.12.2018
ALPA3	23.10.1992	28.12.2018	CPRE3	23.07.2013	28.12.2018
ALSC3	02.02.2010	28.12.2018	CSAN3	22.11.2005	28.12.2018
ARZZ3	04.02.2011	28.12.2018	CSMG3	10.02.2006	28.12.2018
B3SA3	22.08.2008	28.12.2018	CSNA3	21.01.1994	28.12.2018
BBAS3	21.10.1992	28.12.2018	CVCB3	11.12.2013	28.12.2018
BBDC3	21.10.1992	28.12.2018	CYRE3	05.07.2005	28.12.2018
BBSE3	02.05.2013	28.12.2018	DASA3	23.11.2004	28.12.2018
BNBR3	28.10.1992	28.12.2018	DTEX3	25.09.2007	28.12.2018
BRAP3	14.08.2000	28.12.2018	ECOR3	06.04.2010	28.12.2018
BRFS3	15.10.1997	28.12.2018	EGIE3	24.05.2005	28.12.2018
BRKM3	25.02.1993	28.12.2018	ELET3	22.10.1992	28.12.2018
BRML3	10.04.2007	28.12.2018	EMBR3	01.07.1993	28.12.2018
BRPR3	10.03.2010	28.12.2018	ENAT3	11.02.2011	28.12.2018
BRSR3	05.11.1992	28.12.2018	ENBR3	15.07.2005	28.12.2018
BTOW3	01.04.2005	28.12.2018	ENEV3	18.12.2007	28.12.2018
CBEE3	11.01.1993	28.12.2018	ENGI3	26.01.2005	28.12.2018
CCRO3	07.02.2002	28.12.2018	ENMT3	05.12.1995	28.12.2018
CEEB3	01.06.1995	28.12.2018	EQTL3	09.04.2008	28.12.2018
CESP3	20.11.1992	28.12.2018	ESTC3	15.07.2008	28.12.2018
CGAS3	24.05.2001	28.12.2018	EZTC3	26.06.2007	28.12.2018
CIEL3	01.07.2009	28.12.2018	FLRY3	21.12.2009	28.12.2018
CMIG3	29.10.1992	28.12.2018	GGBR3	23.11.1992	28.12.2018
COCE3	31.05.1996	28.12.2018	GOAU3	02.07.1993	28.12.2018
CPFE3	01.10.2004	28.12.2018	GRND3	03.11.2004	28.12.2018

Table A.1 (cont'd)

Start and end dates for data samples of Brazilian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
GUAR3	26.11.1992	28.12.2018	POMO3	04.11.1992	28.12.2018
HGTX3	28.07.1997	28.12.2018	PSSA3	24.11.2004	28.12.2018
HYPE3	23.04.2008	28.12.2018	QUAL3	04.07.2011	28.12.2018
IGTA3	09.02.2007	28.12.2018	RADL3	11.10.1996	28.12.2018
ITSA3	26.10.1992	28.12.2018	RAIL3	01.07.2004	28.12.2018
ITUB3	21.10.1992	28.12.2018	REDE3	13.11.1992	28.12.2018
JBSS3	02.04.2007	28.12.2018	RENT3	25.05.2005	28.12.2018
KLBN3	17.07.2002	28.12.2018	SANB3	05.04.2007	28.12.2018
KROT3	25.07.2007	28.12.2018	SBSP3	06.06.1997	28.12.2018
LAME3	23.10.1992	28.12.2018	SEER3	31.10.2013	28.12.2018
LCAM3	25.04.2012	28.12.2018	SLCE3	19.06.2007	28.12.2018
LEVE3	14.11.2007	28.12.2018	SMLS3	02.05.2013	28.12.2018
LIGT3	22.10.1992	28.12.2018	SMTO3	14.02.2007	28.12.2018
LINX3	14.02.2013	28.12.2018	TIET3	28.07.1999	28.12.2018
LREN3	06.09.1994	28.12.2018	TIMP3	24.09.1998	28.12.2018
MDIA3	20.10.2006	28.12.2018	TOTS3	13.03.2006	28.12.2018
MGLU3	04.05.2011	28.12.2018	TRPL3	28.07.1999	28.12.2018
MRFG3	03.07.2007	28.12.2018	UGPA3	12.05.2008	28.12.2018
MRVE3	25.07.2007	28.12.2018	UNIP3	10.11.1992	28.12.2018
MULT3	31.07.2007	28.12.2018	USIM3	06.11.1992	28.12.2018
MYPK3	08.04.1994	28.12.2018	VALE3	21.10.1992	28.12.2018
NATU3	28.05.2004	28.12.2018	VIVT3	24.09.1998	28.12.2018
ODPV3	05.12.2006	28.12.2018	VVAR3	16.10.1996	28.12.2018
OIRB3	22.10.1992	28.12.2018	WEGE3	12.02.1993	28.12.2018
PETR3	21.10.1992	28.12.2018	WHRL3	12.05.1994	28.12.2018

Table A.2

Start and end dates for data samples of Russian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ABRD	13.04.2012	28.12.2018	IRGZ	09.06.1997	28.12.2018
AFKS	27.09.2007	28.12.2018	IRKT	11.03.2004	28.12.2018
AFLT	26.08.1999	28.12.2018	JNOS	24.03.2009	28.12.2018
AKRN	24.10.2006	28.12.2018	KBTK	13.05.2010	28.12.2018
ALRS	01.12.2011	28.12.2018	KCHE	31.03.2008	28.12.2018
APTK	17.02.2003	28.12.2018	KMAZ	11.02.2005	28.12.2018
BANE	22.11.2011	28.12.2018	KOGK	10.02.2009	28.12.2018
BELU	27.11.2007	28.12.2018	KUBE	18.01.2000	28.12.2018
BLNG	25.04.2007	28.12.2018	KZOS	07.12.2011	28.12.2018
BRZL	16.12.2011	28.12.2018	LKOH	29.01.1998	28.12.2018
BSPB	10.04.2008	28.12.2018	LNZL	21.01.2009	28.12.2018
CHEP	05.02.2009	28.12.2018	LSNG	18.02.2000	28.12.2018
CHMF	24.06.2005	28.12.2018	LSRG	20.02.2008	28.12.2018
CHMK	25.03.2009	28.12.2018	MAGN	20.01.2006	28.12.2018
DVEC	17.12.2007	28.12.2018	MFGS	02.07.1997	28.12.2018
ENRU	16.09.2005	28.12.2018	MFON	30.11.2012	28.12.2018
FEES	18.07.2008	28.12.2018	MGNT	08.06.2006	28.12.2018
FESH	05.09.2008	28.12.2018	MGTS	20.01.2003	28.12.2018
GAZA	23.12.2011	28.12.2018	MOBB	01.08.2012	28.12.2018
GAZP	25.01.2006	28.12.2018	MOEX	19.02.2013	28.12.2018
GCHE	30.05.2008	28.12.2018	MRKC	20.08.2008	28.12.2018
GMKN	02.11.2001	28.12.2018	MRKK	08.09.2008	28.12.2018
HALS	15.11.2006	28.12.2018	MRKP	07.08.2008	28.12.2018
HYDR	26.05.2008	28.12.2018	MRKS	27.08.2008	28.12.2018
IRAO	21.07.2008	28.12.2018	MRKU	15.09.2008	28.12.2018

