

# Seasonalities in stock markets: the Day of the Week Effect

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## Abstract

*Day of the week effect phenomenon is one of the most important calendar anomalies that have been observed in many stock markets in all over the world. This specific phenomenon has been observed and studied by many researchers for many years and as a consequence there are a lot of different results. The present paper aims at examining in a theory level the meaning, the boundaries and the effects of this phenomenon. First of all, we make a short introduction about the day of the week effect phenomenon in general. After that, we present two significant issues: on the one hand the distinction between perfect and imperfect markets, on the other hand the analysis of the efficient market hypothesis. Then we analyze some of the most important calendar anomalies, which have been observed in many stock markets in all over the world and its possible explanations. Finally we analyze more analytically, the day of the week effect phenomenon and its possible explanations.*

*Keywords: Day of the week effect, January effect, The holiday effect, Stock markets, Financial statements.*

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## **1. Introduction**

For many decades, many researchers, through hard and long researches, try to find out whether there is a pattern according to which stock returns are determined, or not. More specifically, they try to find out if it is possible for someone to predict the future determination of stock prices. In order to answer this question, many researchers examine whether there is a consistent seasonality in stock returns, in proportion with the day of the week, the month of the year, the existence of holidays, etc. In other words, they examine if there are calendar anomalies in stock returns (or generally in a stock index) for a long period, and if investors, based on this seasonality, are able to have profits.

However, calendar anomalies tend to argue the Efficient Market Hypothesis (EMH), according to which not only there are not systematic patterns in stock returns, but also it is not allowable for someone to use strategies of commercial transactions in order to have profits. More specifically, Efficient Market Hypothesis supports that no investing group has the ability to have excessive returns for a long period.

The most important calendar anomalies, which many researchers have been working on, are the following:

- Day-of-the-week effect, according to which the average stock returns of Monday are negative, while the average stock returns of Friday are positive,
- January effect, according to which the average stock returns are higher in January than they are in the other months,
- The holiday effect, according to which the stock returns before holidays are higher than they are in any other day of the year.

## **2. Literature review**

An attempt is being made, via an extended literature review, to analyze the concept of the "Day of the week effect phenomenon". Generally, it is argued that it constitutes a form of anomaly of the efficient capital market theory. As it was mentioned above, according to day of the week effect phenomenon the average daily return of the market is different for some days of the week.

There are many empirical studies which proved that day of the week effect phenomenon has been observed not only in USA, the world's biggest capital market, and in other developed markets (U.K., France, Canada, Australia, Japan), but also in the emerging markets (Malaysia, Hong Kong, Turkey).

According to the empirical results for most of the westerns economies (U.S.A., U.K., Canada), there are statistically significant negative returns for the market on Monday, while on Friday there statistically significant positive returns. However, in other markets (Japan,

France, Australia, Singapore, Turkey) the highest negative returns appear on Tuesdays.

There have been many studies for the most developed markets (USA, U.K., Canada) such as Cross (1973), Gibbons and Hess (1981), Jaffe and Westerfield (1985), Harris (1986), Simrlock and Starts (1986), which supported that Monday's average returns are negative and Friday's average returns are positive. However, there are many other studies such as Condoyanni, O'Hanlon and Ward (1987), Solnic and Bousquet (1990), in the French stock market, Athanassakos and Robinson (1994), Jaffe and Westerfield (1985), in the stock markets of Australia and Japan, Kim (1988) in the stock markets of Japan and Korea, Dubois and Louvet (1996) in the stock markets of Japan and Australia, Aydogan (1994), Balaban (1995), Bildik (1997) and Ozmen (1997) in the stock market of Turkey, which supported that the negative average returns are observed on Tuesdays. (Lyroudi K., et.al., 2004).

### **3. Characteristics of Greek Capital Market**

It has to be mentioned that for many years (up to the decade of 1980) Greek stock market was characterized by high fluctuations which mainly owed to:

- social-political factors (political instability, partisanship, change of policy, etc), and
- new investing opportunities (landed property, products imports) and not in profits and in economic activity of companies (Alexakis and Petrakis, 1991).

These factors made Greek capital market more unstable. This instability has to do not only with the social-political factors, that were already mentioned, but also with the macroeconomic and microeconomic condition of economy (high and changeable inflation rates, high shortage of public sector, lack of information, spottiness of public financial statements, high participating of banks in general index (about 50%). In all the above, we could add the problems and the weaknesses of Athens stock exchange which did not have the necessary accoutrement for the development of new informational and telecommunication systems. Generally, it has to be mentioned that in Greek capital market, investor did not have adequate and quick information something that made its investments more and more uncertain.

