

# The concept of market efficiency finance essay

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DEMDevelopment and Enterprise MarketEMHEfficient Market

HypothesisFHMFirst Half of the MonthGARCHGeneralised Autoregressive

Conditional HeteroskedasticityIOSCOInternational Organisation of Securities

CommissionsOLSOrdinary Least SquaresROMRest-of the-MonthSEMStock

Exchange of MauritiusSHMSecond Half of the MonthSLRSimple Linear

RegressionTOMTurn-of the-Month

## Chapter 1: Introduction

The concept of market efficiency is of paramount importance in finance.

After its introduction by Fama in 1970, market efficiency has been a topic of study and empirical evidence for many researchers. Their main aims were to investigate about the randomness in price movements, market efficiency and detecting market anomalies. There are numerous stock market anomalies; calendar effects, size effect, value effect, leverage effect and liquidity effect. Calendar anomalies (or calendar effects) demonstrate market inefficiency and thus indicate scope for profit. However, after they are documented and analysed in the academic literature, they often seem to disappear, reverse, or attenuate. Thus, there are growing scepticisms on the study providing the evidence of anomalies. This study aims at detecting calendar anomalies in stock returns, more specifically, in the returns of the SEMDEX. Studying market efficiency will be relevant for financial managers, financial counsellors, market professionals and investors in general, and all those interested in developing profitable trading strategies. It will help inventors who want to invest in the SEMDEX as they will be more aware of the calendar anomalies present in the returns of the index. This will allow them to make better investment decision while avoiding risks. This research

has been broken down into various chapters. Chapter 2, the literature review, consists of reviewing the different studies carried out by previous authors on market efficiency, the Efficient Market Hypothesis (EMH) and market anomalies. Chapter 3 gives an overview of the Stock Exchange of Mauritius, the market indices and the Legal Framework. Chapter 4 explains the techniques that will be used so as to carry out the research and Chapter 5 consists of analysing the findings and the expected results. Finally, Chapter 6 consists of a Gantt chart which illustrates the time allocated for each activity of the research.

## **Chapter 2: Literature Review**

### **2. 1. Market Efficiency**

Market efficiency refers to the extent to which information about stocks are reflected in the stock prices. This concept was developed by Economist Eugene Fama (1970) whose theory of an Efficient Market Hypothesis (EMH), stated that it is not possible for an investor to outperform the market because all available information is already built into all stock prices. In the words of Fama (1970), " A market in which prices always fully reflect all available information is called efficient". Later, Jensen (1978) explained that a market is efficient with respect to particular information set if it is impossible to make economic profit by trading on the basis of that information set. 2. 2. Conditions for an efficient marketBased on the EMH, an efficient market can exist if the following conditions hold (Jones, 1993; Shleifer, 2000). There are many rational profit-maximising investors who actively participate in the market and hence value securities rationally. If some investors are not rational, their irrational trades are cancelling each

other out or rational arbitrageurs eliminate their influence without affecting prices. Information is costless and widely available to market participants at approximately the same time. Investors react quickly and fully to the new information, causing stock prices to adjust accordingly.

## **2. 3. Assumptions of the Efficient Market Hypothesis**

The EMH is based upon three basic assumptions which are stated as follows. Investors are rational implying that they value the securities with respect to their fundamental or intrinsic value. Some investors may be irrational but their investing activities are in the random fashion and uncorrelated; therefore, their trading cancels each other without affecting the price. In the case that they are highly correlated and that irrational activities do not cancel each other, some professional arbitrageurs eliminate their activities, and make profits. Other assumptions of the EMH are stated below. There is a large number of buyers and seller in the market. Spreading information is costless and instantaneous. Transaction costs are cheaper than the expected profits of an investment strategy. Information is rapidly translated into changes in stock prices. All services in the market are provided at the maximum average cost, whereby all the investors are price-takers.

## **2. 4. Forms of Market Efficiency**

Fama (1970) distinguished three nested information sets: past prices, publicly-available information, and all information including private information. EMH is therefore divided into three stages as the weak form, semi-strong form, and the strong form. In the weak form of efficiency, the stock prices reflect all historical market data such as past prices and trading volumes (Bodie et al., 2007). Investors are thus unable to make additional

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profits by examining historical prices. However, they can beat the market and make superior profits in the weak form of efficient market by analysing public and private (inside) information. In the semi-strong form of efficiency, past prices and all publicly available information should be fully reflected in security prices. Superior profits can only be made by examining private information. Strong form of efficiency states that market prices reflect all information including the past prices, all publicly available information, and all private information. In such a market, prices would always be fair and any investor, even insider traders, cannot beat the market (Brealey et al., 1999).