Table A.2 (cont'd)

Start and end dates for data samples of Russian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
MRKV	11.09.2008	28.12.2018	RSTI	11.12.2008	28.12.2018
MRKY	26.08.2008	28.12.2018	RTKM	29.01.1998	28.12.2018
MRKZ	09.09.2008	28.12.2018	SBER	09.02.1998	28.12.2018
MSNG	24.02.1999	28.12.2018	SELG	18.10.2011	28.12.2018
MSRS	14.02.2006	28.12.2018	SIBN	26.10.1999	28.12.2018
MSTT	09.11.2010	28.12.2018	SNGS	02.06.1997	28.12.2018
MTLR	15.01.2009	28.12.2018	SVAV	06.06.2005	28.12.2018
MTSS	17.10.2003	28.12.2018	TATN	13.12.2001	28.12.2018
MVID	08.11.2007	28.12.2018	TGKA	28.03.2007	28.12.2018
NLMK	20.04.2006	28.12.2018	TGKB	01.02.2007	28.12.2018
NMTP	12.11.2007	28.12.2018	TGKD	06.03.2007	28.12.2018
NNKC	09.04.2008	28.12.2018	TGKN	17.04.2007	28.12.2018
NNSB	07.11.2006	28.12.2018	TRCN	15.11.2010	28.12.2018
NVTK	01.02.2005	28.12.2018	TRMK	19.04.2007	28.12.2018
OGKB	27.06.2007	28.12.2018	UKUZ	12.12.2008	28.12.2018
OPIN	03.12.2008	28.12.2018	UNAC	05.02.2010	28.12.2018
PHOR	20.07.2011	28.12.2018	UPRO	28.05.2007	28.12.2018
PIKK	03.07.2007	28.12.2018	URKA	22.11.2007	28.12.2018
PLZL	16.05.2006	28.12.2018	USBN	16.12.2011	28.12.2018
POLY	24.06.2013	28.12.2018	UTAR	03.04.2001	28.12.2018
PRTK	04.05.2010	28.12.2018	VSMO	04.03.2005	28.12.2018
RASP	16.11.2006	28.12.2018	VTBR	16.11.2007	28.12.2018
RKKE	08.07.2008	28.12.2018	VZRZ	03.08.2005	28.12.2018
ROSB	21.02.2006	28.12.2018	WTCM	31.10.2007	28.12.2018
ROSN	21.07.2006	28.12.2018	YNDX	06.06.2014	28.12.2018

Table A.3

Start and end dates for data samples of Indian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ABB	06.12.1994	31.12.2018	CIPL	09.11.1994	31.12.2018
ABUJ	14.11.1994	31.12.2018	COAL	09.11.2010	31.12.2018
ACC	09.11.1994	31.12.2018	COLG	10.11.1994	31.12.2018
ADAN	25.08.2009	31.12.2018	DABU	14.11.1994	31.12.2018
APSE	30.11.2007	31.12.2018	DIVI	19.03.2003	31.12.2018
ARBN	16.01.1996	31.12.2018	DLF	10.07.2007	31.12.2018
ASPN	09.11.1994	31.12.2018	EICH	13.02.1995	31.12.2018
AXBK	09.12.1998	31.12.2018	GAIL	07.04.1997	31.12.2018
BAJA	29.05.2008	31.12.2018	GILE	16.01.1995	31.12.2018
BAJE	12.12.1996	31.12.2018	GLSM	01.12.1994	31.12.2018
BHRI	02.01.2013	31.12.2018	GOCP	25.06.2001	31.12.2018
BION	13.04.2004	31.12.2018	GODR	08.01.2010	31.12.2018
BJAT	09.11.1994	31.12.2018	GRAS	10.11.1994	31.12.2018
BJFN	14.02.1995	31.12.2018	HALC	09.11.1994	31.12.2018
BJFS	29.05.2008	31.12.2018	HCLT	14.01.2000	31.12.2018
BOB	01.03.1997	31.12.2018	HDBK	19.06.1995	31.12.2018
BOI	12.05.1997	31.12.2018	HDFC	10.11.1994	31.12.2018
BOSH	13.12.1994	31.12.2018	HLL	11.11.1994	31.12.2018
BPCL	06.12.1994	31.12.2018	HPCL	21.11.1994	31.12.2018
BRGR	30.05.1995	31.12.2018	HROM	15.02.1995	31.12.2018
BRIT	19.12.1994	31.12.2018	HVEL	20.03.2002	31.12.2018
BRTI	21.02.2002	31.12.2018	HZNC	24.11.2006	31.12.2018
CADI	03.05.2000	31.12.2018	ICBK	29.09.1997	31.12.2018
CCRI	03.09.1997	31.12.2018	IGAS	31.12.2003	31.12.2018
CHLA	14.08.1995	31.12.2018	INBK	03.02.1998	31.12.2018

Table A.3 (cont'd)

Start and end dates for data samples of Indian stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
INFY	16.11.1994	31.12.2018	PROC	14.11.1994	31.12.2018
IOC	15.04.1996	31.12.2018	PWFC	28.02.2007	31.12.2018
ITC	09.11.1994	31.12.2018	RECM	17.03.2008	31.12.2018
JSTL	29.03.2005	31.12.2018	REDY	09.11.1994	31.12.2018
KANE	02.02.1995	31.12.2018	RELI	09.11.1994	31.12.2018
KTKM	14.11.1994	31.12.2018	SBI	09.11.1994	31.12.2018
LART	09.11.1994	31.12.2018	SHCM	18.01.1995	31.12.2018
LICH	13.02.1995	31.12.2018	SIEM	11.11.1994	31.12.2018
LUPN	14.12.1994	31.12.2018	SRTR	28.10.1996	31.12.2018
MAHM	17.11.1994	31.12.2018	STNCy	16.06.2010	31.12.2018
MOSS	23.08.1996	31.12.2018	SUN	14.02.1995	31.12.2018
MRCO	07.05.1996	31.12.2018	TAMO	09.11.1994	31.12.2018
MRF	07.02.1995	31.12.2018	TCS	30.08.2004	31.12.2018
MRTI	14.07.2003	31.12.2018	TEML	31.08.2006	31.12.2018
MUTT	11.05.2011	31.12.2018	TISC	09.11.1994	31.12.2018
NEST	13.01.2010	31.12.2018	TITN	15.11.1994	31.12.2018
NHPC	04.09.2009	31.12.2018	TMIN	09.02.1995	31.12.2018
NTPC	10.11.2004	31.12.2018	TORP	15.11.1994	31.12.2018
ONGC	16.08.1995	31.12.2018	UBBW	31.07.2008	31.12.2018
ORCL	03.07.2002	31.12.2018	ULTC	27.08.2004	31.12.2018
PGRD	10.10.2007	31.12.2018	UNSP	22.12.1994	31.12.2018
PIDI	28.12.1994	31.12.2018	UPLL	15.11.1994	31.12.2018
PIRA	14.11.1994	31.12.2018	VDAN	28.12.1994	31.12.2018
PLNG	31.03.2004	31.12.2018	WIPR	03.02.1995	31.12.2018
PNBK	02.05.2002	31.12.2018	ZEE	14.02.1995	31.12.2018