Under these circumstances the question is which is the behavior of the Greek investor who invests in Greek stock market. There have been some studies relative to Athens stock exchange behavior and its comparison with other capital markets. At first, Papaioannou and Filippatos (1982) examined the effectiveness of non-synchronous transactions and chronic hysteresis of price development at the beta coefficient of stocks.

Ten years later, Theodosiou, Koutmos and Negakis (1993) studied the stochastic behavior of Athens stock exchange, using an exponential GARCH - M model, and they conclude that the order of the returns is not normally and independently distributed, the positive shocks have higher effect in price's fluctuation than negative shocks do, in

Athens stock exchange prices are more predictable according to previous information than they are in USA, the fluctuation of stock prices in Greece is higher and more stable than it is in USA, and finally the changes in stock market of USA do not affect prices in Greece.

In the meantime, Niarchos and Georgakopoulos (1986) examined the efficiency of Greek capital market relatively to the publication of financial statements of companies and they found out that market is inefficiency as long as investors react very slowly in new information.

Furthermore, Panas (1990) examined if efficient market hypothesis exists in Athens stock exchange. He concluded that in Athens stock exchange stock prices are random (run test and Von Neumanu test) and independent (Q-statistics). According to these results it can be supported that Greek capital market is efficient in its weak form.

In his article, Siriopoulos (1996), used classic and non-statistical tests in general index of Athens stock exchange in order to understand its characteristics and its behavior for the period of 1984 till 1994 (an extremely important period because the number of listed companies increased at 50%, capitalization changed from 1 billion dollars to 12.3 billion dollars and since 1987 and then foreign national investors started to be interested in Athens stock exchange).

At this point it has to be mentioned that most of the researches in the resurgent markets showed that efficient market hypothesis does not exist. More specifically, these results are:

- in Greek capital market the returns of general index do not follow the normal distribution (Jarque-Bera test, Studentized Range statistic, and calculation of asymmetries and curve's coefficients).
- the independency return hypothesis does not exist (Ljung, Box statistic, Box, Pierce statistic, control of point change, flow tests).
- there are clues of non-linear, dynamic and long-term memory (Keenam test, MacLead and Li test, Hsieh test, estimation of Hurst exhibitor).

This article also concludes that developed capital markets are more efficient.

At this point it has to be mentioned that the instability of Greek capital market has been, step by step, decreased since the end of 1988, when there were some important changes which tended to rationalize the behavior of prices of Greek stock market. There are many reasons which led to this situation such as:

- the independence of stock market's operation, without government's interference,
- the establishment of stock brokers offices and the stock brokers operation,
- the creation of Parallel market,
- great effort in order for the transactions to be clear,

- the usage both of information science and high technology, and
- the introduction of new transferable titles.

All the above reasons led investors to be more interested in stock market, and as a consequence a great number of Greek and foreign investors were attracted. New companies were listed in Athens stock exchange. As far as it concerns the period 1989-1990 more than fifty new stocks were listed in stock market and as a result the number of listed companies, in 1995, comes up to 200. At the same period the private sector received about the  $\frac{1}{3}$  of its total financing through Athens stock market, while at the past the percentage of financing of the companies with the usage of capital market was not more than 5%.

As a consequence, investors became more sensitive as far as it concerned the capital market's facts and they started to behave more rationally. The authorities understood that they had to modulate a regular operating framework of stock market; otherwise the consequences would be painful. Companies started to publish their financial statements more frequently. General public and especially investing companies that appeared since the end of 1989, started to become more and more sensitive as far as it concerns the capital market development.

All the above with the introduction of United Charts of Account, the monetary union of Europe, the standardization of financial statements and records in a united pattern for all the countries-members of European Union gave to the Greek capital market the characteristics of developed capital markets.

#### **4. Perfect & Imperfect Markets - Efficient Market Hypothesis**

A generation ago, academic financial economists accepted the efficient market hypothesis. It was generally supported that securities markets was enormously efficient in reflecting information about both individual stocks and stock market as a whole. The accepted view was that when information arises, the news is dispersed very quickly and as a consequence, it is embodied into stock prices without any delay. Thereby, both technical analysis (the study of past stock prices in a trial to predict future prices) and fundamental analysis (the analysis of financial information in order to help investors selecting "undervalued" stocks) would not be capable of helping investors achieving returns higher than those that would be achieved in case investors hold a randomly selected portfolio of individual stocks with comparable risk.