## **2. 5. Implications of Market Efficiency**

Rao (1989) outlines the important implications of the EMH and they are stated below. Stock prices cannot be predicted. All investments will eventually have a zero Net Present Value in the long run. Market value reflects the true or intrinsic value of the asset. Investment decision can be evaluated through stock prices. Investment "advice" is ineffective.

## **2. 6. Calendar Anomalies**

Calendar anomalies include the calendar or seasonal regularities. The existence of such anomalies seems to be inconsistent with maintained theories of asset-pricing behaviour. They indicate either market inefficiency (profit opportunities) or inadequacies in the underlying asset-pricing model. However, after they are documented and analysed in the academic literature, calendar anomalies often seem to disappear, reverse, or attenuate. The calendar anomalies are explained as follows.

## **January Effect (or Month of the year Effect or Turn of the year Effect)**

The January Effect occurs when higher mean returns are observed in January as compared to the rest of the year. Various hypotheses (Chen & Singal, 2001) have been formulated to explain the anomaly of January effect.

## **Monday Effect (or Day of the week Effect or Weekend Effect)**

The day-of-the-week effect indicates that the average daily return of the market is not the same for all the days of the week, as it would be expected on the basis of the efficient market theory. The average returns are expected to be lower on Mondays.

## **Holiday Effect**

The Holiday Effect is characterised with the higher average returns on a day before a holiday as compared to other trading days.

## **Half Month Effect (or Semi- Month Effect)**

It is the tendency of common stock returns for the second half-month to be significantly below the first half of the month.

## **Turn of the month Effect**

This anomaly states that the returns of a firm are significantly higher at the turn of the month, normally defined as the last and first three (-1 to +3) or four (-1 to +4) trading days of a month.

## **Chapter 3: Overview of the Stock Exchange of Mauritius**

### **3. 1. The Stock Exchange of Mauritius (SEM)**

The Stock Exchange of Mauritius Ltd (SEM) was incorporated in Mauritius on the 30th March 1989 under the Stock Exchange Act 1988, as a private limited company responsible for the operation and promotion of an efficient and regulated securities market in Mauritius. It has become a public company since the 6th October 2008, and over the years the SEM has witnessed a significant overhaul of its operational, regulatory and technical framework to reflect the ever-changing standards of the stock market environment worldwide. The SEM operates two markets namely the Official Market and the Development & Enterprise Market (DEM).

### **3. 2. Market Indices**

There are five market indices which consist of all the companies listed on the SEM. SEMDEX, SEMTRI and SEM-7 consist of companies listed on the Official Market while DEMEX and DEMTRI have as constituents the companies listed on the DEM.

### **3. 3. Legal Framework**

The Securities Act 2005 has come into force on September 28, 2007 by proclamation. It provides a wider and deeper coverage of the securities market and is based on standards recommended by the IOSCO. The Securities Act 2005 replaces the Stock Exchange Act 1988, and draws on modern legislation in other jurisdictions and is based on up-to-date regulatory and supervisory standards. The main object of the Securities Act 2005 is ensuring a fair, efficient and transparent securities market and most

importantly, to strike an appropriate balance between the protection of investors and the interest of the securities market.

## **Chapter 4: Research Methodology**

### **4. 1. Definition of the Research Problem**

Calendar anomalies, being an indicator of market inefficiency, also show arbitrage opportunities and thus abnormal profits can be earned. The research problem involves determining the presence of calendar effects in the Stock Exchange of Mauritius (SEM).

### **4. 2. Research Objectives**

The main objectives of this study are as follows: Assess the presence of calendar effects in the returns of the SEMDEX. Determine whether the SEM is efficient in the weak form. Investigate about the trend of calendar anomalies after they have been analysed. Assess opportunities to make abnormal profits on the SEM.

### **4. 3. Data Collection**

Before research is carried out, data has to be collected and can be either primary or secondary data. Primary data is collected first hand by researches, for example, surveys, interviews, and questionnaires. On the other hand, secondary data refers to information that is already available and can be journal articles or books for instance. This study will require the use of secondary data that will be collected from the Stock Exchange of Mauritius. For the purpose of this research, the closing prices of the SEMDEX will be used and the sample period starts from the month of January 2002 to end as at December 2012. The SEMDEX is an index of prices of all listed



shares and each stock is weighted according to its share in the total market capitalisation. Therefore, changes in the SEMDEX are dominated by changes in the prices of shares with relatively higher market capitalisation. It is calculated as follows.