Table A.4

Start and end dates for data samples of Chinese stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
000001	04.09.1992	28.12.2018	002594	05.07.2011	28.12.2018
000002	05.01.1991	28.12.2018	002607	15.08.2011	28.12.2018
000063	21.11.1997	28.12.2018	002714	07.02.2014	28.12.2018
000333	25.09.2013	28.12.2018	300015	04.11.2009	28.12.2018
000338	10.05.2007	28.12.2018	300059	24.03.2010	28.12.2018
000538	20.12.1993	28.12.2018	300122	08.10.2010	28.12.2018
000568	12.05.1994	28.12.2018	600000	15.11.1999	28.12.2018
000617	25.10.1996	28.12.2018	600009	23.02.1998	28.12.2018
000651	21.11.1996	28.12.2018	600010	14.03.2001	28.12.2018
000725	17.01.2001	28.12.2018	600011	11.12.2001	28.12.2018
000776	16.06.1997	28.12.2018	600015	17.09.2003	28.12.2018
000858	30.04.1998	28.12.2018	600016	22.12.2000	28.12.2018
000876	16.03.1998	28.12.2018	600018	31.10.2006	28.12.2018
000895	15.12.1998	28.12.2018	600019	15.12.2000	28.12.2018
000938	09.11.1999	28.12.2018	600028	13.08.2001	28.12.2018
002024	26.07.2004	28.12.2018	600029	30.07.2003	28.12.2018
002027	09.08.2004	28.12.2018	600030	09.01.2003	28.12.2018
002120	09.03.2007	28.12.2018	600031	08.07.2003	28.12.2018
002142	24.07.2007	28.12.2018	600036	12.04.2002	28.12.2018
002230	15.05.2008	28.12.2018	600048	03.08.2006	28.12.2018
002304	11.11.2009	28.12.2018	600050	14.10.2002	28.12.2018
002352	10.02.2010	28.12.2018	600104	28.11.1997	28.12.2018
002415	02.06.2010	28.12.2018	600115	10.11.1997	28.12.2018
002475	20.09.2010	28.12.2018	600276	23.10.2000	28.12.2018
002493	05.11.2010	28.12.2018	600309	10.01.2001	28.12.2018

Table A.4 (cont'd)

Start and end dates for data samples of Chinese stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
600340	05.01.2004	28.12.2018	601318	06.03.2007	28.12.2018
600346	23.08.2001	28.12.2018	601328	18.05.2007	28.12.2018
600406	21.10.2003	28.12.2018	601336	21.12.2011	28.12.2018
600519	30.08.2001	28.12.2018	601360	19.01.2012	28.12.2018
600547	02.09.2003	28.12.2018	601390	06.12.2007	28.12.2018
600585	26.02.2002	28.12.2018	601398	01.11.2006	28.12.2018
600588	23.05.2001	28.12.2018	601601	28.12.2007	28.12.2018
600606	26.05.1992	28.12.2018	601628	12.01.2007	28.12.2018
600690	24.11.1993	28.12.2018	601668	03.08.2009	28.12.2018
600741	29.08.1996	28.12.2018	601669	21.10.2011	28.12.2018
600837	01.03.1994	28.12.2018	601688	03.03.2010	28.12.2018
600887	15.03.1996	28.12.2018	601727	10.12.2008	28.12.2018
600900	21.11.2003	28.12.2018	601766	21.08.2008	28.12.2018
600999	20.11.2009	28.12.2018	601800	14.03.2012	28.12.2018
601006	04.08.2006	28.12.2018	601818	23.08.2010	28.12.2018
601009	24.07.2007	28.12.2018	601857	08.11.2007	28.12.2018
601012	16.04.2012	28.12.2018	601888	20.10.2009	28.12.2018
601088	12.10.2007	28.12.2018	601899	30.04.2008	28.12.2018
601111	24.08.2006	28.12.2018	601933	20.12.2010	28.12.2018
601166	08.02.2007	28.12.2018	601939	28.09.2007	28.12.2018
601169	24.09.2007	28.12.2018	601988	10.07.2006	28.12.2018
601186	13.03.2008	28.12.2018	601989	21.12.2009	28.12.2018
601225	07.02.2014	28.12.2018	601998	09.05.2007	28.12.2018
601238	06.04.2012	28.12.2018	603288	14.02.2014	28.12.2018
601288	20.07.2010	28.12.2018	603993	12.10.2012	28.12.2018

Table A.5

Start and end dates for data samples of South African stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ABGJ	26.09.1989	31.12.2018	DSYJ	26.10.1999	31.12.2018
AELJ	15.04.1988	31.12.2018	DTCJ	01.02.1995	31.12.2018
AFEJ	13.02.1989	31.12.2018	EMIJ	17.12.2003	31.12.2018
AFXJ	04.10.1993	31.12.2018	EXXJ	20.04.1988	31.12.2018
AGLJ	20.09.1989	31.12.2018	FBRJ	01.02.1995	31.12.2018
AIPJ	28.08.2008	31.12.2018	FFAJ	27.10.2009	31.12.2018
AMSJ	29.09.1989	31.12.2018	FFBJ	27.10.2009	31.12.2018
ANGJ	26.09.1989	31.12.2018	FSRJ	06.06.1989	31.12.2018
APNJ	06.12.1994	31.12.2018	FSRPp	15.11.2004	31.12.2018
ARIJ	20.04.1988	31.12.2018	GFIJ	25.09.1989	31.12.2018
ARLJ	12.04.2001	31.12.2018	GLNJ	18.11.2013	31.12.2018
ASRJ	29.08.1988	31.12.2018	GRTJ	20.04.1988	31.12.2018
ATTJ	17.10.2013	31.12.2018	HARJ	25.10.1988	31.12.2018
AVIJ	06.12.1994	31.12.2018	HCIJ	12.04.1988	31.12.2018
BAWJ	24.01.1994	31.12.2018	HYPJ	30.05.1988	31.12.2018
BHPJ	31.07.1997	31.12.2018	IAPJ	29.10.2013	31.12.2018
BTIJ	31.10.2008	31.12.2018	IMPJ	01.09.1989	31.12.2018
BVTJ	20.04.1990	31.12.2018	INLJ	13.12.1988	31.12.2018
CCOJ	13.05.2010	31.12.2018	INPJ	25.07.2002	31.12.2018
CFRJ	28.08.1989	31.12.2018	IPFJ	19.04.2011	31.12.2018
CLSJ	27.03.1996	31.12.2018	IPLJ	27.07.1989	31.12.2018
CMLJ	19.06.2003	31.12.2018	ITEJ	09.11.1988	31.12.2018
COHJ	07.06.2011	31.12.2018	ITUJ	29.06.1999	31.12.2018
CPIJ	21.02.2002	31.12.2018	JSEJ	08.06.2006	31.12.2018
DGHJ	25.11.1988	31.12.2018	KAPJ	01.02.1995	31.12.2018

