



**SCHOOL OF ECONOMICS
AND MANAGEMENT**
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Effect of Fed's Discount Rate Changes on Foreign Stock Indices

- Event Study on Morocco and Denmark -

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ABSTRACT

The paper is divided into 8 chapters: Introduction, Background, Theoretical Framework, Methodology & Data Sampling, Results, Analysis, Discussion and finally Conclusion and Proposals for Further Research. The introduction chapter in brief discusses theory of decoupling suggests that emerging markets can be unaffected by crisis in developed economies, while theory of financial integration states that globalization made economies intertwined to each other.

In the methodology chapter, in order to test whether the theory of financial integration or the theory of decoupling stands, we are performing a standard event study. The purpose is to test for any abnormal returns on the Danish and Moroccan stock indices.

The main outcomes of the event study research can be briefed into four points. First, the Danish market is partially integrated relative to the US economy, with the existence of a diversification prospects. Second, although the Moroccan market shows some signs of financial integration, it is still a segmented market. Third, the Danish market seems to react more to the release of surprise events in relation to anticipated macroeconomic releases. Finally, the Moroccan market appears to respond spuriously to surprise events relative to the expected announcements.

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PURPOSE	The purpose of this research is to constructively contribute to the debate of which of financial integration and decoupling theories hold, implying which investment strategy should be followed by an investor. The objective of the paper is to determine whether there are any abnormal returns with the Danish and Moroccan stock market indices relative to the US benchmark market (S&P500) after the release of Fed rate cut announcements.
METHODOLOGY	In order to test whether the theory of financial integration or the theory of decoupling stands, we are performing a standard event study. The purpose is to test for any abnormal returns on the Danish and Moroccan stock indices.
THEORETICAL FRAMEWORK	The theoretical framework for the event studies is mainly built on the work of MacKinlay (1997) and Chapter 4 in the “Econometrics of Financial Markets”, written by Campbell <i>et al.</i> (1997). Both set up a seven-step process in order to perform event studies.
CONCLUSIONS	The main outcomes of the event study research can be briefed into four points. First, the Danish market is partially integrated relative to the US economy, with the existence of a diversification prospects. Second, although the Moroccan market shows some signs of financial integration, it is still a segmented market. Third, the Danish market seems to react more to the release of surprise events in relation to anticipated macroeconomic releases. Finally, the Moroccan market appears to respond spuriously to surprise events relative to the expected announcements.

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I. Introduction

Throughout summer 2007 and up to now, an infinite amount of reports, articles, press releases and literature have been published on what is now agreed to be "the largest financial shock since the Great Depression" (The Guardian, Apr 10, 2008, p.1). A great debate could be witnessed between the different financial institutions, bodies, governments and experts about the length, the depth, relevance and impact of what started as a US-mortgage crisis. What attracted our attention is the release of contradictory statements from different well-established authorities long after the subprime-mortgage worries. Those opposing views appearing on financial news can be summed up into two main theories: theory of decoupling and theory of financial integration.

In brief, theory of decoupling suggests that emerging markets can be unaffected by crisis in developed economies, while theory of financial integration states that globalization made economies intertwined to each other. Thus, our research focuses on the impact of US financial news releases linked to the current financial crisis on two different stock markets. To our knowledge this specific subject has not previously been handled in the way that we deal with it, throughout this paper. The contribution of this paper to the field of finance is to measure whether news related to the US market has an effect worldwide or not. Likewise, this paper should grab the interests of international investors willing to determine whether diversification opportunities exist within segmented and established equity markets. Also, our research tries to enlighten market participants, especially US, on the stock market behaviour in emerging and established economies after the release of an (un)expected event.

1. Thesis Outline

This paper is organized in the following way. In the very first section, we have an introduction to the paper. Chapter II is the background, where we provide the reader with a sample of media coverage from two major financial publications: The Economist and Financial Times. The background section aims at providing overall insights on the debate within the financial community, whether the Federal Reserve's actions to stimulate the American economy have an impact on other stock markets worldwide (supporting financial integration theory) or they have a weak effect on global economies (supporting theory of decoupling). In chapter III, we discuss the theoretical framework on which our studies are based upon, as well as a discussion

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on previous results within the area of event study. In the fourth chapter, we present the methodology, data sampling as well as the stock indices. This chapter defines the methods used in event studies as well as the data collected for the study. It also includes a discussion on the reliability and validity of the data. In chapter V, we show the empirical findings resulting from the research. In chapter VI, the analysis section refers to the empirical findings to come up with remarks on (un)announced events and on the stock indices involved in the study. In Chapter VII, we discuss the results and analysis regarding explanations of the empirical findings. In chapter VIII, we introduce the implications of our findings to the financial community. The final chapter is the conclusion as well as a proposal for further research.

II. Background

This section presents the views and arguments arena of various financial authorities and experts related to the current US environment as background for our research project. Multiple statements, sometimes contradictory, have been cited in some of the mostly recognized financial press lighthouses, namely International Monetary Fund (IMF) reports, The Economist and Financial Times. The opposing views on the length of US monetary policies reflect the confusion and uncertainty that surround the American economy. Some experts argue that the Fed intervention in relaxing the American equity markets through rate cuts have direct consequences globally while others argue that there is either a weak or no effect on mainly emerging markets.

The background chapter presents the two main subjects debated on specialized financial press. Arguments in favour of a weak global spread support decoupling theory since it implies the existence of diversification opportunities. The strong global spread subsection agrees with the financial integration theorists since it induces that global markets are fully integrated and that a change in US monetary policy is spread worldwide. In addition, the reader is provided with background information on the two financial theories in question, enabling a connection between empirical findings and theoretical framework.

1. Weak Global Spread

The issue of spiral spread has been intensively debated behind the curtains of the major international financial institutions (IFIs) and finance clubs. Numerous reports and statements have maintained the inadequacy of a global financial fear as far as in the beginning of 2008. In its July report, the IMF confirmed its position that the emerging markets will keep a solid growth and temper the spread of the US crisis, basing their arguments on the concept of decoupling that the rest of the world would keep its growing trend regardless of the American crisis (The Economist, Jan 26, 2008, p.82). The examples of both Australian and Swedish central banks raising their discount rates, subsequent to Fed rate cuts, are proofs of the relevance of decoupling theory (The Economist, Dec 8, 2007, p.89). IMF went further by saying that emerging markets will continue to grow strongly for the next two years (The Guardian, Apr 10, 2008, p.28). More has been published on global spread scepticisms. Some

of the academic literature argued that the global economy has been used to shocks and has improved in absorbing them due to better inventory logistics, targeted monetary policies and improved financial derivatives (The Economist, Sept 22, 2007, p.33). South Africa, Singapore, Hong Kong, China and Japan displaying constant house-price inflation contradict views on global spread (The Economist, Dec 8, 2007, p.89). On October 20, 2007, The Economist wrote in its columns that the worst is over and that the financial markets have multiple reasons to remain optimistic (p.36).