The existence of perfect markets is necessary in order for the supply and demand of stocks to be free. Generally, in order for a market to be considered as perfect, it has to be characterized by the following:

- a great number of investors, listed companies and stocks, in order for each investor not to have the ability to affect any stock price, through his transactions,
- perfect information of investors (without any cost),
- all investors face the same time-horizon for their investments,

- there are no taxes,
- all investors have the same expectations for the future development of stock returns, and
- there is no transaction cost.

However, it is generally acceptable that it is very difficult for a market to combine all these characteristics at the same time. This does not mean that a market, where some of these characteristics are absent, does not operate efficiently.

There are many definitions relative to the efficient market. More specifically, according to Jensen (1978), "a market is considered to be efficient when there is no possibility for someone to have profits, through sales and purchases of stocks, based on specific information". Alexander and Sharpe (1989) supported that "the market in which a stock price shows exactly its investing value, at every time, is an efficient market". Finally, according to Fama (1970) "a market is efficient when any information is embodied in the stock price, and there are no margins for profiteering".

In modern portfolio theory, it is believed that in perfect markets (efficient markets) stock prices are developed randomly, so it is impossible for someone to predict the future price of any stock. In other words, stock prices follow the random walk theory.

Moreover, according to the Efficient Market Hypothesis, the usage of available information cannot lead to returns which will be systematically higher than the average market returns. Efficient Market Hypothesis presupposes investors' individuality. More specifically, there is competition among investors, each one of whom aims at profit, but in a way that no one can affect the market prices.

Fama (1970) supported the existence of three forms of market efficiency, based on the criterion of the embodiment of information into the stock price. These forms are: a) weak form, b) semi-strong form and c) strong-form.

- **Weak form**

In this case, it is believed that all the information which is relative not only to the past stock prices but also to the transactions, is already embodied into the stock prices and no one can affect them. In this way, there is no possibility for someone to have profits systematically higher than the average profits (returns follow the random walk hypothesis). As a consequence of the weak form of market efficiency, the technical analysis is not profitable and there is not momentum or reversal at the stock prices.

- **Semi-strong form**

In this case, it is supported that public information for the company is embodied into stock price, which tends to become the same with its internal value. In this way, activities which aim at profits are limited because the analysis of available public information (published balance-sheets, results of operations, provisions and published analysts' deductions, announcements for economy's progress etc.) does not lead us to systematically more efficient provisions, which would bring systematically higher profits.

- **Strong form**

According to this form of market efficiency, it is believed that the whole information (not only public but also internal) is embodied into the stock price. The stock price is the same with its internal value. No investor is capable of making profits through transactions which are based on any kind of information (public or private).

To conclude, it has to be mentioned that for the first two forms of market efficiency (weak and semi-strong), investors analyze and use all the available data and estimate the prospects of the corresponding companies. However, it is generally acceptable that an efficient market presupposes a great number of investors, so at any time a great number of investors think in a similar way and as a consequence, they act in the same way. As a consequence, stock prices reflect the new information and finally it is obvious that it is impossible for the information to be turned to advantage.

Observing a lot of the studies that already existed, we conclude that the majority of the markets that were examined belong in one of the first two forms of market efficiency (weak and semi-strong), while the third form (strong form) is very rare.

## **5. Calendar Anomalies - Time Patterns in Securities Returns**

As it was mentioned above, many years ago efficient market hypothesis was widely accepted. According to random walk theory, which efficient market hypothesis is associated with, any prediction of the future development of stocks is impossible, because they are determined randomly. However, at the beginning of twenty-first century the dominance of the efficient market hypothesis had become far less universal. An important number of financial economists and statisticians started to believe that stock returns are characterized by seasonality and as a consequence they might be partially predictable. Moreover, a new breed of economists supported that stock price determination depends on psychological and behavioral elements, something that make them to believe that future stock prices are somewhat predictable on the basis of past stock price patterns as well as certain "fundamental" valuation metrics.

More specifically, stock returns are systematically higher or lower according to the month of the year, the hour of the day and the existence of holidays or not. All these facts tend to argue not only the random walk theory, but also the efficient market hypothesis, according to which returns are not developed in a standard way and strategies of commercial transactions aiming at profits are not allowed.