Table A.5 (cont'd)

Start and end dates for data samples of South African stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
KIOJ	23.11.2006	31.12.2018	RMHJ	01.12.1992	31.12.2018
LBHJ	28.02.1989	31.12.2018	RMIJ	11.03.2011	31.12.2018
LHCJ	15.06.2010	31.12.2018	RNIJ	24.10.2008	31.12.2018
MNPJ	05.07.2007	31.12.2018	RPLJ	31.10.2013	31.12.2018
MRPJ	14.06.1989	31.12.2018	SACJ	02.10.1995	31.12.2018
MSMJ	07.07.2000	31.12.2018	SAPJ	26.06.1989	31.12.2018
MSPJ	04.09.2009	31.12.2018	SBKJ	16.03.1989	31.12.2018
MTMJ	29.09.1988	31.12.2018	SBPPp	12.07.2004	31.12.2018
MTNJ	21.08.1995	31.12.2018	SGLJ	14.02.2013	31.12.2018
NEDJ	28.07.1989	31.12.2018	SHPJ	06.07.1992	31.12.2018
NHMJ	12.04.1988	31.12.2018	SLMJ	03.12.1998	31.12.2018
NPNJn	16.09.1994	31.12.2018	SNTJ	18.04.1989	31.12.2018
NTCJ	10.12.1996	31.12.2018	SOLJ	29.09.1989	31.12.2018
OCEJ	04.05.1988	31.12.2018	SPGJ	27.10.1995	31.12.2018
OMUJ	14.07.1999	31.12.2018	SPPJ	21.10.2004	31.12.2018
PFGJ	25.04.2008	31.12.2018	TBSJ	16.06.1989	31.12.2018
PIKJ	13.03.1989	31.12.2018	TCPJ	12.06.2012	31.12.2018
PPCJ	18.04.1988	31.12.2018	TFGJ	21.04.1988	31.12.2018
PSGJ	01.02.1991	31.12.2018	TKGJ	07.03.2003	31.12.2018
RBPJ	11.11.2010	31.12.2018	TRUJ	14.05.1998	31.12.2018
RCLJ	21.06.1989	31.12.2018	TSGJ	06.12.1994	31.12.2018
RDFJ	28.02.2000	31.12.2018	VKEJ	29.06.2004	31.12.2018
REMJ	29.09.2000	31.12.2018	VODJ	21.05.2009	31.12.2018
RESJ	11.12.2002	31.12.2018	WHLJ	24.10.1997	31.12.2018
RLOJ	13.04.1988	31.12.2018	ZEDJ	06.12.2006	31.12.2018

Table A.6

Start and end dates for data samples of Turkish stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ADANA	27.02.1991	31.12.2018	BRYAT	13.11.1996	31.12.2018
ADBGR	16.10.1995	31.12.2018	CCOLA	16.05.2006	31.12.2018
ADNAC	27.02.1991	31.12.2018	CLEBI	20.11.1996	31.12.2018
AEFES	09.01.1991	31.12.2018	CMENT	23.03.1993	31.12.2018
AGHOL	21.02.2000	31.12.2018	DENIZ	05.10.2004	31.12.2018
AKBNK	04.01.1991	31.12.2018	DEVA	04.01.1991	31.12.2018
AKCNS	03.10.1996	31.12.2018	DOAS	21.06.2004	31.12.2018
AKGRT	07.12.1994	31.12.2018	DOCO	06.12.2010	31.12.2018
AKSA	08.01.1991	31.12.2018	DOHOL	21.07.1993	31.12.2018
AKSEN	25.05.2010	31.12.2018	DOKTA	04.01.1991	31.12.2018
AKSGY	11.01.2013	31.12.2018	ECILC	04.01.1991	31.12.2018
ALARK	04.01.1991	31.12.2018	EGEEN	04.01.1991	31.12.2018
ALBRK	03.07.2007	31.12.2018	EKGYO	06.12.2010	31.12.2018
ANACM	04.01.1991	31.12.2018	ENKAI	04.01.1991	31.12.2018
ANHYT	29.02.2000	31.12.2018	EREGL	04.01.1991	31.12.2018
ANSGR	24.11.1993	31.12.2018	FROTO	04.01.1991	31.12.2018
ARCLK	04.01.1991	31.12.2018	GARAN	04.01.1991	31.12.2018
ASELS	04.01.1991	31.12.2018	GLYHO	24.05.1995	31.12.2018
ASLAN	10.01.1991	31.12.2018	GOZDE	27.01.2010	31.12.2018
AYGAZ	04.01.1991	31.12.2018	HALKB	14.05.2007	31.12.2018
BANVT	19.04.1993	31.12.2018	HEKTS	04.01.1991	31.12.2018
BIMAS	19.07.2005	31.12.2018	ICBCT	18.01.1991	31.12.2018
BOYP	26.12.1991	31.12.2018	IPEKE	04.07.2000	31.12.2018
BRISA	04.01.1991	31.12.2018	ISATR	08.01.1991	31.12.2018
BRSAN	14.09.1994	31.12.2018	ISBTR	07.01.1991	31.12.2018

Table A.6 (cont'd)