2. Strong Global Spread

"The US is by no means above the median [...] we're now in a state of fear", said Alan Greenspan, previous Fed chief governor. Referred to similar housing booms witnessed in 40 different countries, Alan Greenspan stated that we should not expect emerging markets to shield the American crisis, but rather expect the crisis to deepen in those markets (The Economist, Sept 22, 2007, p.33 & The Economist, Oct 27, 2007, p.91). This statement summarizes views from advocates of the spiral spread of the US financial crisis. Christine Lagarde, currently French minister for economy, industry and employment, adds that "European countries are by no means immune to the US slowdown" (Financial Times, Apr 11, 2008, p.9). She refers to the global financial system as suffering from "structural weaknesses" (*Ibid*). After long claiming that little should be worried regarding the spread of the credit crunch, the IMF started to change its position and estimated that the credit crisis to have already incurred \$1 trillion, with more to come (The Guardian, Apr 10, 2008, p.28). Simon Johnson, IMF research director, stated that there is a significant risk that the global economy will enter into a "vicious circle", with housing prices continuously falling and world banks facing a more severe "damaging feedback loop" (*Ibid*). \$1 trillion is still seen as an overly optimistic estimation. The Economist warned, in its article "It's rough out there", that the markets sharply declined from "Brazil to Britain" to their lowest levels since 9/11 attacks, counting over \$5 trillion of losses only for the first three weeks of 2008 (Jan 26, 2008, p.11).

4. Financial Integration Theory

The theory of financial integration states that two or more markets are integrated together, meaning that what affects one market also affects the other (Oxelheim & Wihlborg, 2005). Some of the factors that contribute to financial integration are the rise in international capital flows as well as foreign ownership of financial assets. One of the consequences of financial integration is the higher exposure to financial shocks (Evans & Hnatkovska 2007). Therefore,

the perspective of this paper is to examine whether the Danish or Moroccan stock indices are exposed to shocks from the US market, which would imply that the theory of financial integration holds stand.

5. Decoupling Theory

The theory of decoupling is practically the opposite of financial integration. It means that a market is decoupled from another market. It usually refers to emerging markets, which are proved to be immune to the turmoil or other reactions from mature markets such as the US. Simon Johnson, IMF research director, stated that the current credit crisis will not go by the emerging markets (The Guardian, Apr 10, 2008, p.28). Other experts are saying that the intra-market trade growth among emerging markets is so strong that the theory of decoupling stands (Hoare, 2008). Therefore, our perspective is to analyze whether any of the two markets, Danish and Moroccan, are decoupled from the US markets, by testing the abnormal returns in regards to financial releases.

6. Problem Discussion

Despite the numerous studies performed on proving the relevance of financial integration and decoupling theories, very few has been done within event study in comparing effects of information releases on foreign markets. In fact, event study analysis has significantly been used in the field of corporate finance. Also, event study was rarely performed for the study of the anticipation of monetary news on foreign markets.

Considering the subject of financial integration and decoupling theories, Bajo and Petracci (2006) investigated the impact of insider's information on stock behaviour using standard event study methodology. Johnson *et al.* (2005) looked at the effect of corporate ratings appearing in the financial press, in that case Business Week, on stockholders' wealth. Using layoff announcements from the Wall Street Journal, Abraham (2006) examined the reaction of the market relative to layoff announcements.

Even though the study of surprise events relative to anticipated ones have been previously covered by the literature, comparative analysis on foreign markets using event study methodology still has not been studied intensively. Fatum and Scholnick (2008) studied the impact of "negative surprises" on positive surprise events. Other researchers focused on the CARs ratio to recognize that anticipated stock splits have a larger effect than unanticipated

ones (Hwang *et al.*, 2008). Some papers have investigated the effect of unexpected discount rates changes on the equity markets (Chen *et al.*, 1999; Wasserfallen, 1989; and Hardouvelis, 1988).

The interest that arises from this research concerns the use of event study techniques to build up a model that investigates both the level of integration as well as the influence of the anticipation level on two foreign stock market indices, belonging to different economic groups, relatively to the US stock market. To our knowledge, there is currently no study that combines the integration level and the degree of anticipation in their impact on emerging and developed stock markets.

7. Purpose

The purpose of this research is to constructively contribute to the debate of which of financial integration and decoupling theories hold, implying which investment strategy should be followed by an investor. Also, the study aims at providing insights on the potential effect of anticipated monetary news versus unanticipated ones, which helps predicting movements in particular stock indices depending on the nature of the event. Both issues aim at clarifying the confusion that arises from the contradictory press releases concerned by the same subject.

The objective of the paper is to determine whether there are any abnormal returns with the Danish and Moroccan stock market indices relative to the US benchmark market (S&P500) after the release of Fed rate cut announcements. Furthermore, the paper aims at proving that a surprise event creates higher volatility than an expected event.

8. Delimitations

To achieve our purpose for modelling, a number of delimitations should be considered. First, the choice of the markets is limited to two countries. An emerging market represented by the Moroccan stock index and a developed market represented by the Danish stock index. In addition, the US market is used as the benchmark relative to the two cited indices. Indeed, the possible global reactions to Fed rate cuts are estimated by comparing the reactions of both the Danish and Moroccan stock markets. Second, the study of abnormal returns covers the event and the post-event review period, meaning that the pre-event period is not tested. Third, the abnormal returns outcomes are assumed to follow a normal distribution. Furthermore, we assume that both the two indices and the US market have a linear relationship.

III. Theoretical Framework

This chapter provides the theoretical framework for the event studies performed. Theories of financial integration and decoupling are also presented in this section. In addition, there is an introduction of previous studies in the field of event studies along with their empirical findings.

1. Framework for Event Studies

The theoretical framework for the event studies is mainly built on the work of MacKinlay (1997) and Chapter 4 in the “Econometrics of Financial Markets”, written by Campbell *et al.* (1997). Both set up a seven-step process in order to perform event studies.

Event studies have been introduced about 75 years ago. What is considered the first case of event studies was when Dolley (1933) examined the effect on stock prices from stock splits in the period ranging from 1921 to 1931. He had a sample of 95 stock splits and found that in 57 cases the prices increased. The event studies developed further and became more sophisticated. The works performed by Ball & Brown (1968) and Fama *et al.* (1969) are the essential methodologies that are still used in today’s event studies. We have chosen to build up our model on more recent literature on event studies, mainly that of MacKinlay (1997). Below, an event study outline has been defined, even though there is no specific structure that has to be applied. Therefore, we have adjusted our outline to fit our study. The outline arranged by MacKinlay is seven steps:

Table 1 – Seven-Steps

Customized Seven-Step Outline	MacKinlay's Seven-Step Outline
1. Defining the Event	1. Defining the Event
2. Choice of Model	2. Selection of the Criteria
3. Calculation of Expected Normal Returns	3. Normal and Abnormal Returns
4. Calculation of Abnormal Returns	4. Estimation Procedure
5. Calculation of CAR	5. Testing Procedure
6. CAR Testing and Hypothesis Testing	6. Empirical Results
7. Interpretation and Conclusions	7. Interpretation and Conclusions

In order to perform a research using event study as a technique, a model has to be chosen. Models can more or less be divided into two groups, the economic and the statistical types (Campbell *et al.*, 1997). Our choice of models, which corresponds to the market model and the market-adjusted model, belongs to the group of statistical models. This group of models relies on statistical assumptions. For the market model, we are dealing with a statistical model where the return of our security is related to the return of the market. This model is considered to be better than other models at detecting the effect of events.