#### **4. 4. Methodology**

As this study will be focusing on behaviour of returns, the first step involved will be to calculate the returns on the SEMDEX. An adjusted return will be used in testing calendar anomalies and it is calculated as follows. Where,  $r_t$  is the rate of return of SEMDEX at time period  $t$ ,  $P_t$  denotes price of SEMDEX at time period  $t$ , and  $P_{t-1}$  denotes price of SEMDEX at time period  $t-1$ . First suggested by Osbrone (1959), the lognormal probability distribution of price change is more popular and used by many other researchers (cited in Kemp & Reid, 1971). The compounded returns will be computed continuously, rather than arithmetic returns, because continuously compounded returns are additive and their distribution "follows" the normal distribution more closely than arithmetic returns (Lauterbach and Uncar, 1995). In the case of a day following a non-trading day, the return will be calculated using the closing price indices of the last trading day. The daily stock prices may be obtained on an irregular basis because of holidays or of closure of the stock market for other causes. This irregularity will have to be eliminated by regularising the data set. This has to be done in order to be able to run regression models. Different hypotheses will be set, specific to each calendar anomaly. These hypotheses will be tested by performing regressions. Statistical softwares such as SPSS or EViews will be needed so as to run regression models. Such applicable models are the SLR model, OLS regression model, and the GARCH

model. To investigate the seasonal patterns, each return observation will be classified according to its month relative to the year, day relative to the week, day relative to a holiday, day relative to the half-month, and day relative to the turn-of-the-month. Then, each of recognised seasonal effects is tested individually, using regression equations with dummy variable(s). After the regression is performed, the results obtained will be analysed and according to the observations, conclusions will be drawn. The expected results are elaborated in the next chapter.

## **Chapter 5: Analysis of findings**

This chapter consists of analysis and expected findings related to calendar anomalies stated in Chapter 2 on the SEM. The equation and hypothesis for the test of each calendar effect are stated below.

### **January Effect**

Where,  $\bar{r}_{SEMDEX,t}$  is the mean return of SEMDEX for month,  $t$ ; to represent February to December;  $\bar{r}_{SEMDEX,Jan}$  is the mean return for January; the coefficients through measure the difference between the mean return for each month of the year and the mean return for January and  $\epsilon_t$  is the error term. The significance of coefficient of at least one dummy variable will confirm that there is no equality of mean returns across the calendar months of the year.

### **Monday Effect**

Where,  $\bar{r}_{SEMDEX,t}$  is the mean return of SEMDEX on day,  $t$ ; to represent Tuesday to Friday;  $\bar{r}_{SEMDEX,Mon}$  is the mean return for Monday; the coefficients through measure the difference between the mean return for other days of the week and the mean return for Monday and  $\epsilon_t$  is the error term. The significance of coefficient

of at least one dummy variable will confirm that there is existence of the day- of-the-week effect.

### **Holiday Effect**

Where, is the mean return of SEMDEX on day,  $t$ ; represents post holidays and regular days ( attains a value of 1 if the return is observed on post-holidays, 0 otherwise); is the mean return for a pre-holiday; the coefficients and measure the difference between the mean return for a pre-holiday and the mean return for a post-holiday and a regular day and a pre-holiday and is the error term. A significant positive coefficient of at least one dummy variable will confirm that there is existence of the holiday effect.

### **Half-Month Effect**

Where, is the daily mean return of SEMDEX; the independent variable, is a dichotomous variable taking a value of 1 if the return occurs on the SHM days and 0 if the return occurs on FHM as defined by Lakonishok and Smidt (1988); is the mean return of the FHM, the coefficient measures the difference between the mean return of SHM return and the mean return of FHM and is the error term. A significant negative coefficient will confirm that there is existence of the half month effect.

### **Turn of the Month Effect**

Where, is the daily mean return of SEMDEX; the independent variable, is a dichotomous variable taking a value of 1 if the return occurs on the TOM days and 0 if the return occurs on ROM days as defined by Lakonishok and Smidt (1988); is the mean return of the of the ROM period; the coefficient measures the difference between the mean return of ROM and the mean

return of TOM days and is the error term. A significant positive coefficient will confirm that there is an existence of the TOM effect. From research conducted in Nepal, Previous researchers, who studied the Monday and January effects, identified the presence of January Effect in the returns of the SEMDEX. However, there is no Monday effect according to them.

## **Chapter 6: Gantt chart**

The Gantt chart below shows how much time will be allocated to perform each of the tasks required for the completion of the research. The available lapse of time is estimated to be 25 weeks.