Start and end dates for data samples of Turkish stocks

Symbol	Start Date	End Date	Symbol	Start Date	End Date
ISCTR	04.01.1991	31.12.2018	SELEC	28.04.2006	31.12.2018
ISFIN	30.03.2000	31.12.2018	SISE	04.01.1991	31.12.2018
ISGYO	13.12.1999	31.12.2018	SKBNK	14.04.1997	31.12.2018
ISMEN	22.05.2007	31.12.2018	SODA	24.04.2000	31.12.2018
KCHOL	04.01.1991	31.12.2018	TAVHL	27.02.2007	31.12.2018
KENT	04.01.1991	31.12.2018	TBORG	11.02.1991	31.12.2018
KERVT	24.06.1994	31.12.2018	TCELL	13.07.2000	31.12.2018
KLNMA	08.03.1991	31.12.2018	THYAO	16.01.1991	31.12.2018
KORDS	04.01.1991	31.12.2018	TKFEN	27.11.2007	31.12.2018
KOZAA	24.02.2003	31.12.2018	TOASO	03.07.1991	31.12.2018
KOZAL	16.02.2010	31.12.2018	TRGYO	25.10.2010	31.12.2018
KRDMA	24.08.1998	31.12.2018	TRKCM	04.01.1991	31.12.2018
KRDMB	07.09.1998	31.12.2018	TSKB	04.01.1991	31.12.2018
KRDMD	10.06.1998	31.12.2018	TTKOM	20.05.2008	31.12.2018
LOGO.	10.05.2000	31.12.2018	TTRAK	15.06.2004	31.12.2018
MGROS	04.03.1991	31.12.2018	TUKAS	07.12.1994	31.12.2018
NTHOL	04.01.1991	31.12.2018	TUPRS	03.06.1991	31.12.2018
OTKAR	26.04.1995	31.12.2018	ULKER	25.02.2004	31.12.2018
PARSN	04.01.1991	31.12.2018	VAKBN	22.11.2005	31.12.2018
PETKM	04.01.1991	31.12.2018	VERUS	21.11.2013	31.12.2018
PGSUS	30.04.2013	31.12.2018	VESBE	25.04.2006	31.12.2018
POLHO	28.05.2012	31.12.2018	VESTL	04.01.1991	31.12.2018
QNBFB	04.01.1991	31.12.2018	YGGYO	20.08.2013	31.12.2018
SAHOL	10.07.1997	31.12.2018	YKBNK	04.01.1991	31.12.2018
SASA	05.11.1996	31.12.2018	ZOREN	29.05.2000	31.12.2018

B. P-VALUES FOR BINOMIAL AND TRINOMIAL TESTS

Table B.1

P-values for Binomial test for 100 trials using 5% probability of success

Number of successes													
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
0.994	0.963	0.882	0.742	0.564	0.384	0.234	0.128	0.063	0.028	0.011	0.004	0.001	0.000

Table B.2

P-values for Trinomial test for 100 trials using 5% probability of success

Number of successes													
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
0.409	0.245	0.127	0.057	0.022	0.008	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000

C. TÜRKÇE ÖZET / TURKISH SUMMARY

Piyasa anomalileri, ortalama üstü getiri elde etmek isteyen yatırımcıların ve bu anomalileri çözümleyebilmek isteyen araştırmacıların ilgisini uzunca bir süredir çekmektedir. Market anomalileri, Etkin Piyasalar Hipotezi (EPH) ile açıklanamayan, yatırım getirilerinde gözlenen olağan dışı hareketlerdir. Etkin Piyasalar Hipotezi finansal piyasaların etkin olduğunu ve piyasada var olan fiyatların her türlü bilgiyi yansıttığını savunur. Fiyatların yeni bilgilere göre hızlıca değişmesinden dolayı, sürekli olarak piyasanın üzerinde getiri elde etmenin mümkün olmadığını öne sürer.

Piyasa anomalileri, kesitsel ve takvimsel anomaliler olarak iki kategoriye ayırabilir. Kesitsel anomaliler, belirli yatırım araçlarının diğerlerine göre daha yüksek getiri sağlaması olarak tanımlanır. Kesitsel anomalilere örnek olarak, boyut etkisi, değer etkisi ve ihmal edilen hisse etkisi verilebilir. Bu çalışmada incelenen takvim anomalileri ise, takvime bağlı olarak yatırım araçlarının getiri performanslarının istatistiksel olarak dönemsel trendler gösterdiği durumları, bir başka deyişle, haftanın farklı günlerinde, yılın farklı aylarında ve ayların farklı dönemlerinde hisse senedi fiyatlarında dönemsellikler görülebileceğini ifade eder. Bu anomalilere, haftanın günü etkisi (DoW), yılın ayı etkisi (MoY), Pazartesi etkisi, Ocak etkisi ve ay dönümü etkisi örnek olarak verilebilir.

Gelişmekte olan ülkeler yerli ve yabancı pek çok yatırımcı için önemli bir ilgi odağı olmuştur. IMF'nin 2019 verilerine göre, son 20 yılında gelişmekte olan ülkeler gelişmiş ülkelere göre 2 ile 3 kat daha hızlı büyümektedir. Bu veriler, aynı zamanda, gelişmekte olan ülkelerin daha hızlı büyümeye devam edeceğini de göstermektedir. Uluslararası yatırımcılar büyümenin yüksek olduğu ülkelerde yatırım yapmayı tercih etmektedir, çünkü ekonominin hızlı büyüdüğü ülkelerde kurumsal kazançlar da daha yüksek olarak ortaya çıkmaktadır. Bunun dışında, gelişmekte olan ve gelişmiş piyasalar arasındaki korelasyon zayıf olduğu için, gelişmekte olan piyasalar uluslararası yatırımcılara portföy çeşitlendirme avantajları da sağlamaktadır.

Takvimsel anomaliler açısından, gelişmiş ülkeleri kapsayan pek çok çalışma bulunurken, gelişmekte olan ülkeler üzerine yapılan araştırmaların sayısı buna göre oldukça azdır. Bu çalışmanın odağı, yüksek büyüme hızları ve sundukları portföy çeşitlendirme avantajları ile uluslararası yatırımcıların dikkatini üzerlerine toplayan gelişmekte olan ülkelerdir. Bu araştırmada, gelişmekte olan başlıca ülkelerden Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye'nin piyasa etkinlikleri, en yaygın olarak bilinen takvim anomalilerinden olan haftanın günü etkisi ve yılın ayı etkisinin incelenmesi yoluyla değerlendirilmektedir. Bununla birlikte, haftanın günü etkisi, bir önceki günün fiyat değişim yönüne göre de analiz edilmektedir. Ayrıca, kırılma noktaları testler vasıtasıyla belirlenerek bu tarihlerin öncesi ve sonrası için analizler yenilenmekte ve bu sayede bulunan takvimsel anomalilerin zaman içerisinde değişime uğrayıp uğramadıkları incelenmektedir. Bu çalışmanın iki temel amacı; gelişmekte olan başlıca ülkelerde, hisse senedi ve hisse senedi endeks getirileri üzerindeki haftanın günü ve yılın ayı etkilerini analiz etmek ve gözlemlenen haftanın günü ve yılın ayı etkilerinin örneklem periyodu boyunca tutarlı olup olmadığının belirlemektir.