Alpha is a risk-adjusted measure of excess performance compared to the market benchmark. The assumption for the market model is that there is an excess return from the indices. In other words the alpha will have to be higher than zero. Whereas if it is assumed that alpha is equal to zero, the index in question is performing the same way as the market. This is the assumption made for the market-adjusted model. If the excess return is set to be above zero, the beta value can still be assumed to be one, which means there is a linear relation with the market. Since a beta value above one would indicate the index as being more risky than the market. In the market model, we therefore set alpha equal to two and beta equal to one. In the market-adjusted model, we set alpha equal to one as it is adjusted to the market and a beta value of one (Lett, 2006).

2. Previous Studies

In a previous study by Ghazanfari *et al.* (2006), the effect of Fed's interest rate policies on the returns of commercial bank stocks is tested. They reach the conclusion that the effect of the change in Fed's interest rates depends on both the magnitude of the change as well as the anticipations of changes from the market. They found significant abnormal returns on the commercial bank stocks in relation to the two events.

Second, in an event study titled "Stocks and shocks" by Scholtens and Steensma (2002), it is worth mentioning that this study holds similarities with ours in its event study design. The latter is structured in a similar way to how we have built our event study. They chose a small amount of events in order to test the announcements effect on international stock markets. Their empirical findings were not unanimous, while some events had a significant effect, others did not display any significance at all.

IV. Methodology & Data Sampling

In this chapter, motivation for the choice of research approach is provided as well as the research method. Furthermore, a discussion of the validity and reliability of the methodological problems is presented.

1. Markets

In this section, we provide a short insight on how the Danish and Moroccan indices are structured, OMXC20 and MADEX. Also, the market return is presented in the form of S&P500.

i. OMXC20

The OMXC20 index groups the 20 most liquid stocks on the Copenhagen Stock Exchange. The index is corrected every six months under two conditions to fulfil to be included in the index. The first criterion is that the company has to be among the 20 most active stocks in terms of value traded. The second criterion is that the company has to be among the 25 most traded stocks in 40% of the opening days in the prior six months. This last criterion is also referred to as the liquidity criterion.

ii. MADEX

Just as the OMXC20, MADEX is also comprised of the most liquid stocks, which is indicated in its appellation, Moroccan Most Active Shares Index. MADEX was launched in 2002 and consist of the 50 most liquid stocks on Bourse de Casablanca.

iii. S&P500

We have chosen S&P500 as the market return, the reason for choosing a foreign index instead of the countries respective all-share indices as market return is mainly due to the fact that we want to avoid autocorrelation disturbances, being that both the Moroccan and Danish indices make up a large portion of their respective all-share indices.

Another reason relates to whether theories of financial integration or decoupling stand for any of the two markets. Motivation for choosing S&P500 is that when testing for financial integration, it is preferable to base the market return on the US market. We assume that if

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financial integration theory holds, taking the US stock market as the benchmark relative to OMXC20 and MADEX is the "best" possible alternative. Otherwise, we assume that it is rather decoupling theory that should hold.

2. Event Selection

In the process of event screening, potential significant events have been identified and have been narrowed down to two specific announcements. This type of event study is in many aspects similar with previous studies performed by Scholtens and Steensma (2002). The two events chosen are:

Table 2 – Event Selection

Event	Date	Characteristics
Fed cut in discount rate	August 16, 2007	On August 16 th , 2007, Fed unexpectedly announced a cut in the discount rate by 50 basis points.
Fed cut in discount rate	March 13, 2008	On March 13 th , 2008, Fed cut the discount rate by 75 basis points. This was proportionally the largest cut in rates in more than 25 years.

These two events are the ones that are analyzed. Nine months separate the two events in question. Furthermore, the first event occurred in the beginning of Fed's change in monetary policies, whereas the second event happened close to present time. Event I was chosen since it corresponded to a surprise event when the Fed decided to cut its discount rate by 50 basis points, while Event II was expected by market participants, but was proportionally the largest rate drop for more than quarter of a century.

2. Data and Sample Selection

The process of data collection came from three different sources. Data from the Danish OMXC20 index was gathered from the official website of the Danish stock exchange¹. The duration of the daily observation was comprised from 1st of July 2007 to 1st of May, 2008, leaving us with 207 daily observations. For the Moroccan MADEX index, we have collected our data from the official website of Bourse de Casablanca². Again, we have taken the period of July 1st, 2007 to May 1st, 2008. The number of observations from MADEX is 206. This offset in observations is due to the difference in opening hours of the two exchanges e.g. holidays. This gap between the Copenhagen Stock Exchange and Bourse de Casablanca is

¹ www.omxnordicexchange.com

² www.casablanca-bourse.com

neglected in our research since we are studying event dates on a scale based on the event date t (e.g. $t-1$; t ; $t+1$). For the market return, S&P 500 was used. These data has been retrieved from Yahoo Finance. Again the time period is the same, leaving 209 observations. The S&P500 observations were then adjusted to the Danish and Moroccan indices. The adjustment has been performed by assuming that the market index was open, displaying the same return on the supposedly opening date than on the next trading day. For example, on July 30th, 2007, S&P500 was open for trading while MADEX was closed. In this case, we assumed that MADEX had the same return and performance as in the next opening date. This is needed for the dates of the market return to fit with each of the two indices (OMXC20 vs. S&P500 and MADEX vs. S&P500). The final sample, after the adjustments, leaves us with 214 observations for OMXC20 and 215 observations for MADEX.

3. Methodology

In order to test whether the theory of financial integration or the theory of decoupling stands, we are performing a standard event study. The purpose is to test for any abnormal returns on the Danish and Moroccan stock indices.