## **6. January Effect & its Possible Explanations**

January effect is the phenomenon according to which the January's returns are higher than the returns that are observed for all the other months of the year. Not only stock returns, but also risk bonuses are high in January, and this is a fact that is ascertained for many stock markets (Gultekin M. and Gultekin N., 1983). The first researchers that documented evidence of higher returns in January as compared to the other months are Rozeff and Kinney (1976). They used NYSE stocks for the period of 1904-1974 and they found that the

average returns in January were 3.48 percent as compared to only 0.42 percent for the other months. Moreover, there are later studies that support that the January effect exists in more recent years: Bhardwaj and Brooks (1992) for 1977-1986 and Eleswarapu and Reinganum (1993) for 1961-1990. It has to be mentioned that there are two main phenomena in January. The first one is a change in stock returns, which contain tax losses for the investors and especially for the stocks with long-term losses. As far as it concerns the second one, it has to do with the relationship between the unusual high or low returns and the stock yield. More specifically, stocks with zero and high yield have higher returns. The correlation between January effect and the size of capitalization seems to be indifferent. This means that the observation according to which periodicity in January's returns exists only in companies with low capitalization cannot be absolutely ensured.

As far as it concerns the possible explanations of this phenomenon, the most famous is that investors throw away "bad papers" in December, because of tax reasons, and the consequential decrease of sales in January can explain the higher returns. Although this explanation agrees with the development of the stock returns in many stock markets in all over the world, it is not satisfactory enough because at the end of the year the pressure for sales is not too high to excuse the change in stock returns in January. Another explanation is the year-end window-dressing. This means that some portfolio managers throw away "bad papers" at the end of the year in order to avoid presenting them at the annual report. Similar papers are repurchased at the beginning of the year and in this way January effect is arisen.

Furthermore, the January risk seasonal can explain the higher returns that are observed. The truth is that the systematic and non-systematic danger of a stock increases in January, while for the rest months there is no important correlation between danger and yield, no matter if the danger is countered as a part of CAPM. This is a financial mystery. Another possible explanation has to do with the fact that the periodicity of the January may be an exchange for undertaking information risk. January periodicity may derive from the decrease of uncertainty, because of information dispersion. However, this explanation might be inadequate, because as far as it concerns companies, periodicity in returns does not happen during the change of calendar year, but during the change of their economic year.

## **7. Holiday Effect and its Possible Explanations**

Holiday effect is the phenomenon according to which there are unusually high stock returns before stock markets holidays. Lakonishok and Smidt (1988), Ariel (1990), and Cadsby and Ratner (1992) all provide evidence to show that returns are, on average, higher the day before a holiday, than on other trading days. The first time that this phenomenon was observed was the period between 1901 and 1932, and from that time many researchers started to examine it. There are many academic studies that confirm the holiday affect in stock returns. Holiday effect interacts with the rest stock returns anomalies, and it seems to be more powerful for companies with low capitalization.



One of the possible explanations of this phenomenon is that liquidation is responsible for price fluctuations at the period of holidays. However, these fluctuations are not too high to excuse this phenomenon. Moreover, the unusually high returns, before holidays, are not a result of increased danger. It has been observed that the fluctuation of the returns, during the days before holidays, is lower than volatility that is observed during days that do not come before holidays.

Another possible explanation is that high returns before holidays may have to do, like the weekends, with the phenomenon of systematically high returns before the stoppage of transactions, but this cannot be true, because the return for the day before holiday is much higher than the return for the last day of the week.

Finally, what can explain the holiday effect phenomenon may be the fact that people, because of the holiday, feel pleasantly something that leads to high purchasing power and as a consequence to systematically high returns for the day before holiday.

## **8. Day of the Week Effect & its Possible Explanations**

Day of the week effect is a phenomenon according to which the average daily return of the market is not the same for all the days of the week, as it would be expected according to efficient market theory. More specifically, according to this phenomenon, there are systematically negative returns on Monday and systematically positive returns on Friday.

Day of the week effect appears not only in indexes of many stock markets, but also in stock options, stock index futures (Yadav & Pope, 1992), in bonds and in T-bills (Gibbons & Hess, 1981). It has to be mentioned that the longer the maturity of the bonds, the lower the Monday's returns. Roll (1984), supported that day of the week effect has been observed in orange juice futures. Moreover, the day of the week effect has been observed in foreign exchange rates. This phenomenon does not counterbalance the day of the week effect phenomenon in a foreign market, if we change the returns of this market to foreign money.

Day of the week effect, more than the other calendar anomalies, was studied by many researchers. Except for its existence or not in many stock markets, it was examined for its robustness and for its correlation with other calendar anomalies. In this way, it was proved that day of the week effect was stronger for companies with low capitalization, but it was weaker than the holiday effect in indexes returns. More specifically, the returns of Monday when there is holiday on Tuesday are, on average, positive (Lakonishok & Smidt, 1988).