Bu doğrultuda, bahsi geçen altı ülkeden 20 borsa endeksi ve 600 hisse senedi için 1992 – 2018 dönemine ait veriler kullanılmıştır. Bu borsa endeksi ve hisse senetleri için, uzun bir zaman aralığını kapsayan günlük ve aylık kapanış fiyatı verileri Thomson Reuters Eikon veritabanı kullanılarak elde edilmiştir. Analizlerde Otoregresif Koşullu Değişen Varyans (GARCH) modeli kullanılmıştır. Çalışmada ilk olarak, haftanın günü etkisinin bu altı piyasada var olup olmadığı borsa endeksi günlük kapanış verileri kullanılarak analiz edilmektedir. Ardından, borsa endeksleri için günlük kapanış verileri bir önceki günün fiyat değişim yönüne göre ikiye ayrılarak haftanın günü analizi yinelenmektedir. Bu analizin akabinde, borsa endeksleri için, aylık kapanış verileri kullanılarak ayın günü analizi yapılmaktadır. Son olarak, altı ülkenin her biri için seçilen 100'er hisse senedi için günlük kapanış verileri ile haftanın günü analizi yapılmaktadır. Her bir ülke için 100 hissenin analiz sonuçları bir araya getirilerek binom testi ve trinom testi vasıtasıyla istatistiksel çıkarım yapılmaktadır. Tüm bu analizlerde, günlük kapanış verileri kullanılırken haftalık getiri ortalaması, aylık kapanış verileri kullanılırken ise aylık getiri ortalaması ilgili modellere dahil edilerek, eğilim etkisinin ortadan kaldırılması ve getirilerin hareketlerinin daha açık bir şekilde anlaşılabilmesi amaçlanmıştır.

Seçilen borsa endeksleri, Brezilya için BVSP, IBRX ve IBX50'dir. Rusya'dan IRTS, IMOEX ve MOEX10 endeksleri seçilmiştir. Hindistan piyasasının iki borsasından BSE500, SENSEX, NIFTY50 ve NIFTY500 endeksleri analizlerde kullanılmıştır. Çin piyasası için, Şanghay ve Shenzhen borsalarından SSE180, SSEC, CSI300, SZS100 ve SZSC endeksleri seçilmiştir. Güney Afrika Johannesburg borsasından JALSH ve JTOPI endeksleri analiz edilmektedir. Türkiye için Borsa İstanbul'dan XU100, XU030 ve XUTUM endeksleri analizlerde kullanılmaktadır.

Her ülkeden analizlerde kullanılacak 100'er adet hisse senedi belirlenirken iki kriter kullanılmaktadır: Piyasa kapitalizasyonu ve örneklem boyutu. Yapılacak analizin yeterli kesinliğe sahip olabilmesi amacıyla, en az 1250 günlük kapanış fiyatı verisine sahip olan hisseler tercih edilmiştir. Bu kriteri sağlayan hisselerden, piyasa kapitalizasyonu en yüksek 100'er hisse analizlerde kullanılmıştır. Örneklemlerin zaman aralığı hisseden hisseye değişmekle birlikte hepsinin bitiş tarihi 31 Aralık 2018'dir. Başlangıç tarihleri Ocak 1991 ile Kasım 2013 arasında değişiklik göstermektedir. Analizlerde kullanılan kapanış fiyatları, temettü ödemesi, sermaye artırımı, hisse bölünmesi gibi kurumsal işlemlere göre düzeltilmiş verilerdir.

Analizlerde, kapanıştan kapanışa olan günlük ve aylık getiri verileri, sırasıyla, haftanın günü ve yılın ayı etkilerini incelemek maksadıyla kullanılmaktadır. *t* günü (ayı) için günlük (aylık) getiri aşağıdaki gibi hesaplanmaktadır:

$$R_t = ln\,(P_t / P_{t-1}), \qquad (1)$$

Bu hesaplamada P_t, *t* günündeki (ayındaki) düzeltilmiş kapanış fiyatı, P_{t-1} de bir önceki günün (ayın) düzeltilmiş kapanış fiyatıdır. Bu çalışmada, hisse senetleri ve borsa endeksleri için getiriler logaritmik olarak hesaplanmaktadır.

Doğrusal regresyon, hata teriminin otokorelasyona sahip olmamasını, normal dağılıma sahip ve homoskedastik olmasını gerektirir. Bu gereksinimlerin sağlanmaması en küçük kareler yöntemi (OLS) ile yapılan kestirimlerin kesinliğini azaltması nedeniyle güvenilirliğe sahip olmayan sonuçlara sebep olacaktır. Dolayısıyla, bu çalışmada kullanılan verilerin içerdiği otokorelasyon ve heteroskedastisite etkileri ile baş edebilmek için Otoregresif Koşullu Değişen Varyans (GARCH) modeli kullanılmaktadır.

Çalışmada kullanılan GARCH (1, 1) modeli bir ARCH terimi ve bir GARCH terimi içermektedir. GARCH modeli, volatiliteyi modellemek vasıtasıyla parametre kestirimlerinin verimliliğini arttırmaktadır.

Ayrıca, getiri verilerindeki eğilim etkisinin ortadan kaldırılması ve getiri hareketlerinin daha net bir şekilde tespit edilebilmesi için, haftalık ortalama getiri terimi ve yıllık ortalama getiri terimi, sırasıyla, haftanın günü ve yılın ayı etkilerinin incelendiği modellere eklenmiştir.

Bu analizlere ek olarak, borsa endeksleri üzerindeki haftanın günü etkisi, bir günün getirisinin bir önceki günün getirisinin değişim yönüne göre nasıl etkilendiğini tespit edebilmek amacıyla, tarihsel verinin bir önceki günün getirisinin pozitif veya negatif olmasına göre iki gruba ayrılması yoluyla da incelenmektedir.

Her ülkeden daha önce tarif edilen kriterlere göre belirlenen 100'er hisse senedi için toplanan günlük getiri verileri, GARCH (1, 1) modeli kullanılarak ayrı ayrı analiz edilmektedir. Ardından, bir ülke için elde edilen bu 100 adet analiz sonucu tek bir tabloda toplanmaktadır. Bu tabloda, haftanın her bir günü için sonuçlar istatistiksel olarak anlamlı ve pozitif, anlamlı ve negatif ve istatistiksel olarak anlamsız olmak üzere üçe ayrılır. Bu şekilde oluşturulan tablolarda yer alan verilerin istatistiksel olarak yorumlanabilmesi için binom test ve trinom test kullanılmaktadır.