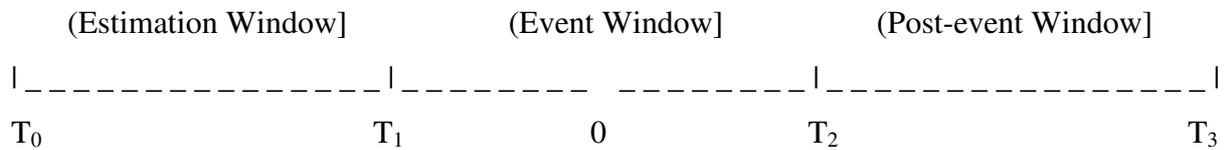
For us to perform the event study we are following a 7-step process, as set out by McKinlay (1997), though the seven steps have been adjusted to our specific event study:

Step 1: Event Identification

The first step is to identify the event. It is important that the event date is as precise as possible since this provides more reliable results of the event study (Scholtens & Steensma, 2002; Brown & Warner, 1985). Because there are two Fed rate cuts as events, there should be no problem of identifying the event date. In fact, Fed makes an announcement immediately prior to a discount rate change. Discount rate changes are usually discussed by market participants before they take place, but there is nothing indicating that they should be in possession of any information of what will actually take place at the Fed meetings. So, any comments and expectations by the market are considered in this research as being speculation and should not be considered as insider information. It implies that the day of the announcement is equivalent, in this research, to the day of the event and not the actual change of the benchmark rates. We mainly test the indices reaction from the events on day 0 to 1, but also the 2, 3, 4 and 5 day period. The events take place in a different time zone than the

Moroccan and Danish markets, which explains the reasoning for not analyzing the abnormal return of the event day alone.

Figure 1 – Event Diagram



Step 2: Choice of Model

The second step is to choose the model for calculation of returns. In event studies, there are several choices among models: the market adjusted return model, the market model and the constant mean model. We have chosen to leave out the last model and use both the market model and the market-adjusted model (McKinlay, 1997).

The market model is a model where the return of the security depends on the market portfolio. This is measured by estimating the beta. The beta of the index is calculated based on the index risk relative to the market risk, which in our case is S&P500. Weaknesses of this model includes that empirical test has shown that the assumption of a beta value calculated from historical numbers is not always a reliable measure of the future. Being that beta values do not remain constant through time. The market model though, is considered to be more sophisticated than the market adjusted model (Wells, 2004). In the market-adjusted model, we are removing the relationship between the market and the security. This is done by setting the beta equal to zero.

Step 3: Calculation of Expected Normal Returns

The third step in the process is to calculate the expected normal returns if the event had not taken place. In order to do this, we need to define the estimation window, event window and post-event window (MacKinlay, 1997). As in Scholtens and Steensma (2002), where they accept stock exchanges as being well-developed in their construction of a model, we make the same assumption in our event studies. Therefore, we can choose a rather small estimation window which is set to be 30 days. To calculate the expected normal returns had the event not taken place, we need to estimate two parameters: alpha and beta. This is done based on our newly defined estimation window. The parameters α_i and β_i are calculated using the estimation window prior to the event. The estimation window runs from t-30 to t-1. The calculation of the expected normal return is calculated using the following formula:

$$E[R_{it}] = \alpha_i + \beta_i \cdot R_{mt} + \varepsilon_{it} \quad (1)$$

$$E[\varepsilon_{it}] = 0 \quad \text{Var}[\varepsilon_{it}] = \sigma_{\varepsilon_i}^2$$

Where $E[R_{it}]$ is the expected normal return for index i at time t . α_i and β_i are the parameters calculated and are respectively the intercept and the slope for index i . R_{mt} is the market return at time t and ε_{it} is the error term.

Step 4: Calculation of Abnormal Returns

The fourth step is to measure the abnormal returns. The abnormal returns are calculated as follows:

$$\varepsilon_{it}^* = R_{it}^* - E[R_{it}^* | \Omega_{it}] \quad (2)$$

Where $\varepsilon_{it}^* \equiv$ the abnormal return for index i on day t , $R_{it}^* \equiv$ the return for index i on day t , $\Omega_{it} \equiv$ the information of the event

Step 5: Calculation of Cumulative Abnormal Returns

The fifth step in the customized step process is the calculation of the cumulative abnormal returns, also referred to as CAR. The idea of CAR is a necessary step to account for a multiple period event window. The calculation of the CAR:

$$CAR(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} AR_{it} \quad (3)$$

$CAR(\tau_1, \tau_2)$ is the sample cumulative abnormal returns from τ_1 to τ_2 where $T_1 < \tau_1 \leq \tau_2 < T_2$. The CAR from τ_1 to τ_2 is the sum of the included abnormal returns (McKinlay 1997).

Step 6: CAR and Hypothesis Testing

Knowing that normal distribution is assumed, in order to test our CAR, we use the Z-test to test the CAR compared to the mean abnormal return $\mu_0 = 0$:

$$CAR_i(\tau_1, \tau_2) \sim N(0, \sigma_{\varepsilon_i}^2(\tau_1, \tau_2)) \quad (4)$$

The test that is being performed is a two tailed test. A hypothesis testing can be used to test whether the cumulative abnormal returns are significant or not. We use the Z-test statistic to test whether the abnormal returns are significantly abnormal or not. It is done at several different significance levels (10%, 5% and 1%). The null hypothesis would be that there is no abnormal return, and the alternative hypothesis would be that there is an abnormal return:

H_{D0}: The Danish index *is not* showing abnormal returns relatively to S&P 500.

H_{D1}: The Danish index *is* showing abnormal returns relatively to S&P 500.

H_{M0}: The Moroccan index *is not* showing abnormal returns relatively to S&P 500.

H_{M1}: The Moroccan index *is* showing abnormal returns relatively to S&P 500.

This means that acceptance of the null hypothesis shows that there is no sign of a significant abnormal return caused by the event.

The test statistic is performed the following way:

$$\frac{CAR - \mu_0}{\sigma / \sqrt{n}} \quad (5)$$

Where CAR is the cumulative abnormal return, μ_0 is the mean abnormal return, in our case 0, σ is the standard deviation and n = the sample size. Later on, the results will then be compared to the critical values at different significant levels (90%, 95% and 99%).

CAR Anticipation Ratio

Since we are dealing with one event that is anticipated and one event that is not, we decided to measure a ratio of the CARs from Event I and Event II, inspired by Hwang *et al.* (2008). The ratio is calculated as:

$$\text{CAR Anticipation ratio} = \frac{\text{CAR}[(\tau_1, \tau_2) | \Omega_{\text{event1}}]}{\text{CAR}[(\tau_2, \tau_1) | \Omega_{\text{event2}}]} \quad (6)$$

4. Reliability and Validity

The data we are using for performing the event study are both valid and reliable, they are comprised from the official websites, and are observations of the stock markets, and therefore there should be no question on the validity or reliability of these. The number of observations is also considered as being sufficient since we have taken the observations for the needed period.

There are no problems with availability of data, since it is simply stock market closing prices. We are using approximately 208 observations for the markets, but since event studies are

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performed with different methods and over different time periods, this number is not comparable.