It has been proved that there is no possibility for someone to take advantage of day of the week effect phenomenon, in order to have systematically profits. Moreover, it has to be mentioned that the transaction's cost makes the development of a profitable strategic

difficult, because the spreads in returns are not too high to cover this profit. This agrees with efficient market hypothesis, according to which the future development of stock prices is random and we cannot make predictions in order to earn money. However, this periodicity can be very helpful for all investors, because depending on this periodicity they can plan their transactions. More specifically, knowing that stock returns are negative on Monday and positive on Friday, they purchase on Monday instead of Friday.

There are many explanations for the day of the week effect phenomenon, but none of these are satisfactory enough. One possible explanation is the so called measurement error. There are many times that measurement error is considered to be the cause of day of the week effect phenomenon, mostly because this phenomenon appears to be stronger for companies with low capitalization. Measurement error is caused when stocks have low merchantability. This error can have positive effects in Friday's prices and negative effects in Monday's prices. This means that there must be negative correlation between Friday and Monday. However, the correlation that is observed between the returns of Fridays and Mondays is not only positive but also the highest of the week, so the above explanation is not satisfactory.

Another possible explanation has to do with the specialist-related bias. Stock returns are calculated from the close prices, and when we are talking about close price we mean the price according to which the last transaction happened (sale or purchase). Thereby, the close prices do not show the real price at which the orders of purchases and sales would be balanced, but they show an unreal price, which presents high variations (bid or ask price). This means that day of the week effect can be created by the high "supply" (bid prices), as close prices on Monday, and by high demand (ask prices), as close prices on Friday. However, this explanation, after many different studies, has been rejected.

Another explanation concerns with the procedures of liquidation. Liquidation procedure has to do with the period between the order of the sale (purchase) and the final transaction and final delivery (receiving) of the title. We are going to use an example in order for the above explanation to be more coherent. Let's suppose that the liquidation period is five days. This means that someone who buys stocks on Friday and sells stocks on Monday will pay, for the stocks that he bought, on next Friday, and will receive his money from the sale, on next Monday. The payment takes place three days before the receiving of the money, so the returns of Monday have to be high enough, because the investor, for these three days, loses the interest rate. This explanation seems to be very interesting, but the day of the week effect exists in many countries with different liquidation procedures, so this explanation is not satisfactory enough too.

One of the most satisfactory explanations, for the negative returns of Monday, is the trading activity of investors. This explanation has to do with the Information Processing Hypothesis. According to this hypothesis investors, during the week, has not got plenty of time in order to search for information. Thus, they purchase the stocks that their stockbrokers suggest them. Stockbrokers' suggestions tend to keep step with the market's promptitude. According to a study of

Groth, Lewellen, Schlarbaum and Lease (1979), the 77% out of six thousands of stockbrokers recommendations, suggests purchases, while only the 23% suggests sales. However during weekend, investors have the time to search for information and to organize their own investing strategy. The problem of this explanation is that it interprets only the negative returns of Monday, while for the positive returns of Friday it cannot give a satisfactory explanation.

Finally, many analysts support that investors' psychology can play a significant role in causing day of the week effect phenomenon. More specifically, Monday is regarded by most investors as the worst day of the week for the reason that it is the first working day of the week and Friday is regarded as the best day because it is the last working day of the week, so investors feel pessimistically on Monday and optimistically on Fridays. Thereby, they proceed on sales on Monday and on purchases on Friday. As a consequence, the prices fall on Mondays and rise on Friday (Lyroudi K., et al., 2004).

The sciences of Psychology and Sociology try to give a satisfactory explanation for this phenomenon. There is a field known as "behavioral finance" (a connection between psychology, sociology and finance) that tries to give answers in the way that psychology, emotions, and errors of apprehension affect investors' decisions. Moreover, the weekend effect in stock returns may have to do with the fact that people tend to announce the good news immediately, and to encrypt the bad news. Usually, companies announce the bad news at the weekend, in order for the market to absorb the shock during the two days that intermediate until the open of the market, while the good news is announced immediately.

## **9. Conclusion**

Many researchers try to examine whether there is a consistent seasonality in stock returns, in proportion with the day of the week, the month of the year, the existence of holidays, etc. Through an extended literature review, we depicted the concept of these "Calendar Anomalies" and their explanations. In conjunction, we analyzed the characteristics of Perfect & Imperfect Markets. Generally speaking, there are many explanations for these phenomena, but none of these are satisfactory enough. Finally we dissert the existence of these phenomena in the Greek Capital Market. All of these remain still enigma, either they continue to exist until today, or not.

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