Binom testte, iki durumun sayısı, yani istatistiksel olarak anlamlı sonuç sayısı ve istatistiksel olarak anlamsız sonuç sayısı kullanılarak her bir gün için haftanın günü etkisinin olup olmadığı incelenir. Bu hesaplama için, anlamlı pozitif ve anlamlı negatif sonuç sayısından hangisi büyük ise diğerinin sayısı bu sayıdan çıkarılarak kullanılır. Örnek oldrak, 100 hisse senedinin GARCH (1, 1) modeli ile yapılan analizleri sonucu bir tabloda bir araya getirildiğinde, Salı günü için 11 adet anlamlı negatif, 2 adet anlamlı pozitif ve 87 adet istatistiksel olarak anlamsız sonuç olduğu durumda, 11 adet anlamlı negatif sonuç sayısından 2 adet anlamlı pozitif sonuç sayısı çıkarılarak elde edilen 9 sayısı kullanılarak 100 adet analiz sonucu içerisinde bu miktarda anlamlı sonuç elde etmenin 0.05 önem seviyesinde istatistiksel anlamlılığa sahip olup olmadığı test edilir.

Trinom testinde ise, üç farklı durum, yani anlamlı pozitif sonuç, anlamlı negatif sonuç ve istatistiksel olarak anlamsız sonuç sayıları hesaba katılarak, bu pozitif ve negatif sonuçlar arasında istatistiksel olarak anlamlı bir fark olup olmadığı test edilir. Binom testi ile benzer bir hesaplama yönteminin kullanıldığı bu testte üç farklı çıkarım yapılabilmektedir: anlamlı pozitif sonuç sayısının anlamlı negatif sonuç sayısından istatistiksel olarak fazla olması, az olması ve farksız olması.

Analizlerde kullanılan bir diğer test de Quandt – Andrews kırılma noktası testidir. Bu test kullanılarak tarihsel veriler için model parametrelerinde yapısal bir kırılma, diğer bir deyişle, parametrelerde yapısal bir değişiklik olup olmadığı ve böyle bir kırılma varsa bu kırılmanın hangi tarihte meydana geldiği sonuçları elde edilir.

Bu çalışmada ilk analiz, borsa endekslerinde haftanın günü etkisinin varlığının incelenmesidir. Bu kısımda, her bir borsa endeksi için toplanan günlük kapanış verileri kullanılarak hesaplanmış olan günlük getiriler kullanılmaktadır. Bu getiri verileri ile yapılan analizin ardından bu getiri verileri, bir önceki günün getirisinin pozitif ya da negatif olmasına göre iki gruba ayrılarak bu iki grup ayrı ayrı analiz edilmektedir.

Brezilya Borsası endekslerinden BVSP üzerinde, verilerin alındığı 1992 – 2018 döneminde negatif Pazartesi etkisi gözlenmektedir. Bir önceki gün getirilerinin pozitif olduğu durumda, haftanın hiçbir günü üzerinde haftanın günü etkisi gözlenmemektedir. Negatif getiri olan günlerden sonraki günler için analiz yapıldığında ise negatif Pazartesi ve pozitif Çarşamba etkileri görülmektedir.

Diğer bir Brezilya Borsası endeksi olan IBRX üzerinde, 1997 – 2018 zaman aralığı için, negatif Pazartesi etkisi tespiti yapılmaktadır. Pozitif getiri elde edilen günlerden sonra gelen günler için yapılan analizde pozitif Çarşamba etkisi görülürken, bir önceki günlerinde negatif getiri olan günler için negatif Pazartesi ve pozitif Çarşamba etkileri görülmektedir.

Brezilya Borsası'ndan IBX50 endeksi üzerinde ise, 2003 – 2018 yılları arasında, hiçbir haftanın günü etkisi görülmemektedir. Bir önceki gün getirilerine göre yapılan analizlerde de haftanın günü etkisine rastlanmamaktadır.

Rusya Moskova Borsası'nın RTSI endeksi 1995 – 2018 verileri kullanılarak incelendiğinde, negatif Salı etkisi tespit edilmektedir. Pozitif getiri elde edilen günlerden sonraki günler üzerinde pozitif Pazartesi ve Perşembe etkileri gözlemlenirken, tersi durumda negatif Pazartesi ve Çarşamba etkileri görülmektedir.

Moskova Borsası IMOEX endeksi üzerinde, 1997 – 2018 zaman aralığında herhangi bir haftanın günü etkisi görülmemektedir. Bir önceki günün getirisi pozitif olduğunda pozitif Pazartesi etkisi ortaya çıkmaktadır.

MOEX10 endeksi için, IMOEX'e benzer şekilde herhangi bir haftanın günü etkisi görülmemektedir. Bir önceki günün getirisi pozitif olduğunda pozitif Pazartesi, önceki günün getirisi negatif olduğunda ise negatif Pazartesi etkisi görülmektedir.

Hindistan Bombay Borsası endeksi SENSEX, 1992 ve 2018 yılları arası verileri kullanılarak analiz edildiğinde haftanın günü etkisi gözlenmemektedir. Pozitif getiri elde edilen günlerin ardından pozitif Pazartesi ve Cuma etkileri tespit edilmektedir. Bir önceki gün getirileri negatif olduğunda ise negatif Pazartesi etkisi görülmektedir.

Bombay Borsası'nın bir diğer endeksi olan BSE500 üzerinde de haftanın günü etkisi görülmemektedir. SENSEX ile benzer şekilde, pozitif getirili günlerden sonra pozitif Pazartesi ve Cuma etkileri görülürken, negatif getirili günlerin ardından negatif Pazartesi etkisi ortaya çıkmaktadır.

Hindistan Ulusal Borsası endeksi NIFTY50 için analiz sonuçları herhangi bir haftanın günü etkisi göstermemektedir. Bir önceki günün getirisi pozitif iken, pozitif Pazartesi, Çarşamba ve Cuma etkileri ortaya konulmaktadır. Fiyatlarda düşüş yaşanan günlerden sonra negatif Pazartesi etkisi görülmektedir.

Hindistan Ulusal Borsası'nın NIFTY500 endeksi ise negatif Salı etkisi göstermektedir. Fiyatlarda artış yaşanan günlerin ardından pozitif Pazartesi, Çarşamba ve Cuma etkileri görülmektedir. Bir önceki gün negatif getiri elde edilen durumda, negatif Pazartesi, Salı, Perşembe ve Cuma etkileri görülmektedir.

Çin Şanghay Borsası endeksi SSEC üzerinde, 1992 – 2018 yılları arasında, negatif Perşembe etkisi görülmektedir. Pozitif getiri elde edilen günlerin ardından pozitif Pazartesi ve negatif Perşembe etkileri gözlenmektedir. Tersi durumda, negatif Pazartesi ve Perşembe etkileri ve pozitif Çarşamba etkisi ortaya çıkmaktadır.