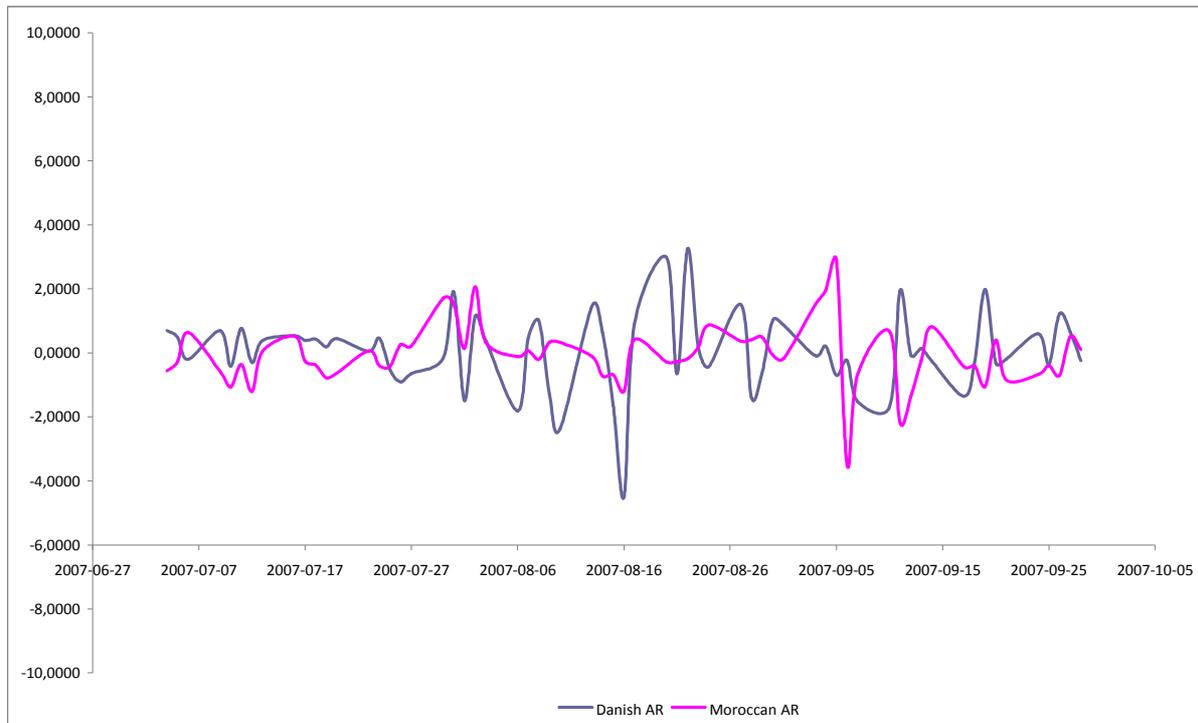
In addition to this, all sources we used for the market model and the market-adjusted model can be considered as trustworthy sources, both in terms of validity and reliability. The models are general accepted models, and MacKinlay (1997) is frequently cited in other research papers. The testing of our calculations is based on the usual assumptions of normal distribution and independently and identically distributed through time (Campbell *et al.*, 1997).

V. Results

1. Abnormal Returns

The study of the graphs of the abnormal returns for both the Danish and Moroccan stock indices relative to S&P500 provides a number of insights. For Event I, it can be seen that the surprising announcement of the Fed on August 16th had a significant effect on OMXC20. Actually, the residuals reach their lowest figure on that specific date for the whole sampling period with $\varepsilon_{it} = -4,5$. Three days before the announcement, ε_{it} was equal to 1,45, then a sharp decrease before it skyrocketed to 2,99 on August 20th. Another observation is raised. A positive reaction to the announcement is only observable one day after the announcement. On the other hand, the trend of the abnormal returns of the MADEX does not display any particular change after the August announcement, though there is a slight increase in the abnormal returns one day after the Fed cut rate release. It, instead, illustrates steadiness around a mean zero. In other words, no important abnormal returns can be noticed from the MADEX relative to S&P500.

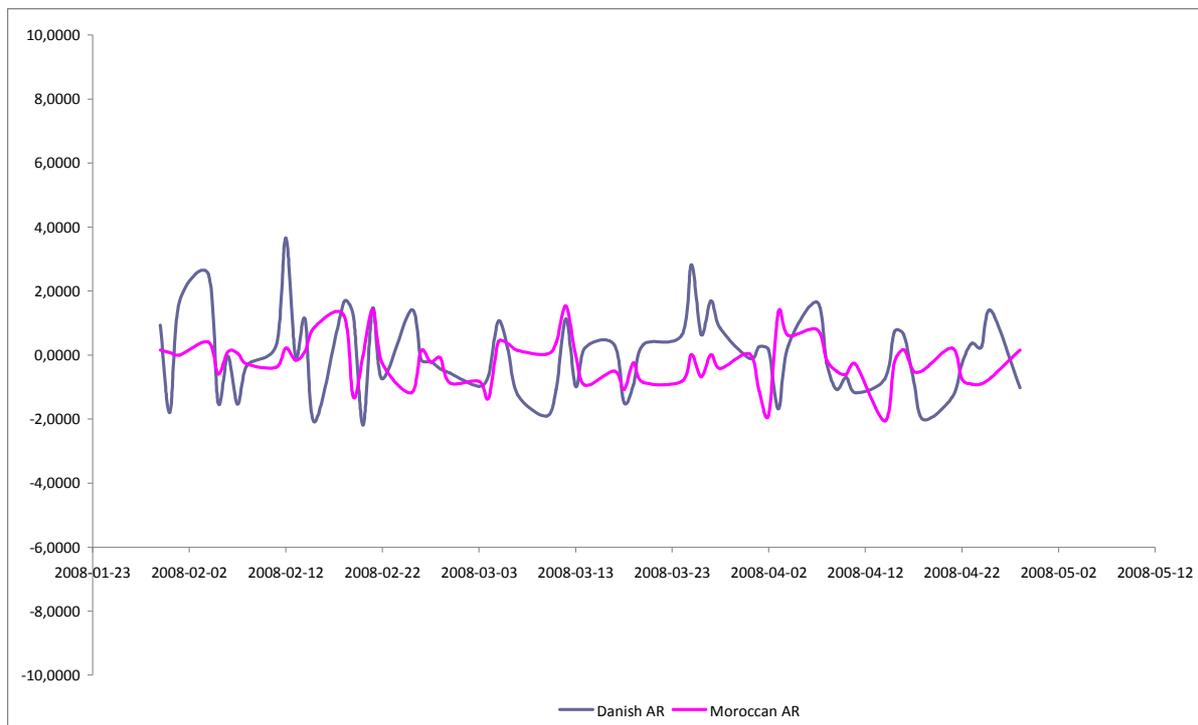
Graph 1 – Abnormal Returns for OMXC20 and MADEX for Event I



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For Event II, no significant down/upward trends are detected from the abnormal returns graph relative to S&P500. However, both OMXC20 and MADEX indices have a relative tendency to move within the same direction. It is more noticeable at the announcement date when OMXC20 and MADEX decline simultaneously and at the same rate. Again, the Danish stock market decreases at the day of the announcement relative to S&P500 returns and raises from $\varepsilon_{it} = -0,97$ to $\varepsilon_{it} = 0,23$. The MADEX keeps going down one day after the announcement to reach -0.94, but then slowly increases.

Graph 2 – Abnormal Returns for OMXC20 and MADEX for Event II



2. Cumulative Abnormal Returns

By observing the graphs of the cumulative abnormal returns, two points can be raised for each event.