Şanghay Borsası'nın SSE180 endeksinde SSEC ile benzer şekilde negatif Perşembe etkisi ortaya konmaktadır. Fiyatların yükseldiği günlerden sonra pozitif Pazartesi ve negatif Perşembe etkileri görülmektedir. Negatif getirili günlerin ardından negatif Pazartesi ve Perşembe etkileri gözlemlenmektedir.

Çin Shenzhen Borsası'nın SZSC endeksi üzerinde, 1992 – 2018 döneminde, negatif Perşembe etkisi görülmektedir. Pozitif getirili günlerin ardından pozitif Pazartesi ve negatif Perşembe etkileri görülürken, negatif getirili günlerden sonra negatif Pazartesi etkisi görülmektedir.

Shenzhen Borsası'nın SZS100 endeksi, SZSC ile benzer şekilde negatif Perşembe etkisi göstermektedir. Yine SZSC ile benzer şekilde, yükseliş yaşanan günlerin ardından pozitif Pazartesi ve negatif Perşembe etkileri ortaya çıkarken, negatif getirili günlerden sonra negatif Pazartesi etkisi ortaya konmaktadır.

Şanghay ve Shenzhen Borsaları'nın kompozit endeksi CSI300 incelendiğinde, negatif Perşembe etkisi görülmektedir. Bir önceki günün getirisi pozitif olduğunda pozitif Pazartesi ve negatif Perşembe etkileri görülürken, fiyatlarda düşüş yaşanan günlerin ardından negatif Pazartesi etkisi ortaya çıkmaktadır.

Güney Afrika Johannesburg Borsası'nın JALSH endeksi 1995 – 2018 verileri kullanılarak analiz edildiğinde pozitif Pazartesi etkisi görülmektedir. Yükseliş yaşanan günlerin ardından pozitif Pazartesi ve Perşembe etkileri gözlemlenirken, fiyatların düştüğü günlerden sonra negatif Çarşamba ve Cuma etkileri ortaya çıkmaktadır.

Johannesburg Borsası'nın bir diğer endeksi JTOPI de benzer şekilde pozitif Pazartesi etkisi göstermektedir. Bir önceki günün getirisi pozitif olduğunda pozitif Pazartesi ve Perşembe etkileri gözlemlenirken, tersi durumda gözlenen haftanın günü etkileri negatif Perşembe ve Cuma'dır.

Türkiye'de Borsa İstanbul endeksi XU100, 1992 – 2018 zaman aralığı için negatif Salı etkisi göstermektedir. Fiyatlarda artış yaşanan günlerden sonra negatif Salı ve pozitif Perşembe etkileri görülürken, bir önceki günün getirisi negatif olduğunda negatif Pazartesi etkisi ortaya çıkmaktadır.

Borsa İstanbul endeksi XU030 üzerinde, 1997 – 2018 aralığında negatif Salı etkisi gözlemlenmektedir. Fiyatların yükseldiği günlerden sonra negatif Salı ve pozitif Perşembe etkileri görülmektedir.

Borsa İstanbul'un bir diğer endeksi XUTUM da diğer iki endeks gibi negatif Salı etkisi göstermektedir. Pozitif getirili günlerin ardından negatif Salı ve pozitif Perşembe etkileri analiz sonuçlarında ortaya konmaktadır.

Bu analizlerin ardından, gözlemlenen haftanın günü etkilerinin zaman içerisinde değişime uğrayıp uğramadığını incelemek için Quandt – Andrews kırılma noktası testi uygulanmaktadır. Borsa endekslerinin tarihsel verileri üzerinde belirlenen kırılma noktalarının öncesi ve sonrası için GARCH (1, 1) modeli kullanılarak ayrı ayrı testler yapılarak zaman içerisinde model denkleminin parametrelerinde yapısal bir değişim olup olmadığı analiz edilmektedir.

Brezilya Borsası'nın üç endeksinde de 2008 sonrasında haftanın günü etkileri ortadan kalkmaktadır. Rusya Moskova Borsası'nın üç endeksi için de aynı şekilde 2008 sonrasında hiçbir haftanın günü etkisi gözlemlenmemektedir. Hindistan için hem Bombay Borsası hem de Ulusal Borsa endeksleri 2008 yılı sonrasında haftanın günü etkisinden arınmış olarak ortaya çıkmaktadır. Çin'in Şanghay ve Shenzhen Borsaları'ndan seçilen beş endeks de 2008 sonrasında negatif Perşembe etkisi göstermektedir. Güney Afrika Johannesburg Borsası endeksleri üzerinde 2008 – 2018 yılları arasında pozitif Pazartesi etkisi görülmektedir. Benzer şekilde, Borsa İstanbul'dan belirlenen üç endeks üzerinde 2008 sonrasında pozitif Pazartesi etkisi ortaya konmaktadır.

Çalışmanın sonraki bölümünde, borsa endeksleri üzerinde yılın ayı etkisi olup olmadığı incelenmektedir. Analizler sonucunda, Brezilya Borsası endeksleri üzerinde negatif Mayıs etkisi gözlemlenmektedir. Moskova Borsası'nda da benzer şekilde negatif Mayıs etkisi görülmesine ek olarak, IMOEX endeksi üzerinde pozitif Ocak etkisi bulunduğu tespit edilmektedir. Hindistan'ın Bombay ve Ulusal Borsaları yılın ayı etkisi göstermemektedir. Çin'in Şanghay ve Shenzhen Borsaları'ndan bu çalışmada kullanılan beş endeksten SZSC haricindekiler üzerinde yılın ayı etkisi bulunmamaktadır. Shenzhen Borsası endeksi SZSC ise pozitif Şubat etkisi göstermektedir. Johannesburg Borsası endeksleri pozitif Ocak etkisi ortaya koymaktadır. Borsa İstanbul endeksleri negatif Mayıs etkisi gösterirken, XUTUM endeksi üzerinde ek olarak negatif Ağustos etkisi de ortaya çıkmaktadır.

Bulgular, altı ülkenin hepsinde haftanın günü etkisi bulunduğunu, fakat 2008 finansal krizinden sonraki dönemde bu etkilerin Brezilya, Rusya ve Hindistan için ortadan kalktığını ortaya koyarken, Çin, Güney Afrika ve Türkiye için haftanın günü etkileri sürmektedir. Yılın ayı etkisi ise, Brezilya, Rusya, Güney Afrika ve Türkiye pazarlarında görülmektedir. Ayrıca, Çin'in Shenzhen Borsası'nda da yılın ayı etkisi bulunurken, Şanghay Borsası ve Hindistan Borsaları üzerinde yılın ayı etkisi görülmemektedir.

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