The first point is that the reaction to Fed cut rates announcement is more evident in Event I than in Event II for the Danish stock index. In Event I, OMXC20 positively reacts one day ahead of the announcement after witnessing a sharp decline at event t . The second point concerns the fact that no significant drop or rise can be drawn from the CAR of the MADEX.

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Graph 3 – Cumulative Abnormal Returns OMXC20 and MADEX for Event I



Graph 4 – Cumulative Abnormal Returns OMXC20 and MADEX for Event II



3. Market and Market-Adjusted Models

With the market model method, we performed a Z-test with $\mu_0=0$ on the CAR for each of the events. The Z-test statistic has been compared with the critical values of three significance levels (10%, 5% and 1%). The following chart illustrates the results of the five different CARs:

Table 3 – Test Statistics for the Market Model and Market Adjusted Model

Methods	Market Model				Market Adjusted Model			
	Event I		Event II		Event I		Event II	
Countries	DK	MOR	DK	MOR	DK	MOR	DK	MOR
CAR(0,1)	-1,3330	-0,9687	-1,2440	-2,0651 **	-1,6906 ***	-0,0498	-2,1769 **	-1,0191
CAR(0,2)	-0,2727	-2,2732 **	-1,0119	-5,4183 *	-0,9217	0,1070	-3,0247 *	-2,7012 *
CAR(0,3)	-0,7965	-4,0211 *	-4,2613 *	-10,5143 *	-2,0172 **	0,4577	-6,7736 *	-6,4764 *
CAR(0,4)	1,4099	-5,8528 *	-7,9295 *	-13,7586 *	-0,2914	1,3242	-11,8480 *	-7,7393 *
CAR(0,5)	1,9006 ***	-5,9401 *	-7,6830 *	-21,0923 *	-0,5989	3,9332 *	-12,8199 *	-12,6192 *

*Statistically significant at 1% level with a two-tailed test
 **Statistically significant at 5% level with a two-tailed test
 ***Statistically significant at 10% level with a two-tailed test

i. Market Model

For Event I, the Danish stock market displays a positive significant relationship for CAR(0,5) at 10% significance level, rejecting the null hypothesis H_{D0} . Although the CARs had negative relationships for the three days following Event I, the cumulative abnormal return drastically showed a positive relationship after the fourth day. On the other hand, the MADEX exhibits strong negative relationships starting from CAR(0,2), reaching the 5% two-tailed rejection area at CAR(0,2) and the 1% two-tailed rejection area starting from CAR(0,3), which corresponds to the statistical acceptance of the alternative hypothesis H_{M1} .

For Event II, unlike for Event I, OMXC20 displays negative relationships for all its CARs, implying rejection of the null hypothesis H_{D0} for Event II. 1% significance level is reached with the CARs starting from the day 3 after the announcement release. The Moroccan stock market appears to have negative significant abnormal returns relative to S&P500. This relationship is strengthened after the t+1 day with a Z-test statistic that rises from 5% to 1% significance level, meaning that H_{M0} has been rejected from all the CARs.

ii. Market Adjusted Model

OMXC20 has negative relationships with all the five CARs regarding Event I. Statistical significance is only reached at CAR(0,1) at 10% and at CAR(0,3) at 5%, statistically accepting the alternative hypothesis with different confidence interval according to the review

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period. MADEX's first two CARs are close to the zero-mean abnormal return. However, the relationship starts to raise to reach 1% statistical significance at CAR(0,5), which proves rejection of its null hypothesis.

Concerning Event II, OMXC20 has negative statistical significance in all its CARs, at 5% at CAR(0,1) and 1% from CAR(0,2) to CAR(0,5), corresponding to rejections of their respective null hypotheses. Unlike the Danish stock market, there is no statistical significance at CAR(0,1) for the MADEX. Nevertheless, the latter has statistical significant CARs from day 2 at 1%, which relates again to rejection of the null hypothesis.

4. CARs Anticipation Ratio

This part aims at providing a comparison between CARs of Event I relative to Event II. The table below summarizes the outcome found:

Table 4 – CARs Anticipation Ratio

Methods Countries	Market Model		Market Adjusted Model	
	DK	MOR	DK	MOR
CAR(0,1)	4,6180	79,0162	3,9713	-3,6214
CAR(0,2)	4,8163	0,8129	3,4905	0,0847
CAR(0,3)	1,4399	0,7292	1,6281	-0,0688
CAR(0,4)	0,6627	0,5249	1,0559	-0,0970
CAR(0,5)	-0,7055	0,5432	0,0976	-0,2185
Average	2,1663	16,3253	2,0487	-0,7842

After performing an average calculation, the Danish stock index shows more consistent figures with CARs anticipation ratio approximately equalling 2 in both market and market-adjusted models. In addition, the ratio seems to diminish as the event window of the CAR gets larger. On the other hand, MADEX displays peculiar and largely disparate results with the ratio of CAR(0,1) reaching an unbelievable 79 times in the market model. The average of MADEX market model is equal to 16,32 while for the market-adjusted model, the average is equal to -0,78. The reason behind the average results of MADEX within the market and market-adjusted models is due to the extreme values at CAR(0,1).

VI. Analysis

This section summarizes the outcomes from the analysis of the five cumulative abnormal returns. The analysis consists of recognizing similarities and disparities between announced and unannounced events, MADEX and OMXC20 indices.

1. Announced and Unannounced Events

The unannounced event, named Event I, seems to cause negative abnormal returns to both the Danish and Moroccan stock indices. This hypothetical causality is more obvious for OMXC20. From the abnormal returns graph, OMXC20 witnesses its lowest abnormal return in 63 days, corresponding to the sampling period. The Z-test statistics in the market and market adjusted models are respectively equal to -1,33 and -1,69. The latter statistic is significant at a 90% confidence interval. The market model also demonstrates a potential relationship with a lag relative to OMXC20. The abnormal return relationship between S&P500 and MADEX is less evident.

As with Event I, the announced event displays negative response for the Danish stock index. The MADEX displays negative abnormal returns relative to the US benchmark index. Also, the higher the sampling period of the event window, the higher the test statistic is. Although the Z-test statistics chart illustrates high-test statistic figures for both OMXC20 and MADEX, the abnormal returns graph show no obvious drops or jumps after the expected news release.

The CARs anticipation ratio table partially explains the disparity between results in Event I and those of Event II. In fact, OMXC20 seems to react more to surprise events than anticipated announcement from the Fed. This is the case for the two calculation methods. The Danish stock index reacts twice as much when the event is expected than when it is not. On the other hand, MADEX numerical figures seem to confirm the Z-test statistics results, with irregular outcomes where no obvious observations could be raised.

2. MADEX and OMXC20

Overall, the Moroccan most active index displays negative spurious relationships in both events and both models. In fact, the MADEX's test statistics are 99% statistically significant

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with the CARs reaching very high figures, especially at CAR(0,5). For example, the test statistics for CAR(0,5) at Event II are equal to -21,09 and -12,62 in the market and market-adjusted models, respectively.

The OMXC20 has different outcomes whether the calculation method is the market or the market-adjusted ones. OMXC20 is negatively related but without significance in the market model. Significance only takes place at CAR(0,5) for Event I and starts at CAR(0,3) for Event II. The relationships are more significant while using the market-adjusted model. Ten-percent significance level at Event I and higher-than-2 test-statistics from CAR(0,1) at Event II.

VII. Discussion

This section provides potential explanations of the outcomes mentioned in the analysis section. It also presents parallels between similar studies performed on the subject with the research results. The chapter is divided into two subparts. The first part discusses the possible impact of macroeconomic news releases on foreign stock markets in general and on OMXC20 and MADDEX in particular, while the second subsection relates theories of decoupling and financial integration with the outcomes for the transition and established equity markets, represented by the Moroccan and Danish benchmark stock indices.

1. Impact of the Fed Announcements on Foreign Stock Markets

Many observations can be raised to understand the reaction of both MADDEX and OMXC20. In overall, the results illustrate a negative relationship between S&P500 and the two other stock indices. Relying on previous studies, we aim at clarifying the inverse relationship between abnormal returns of OMXC20 and MADDEX relative to S&P500.

One of the explanations of the inverse relationship can be related to the exchange rate. According to Fatum and Scholnick (2008), news related to the US monetary policy has a direct impact on exchange rates. In fact, a benchmark rate cut by Fed leads to a depreciation of the US dollar (Hardevoulis 1988). We should thus consider Fed's cut in rates as being negative news for the Danish and Moroccan stock markets because of the effect on exchange rate. A depreciation of the dollar causes US exports to be more attractive to domestic consumers in Denmark and Morocco, which should weaken Moroccan and Danish companies listed in their respective countries. In addition, a depreciation of the US dollar causes American imports from Denmark and Morocco to be less competitive within US borders. Although S&P500 responds positively to Fed's cut rates since changes in interest rates cause more trading volume on the equity market (Chen *et al.*, 1999), the opposite response is noticed for both OMXC20 and MADDEX, implying that those two markets see Events I and II as negative announcements that make the dollar depreciate. Wasserfallen (1988) has shown that interest rates on one country, in his study referring to UK, Germany and Switzerland, provoke negative abnormal returns in the equity markets of the other two. Hence, Denmark and Morocco's imports and exports are simultaneously negatively affected by the decrease of

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the US central bank's cut in discount rates. The results support the argument in favour of financial integration since both Morocco and Denmark seem to react to changes in discount rates in United States. The outcome also confirms previous studies proving that US macroeconomic news appears to have as much importance as domestic news (Funke & Matsuda, 2006).

Another observation concerns the nature of the announcement, whether it is scheduled or not. Our outputs seem to confirm patterns also observed for (un)anticipated macroeconomic news on global stock markets within the Barberis *et al.* (1998) behavioural model. In a study of the impact of discount rates changes on stock markets, Chen *et al.* (1999) used intraday data to come up with the conclusion that stock markets' trading volumes are more sensitive to surprise events than to expected changes in discount rates. Chen *et al.*'s study joins the results of Event I CARs relative to Event II CARs, where the ratio is more important after the unexpected change than after the expected change with the two measurement methods: the market model (applied to OMXC20 and MADEX) and market-adjusted model (applied to OMXC20 only). In fact, various research have highlighted the fact that when a foreign market reacts more to an American-related surprise event than to an unanticipated one, the foreign market is considered to be closely integrated (Nikkinen *et al.*, 2006; Bekaert & Harvey, 1995; and Rockinger & Urga, 2001). The results found in the CARs' ratio table support the idea that G-7, other-than-G-7 European countries, developed and emerging Asian countries are highly financially integrated, while Latin American and transition economies are weakly integrated. Likewise, the outcomes show that Denmark is financially integrated while Morocco still has displayed spurious results, suggesting weak integration. Therefore, Morocco can be seen as a segmented emerging market where diversification opportunities are still available for international investors (Nikkinen *et al.*, 2006), inducing an argument in favour of decoupling theory among emerging markets.

To sum up the first part of the discussion, the numerical figures of OMXC20 seem to signal a partial integration, but not fully, from both the inverse relationship part and the (un)announced events' part. MADEX appears to have contradictory outcomes with the inverse relationship and with the (un)expected news releases, which could imply a relative independence from the US market.

2. Financial Integration and Decoupling Theories' Arguments on Foreign Stock Markets

This subsection deals with the issue of whether financial integration or decoupling theories stand as an understanding of our research outcomes. Again, the cases of the Danish and Moroccan stock indices are taken as references to established and emerging economies, respectively. This part also includes parallels between previous studies and the outcomes of this paper.

As mentioned within the analysis chapter, the results of the Z-test statistics show that although there are some significant and negative relationships between S&P500 and the two other stock indices studied (OMXC20 and MADEX), there are no unanimous conclusions that could be drawn. A potential explanation of these outcomes lies on the idea that the two markets are neither fully integrated (for OMXC20) nor fully segmented (for MADEX).

Although Morocco, as representing emerging economies, seems to signal moving toward financial integration, the country should still be considered as a segmented market with "significant diversification opportunities" (Lagoarde-Segot & Lucey, 2007; Sarkar & Li, 2002; Swanson, 1996; and Errunza *et al.*, 1992). Other studies went further on their rejection of financial integration such as Dunis and Shannon (2005), which highlights the idea that a number of transition economies have experienced a "steady or decline" in their level of integration. The spurious and irregular results observed at the Z-test statistics table relative to MADEX is a possible argument in favour of Dunis and Shannon's research. Likewise, and as stated by Swanson (1996), "evidence of remaining segmentation is prevalent". Moreover, the possible steadiness and decline in the level of integration of the Moroccan stock index can be connected to periods of financial crises, where emerging countries seem to reduce their degree of integration with global markets (Yang *et al.*, 2003). Knowing that the review period of our study is at the heart of the current financial crisis, the MADEX peculiar Z-test statistics can be related to Yang *et al.*'s conclusion. Hence, the Moroccan stock market, represented by MADEX, can be seen more as a segmented than as an integrated market, reinforcing the argument in favour of decoupling theory.

Also, since OMXC20 holds negative and significant relationships with S&P500 abnormal returns, we can also think of a diversification opportunity for American investors in the

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Danish market and vice versa. In fact, Yang *et al.* (2003II) has proven the existence of "long-run benefits to U.S. investors of diversifying" into financially integrated markets, referring to Germany, Japan and United Kingdom. Because of the exchange rate argument presented earlier in this chapter, alongside with the negative statistical significance between S&P500 and OMXC20, we can also think of the Danish stock market as holding diversification opportunities. Overall, OMXC20, and by extension the Danish market, can be considered as an integrated market due to the relatively consistent results found on the Z-test chart, but still holding some diversification potentialities from the sign of test statistics. Therefore, financial integration stands for the case of the Danish market, making the latter a market closely and inversely related to the US market.

To sum up this discussion subsection, the Moroccan stock index confirms its segmented nature relative to the US market, supporting the arguments in favour of decoupling theory's emerging markets. On the other hand, OMXC20 display diversification opportunities with relatively important financial integration compared with S&P500.

VIII. Conclusion

This final section sums up the empirical findings as well as the analysis and discussions. The conclusion section is divided into three subsequent parts. The first part is a summary that groups the main findings of the research. Recommendation to international investors interested in knowing the behaviour of foreign markets relative to the US is given. The final part is about a further research part suggesting model improvements and changes.

1. Summary

The main outcomes of the event study research can be briefed into four points. First, the Danish market is partially integrated relative to the US economy, with the existence of a diversification prospects. Second, although the Moroccan market shows some signs of financial integration, it is still a segmented market. Third, the Danish market seems to react more to the release of surprise events in relation to anticipated macroeconomic releases. Finally, the Moroccan market appears to respond spuriously to surprise events relative to the expected announcements.

2. Proposal for Further Studies

The empirical findings given by our model suggests to further investigate within this subject with more powerful modelling. Various points can be raised to improve the modelling in order to further understand the mechanisms of the modern global financial world. We can think of enlarging the data sampling by including more dates within the event window so that we can capture the full impact of the cumulative abnormal returns. In addition, the enlargement of the data sampling would allow making performance and distribution tests within the event window. A thorough study of (un)anticipated events would require adding post- and pre-events to the analysis of the CARs in order to be able to make a comparative analysis. Also, further research should think of enlarging and diversifying major events to be able to grasp the effect of specific types of announcements (monetary, regulatory, corporate, political ...) on foreign markets. The foreign markets should also include various clusters such as geographical and economic freedom to capture the whole impact of news releases on similar markets.

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Appendices

Appendix A – Event I – Danish Stock Index

		Danish Market							
	Date	OMXC20	R _{ic}	S&P 500	R _{mc}	E[R _{ic}]	σ _{ic}	CAR	
(Estimation Window]	T ₀	7/4/2007	495.83	0.68		0.03	-0.0206	0.7006	0.7006
		7/5/2007	498.15	0.47	1,525.40	0.03	-0.0206	0.4875	1.1881
		7/6/2007	497.71	-0.09	1,530.44	0.33	0.1112	-0.1995	0.9885
		7/9/2007	501.19	0.70	1,531.85	0.09	0.0050	0.6918	1.6803
		7/10/2007	495.76	-1.09	1,510.12	-1.43	-0.6744	-0.4150	1.2654
		7/11/2007	500.67	0.99	1,518.76	0.57	0.2187	0.7669	2.0322
		7/12/2007	503.20	0.50	1,547.70	1.89	0.8070	-0.3030	1.7293
		7/13/2007	505.66	0.49	1,552.50	0.31	0.1022	0.3855	2.1148
		7/16/2007	507.73	0.41	1,549.52	-0.19	-0.1220	0.5305	2.6453
		7/17/2007	509.48	0.34	1,549.37	-0.01	-0.0405	0.3846	3.0299
		7/18/2007	511.00	0.30	1,546.17	-0.21	-0.1285	0.4264	3.4563
		7/19/2007	512.80	0.35	1,553.08	0.45	0.1630	0.1886	3.6449
		7/20/2007	512.07	-0.14	1,534.10	-1.23	-0.5854	0.4430	4.0879
		7/23/2007	513.29	0.24	1,541.57	0.49	0.1808	0.0572	4.1451
		7/24/2007	510.84	-0.48	1,511.04	-2.00	-0.9297	0.4513	4.5964
		7/25/2007	508.99	-0.36	1,518.09	0.47	0.1718	-0.5346	4.0618
		7/26/2007	498.91	-2.00	1,482.66	-2.36	-1.0911	-0.9092	3.1526
		7/27/2007	491.94	-1.41	1,458.95	-1.61	-0.7563	-0.6506	2.5020
		7/30/2007	493.22	0.26	1,473.91	1.02	0.4195	-0.1597	2.3423
		7/31/2007	499.66	1.30	1,455.27	-1.27	-0.6047	1.9020	4.2443
	8/1/2007	493.68	-1.20	1,465.81	0.72	0.2862	-1.4902	2.7540	
	8/2/2007	500.11	1.29	1,472.20	0.43	0.1581	1.1359	3.8900	
	8/3/2007	495.86	-0.85	1,433.06	-2.69	-1.2399	0.3864	4.2764	
	8/6/2007	491.97	-0.79	1,467.67	2.39	1.0298	-1.8174	2.4589	
	8/7/2007	495.38	0.69	1,476.71	0.61	0.2381	0.4526	2.9115	
	8/8/2007	503.35	1.60	1,497.49	1.40	0.5880	1.0080	3.9196	
	8/9/2007	490.10	-2.67	1,453.09	-3.01	-1.3807	-1.2870	2.6326	
	8/10/2007	478.50	-2.40	1,453.64	0.04	-0.0193	-2.3761	0.2565	
	8/13/2007	485.21	1.39	1,452.92	-0.05	-0.0583	1.4509	1.7074	
	8/14/2007	484.16	-0.22	1,426.54	-1.83	-0.8547	0.6380	2.3454	
] (Event Window T ₀	T ₁	8/15/2007	473.12	-2.31	1,406.70	-1.40	-0.6618	-1.6448	0.7006
		8/16/2007	452.79	-4.39	1,411.27	0.32	0.1087	-4.5008	-3.8002
	T ₂	8/17/2007	461.70	1.95	1,445.94	2.43	1.0480	0.9007	-2.8994
		8/20/2007	475.49	2.94	1,445.55	-0.03	-0.0482	2.9913	0.0918
		8/21/2007	472.46	-0.64	1,447.12	0.11	0.0123	-0.6516	-0.5598
		8/22/2007	490.49	3.75	1,464.07	1.16	0.4840	3.2612	2.7014
		8/23/2007	491.07	0.12	1,462.50	-0.11	-0.0841	0.2023	2.9037
		8/24/2007	491.30	0.05	1,479.37	1.15	0.4762	-0.4293	2.4744
		8/27/2007	496.72	1.10	1,466.79	-0.85	-0.4177	1.5148	3.9892
		8/28/2007	484.48	-2.50	1,432.36	-2.38	-1.0972	-1.3978	2.5914
		8/29/2007	485.84	0.28	1,463.76	2.17	0.9325	-0.6522	1.9392
		8/30/2007	489.72	0.80	1,457.64	-0.42	-0.2233	1.0188	2.9580
		8/31/2007	496.30	1.33	1,473.99	1.12	0.4621	0.8726	3.8306
		9/3/2007	498.01	0.34		1.04	0.4290	-0.0851	3.7455
		9/4/2007	501.21	0.64	1,489.42	1.04	0.4290	0.2115	3.9570
		9/5/2007	494.93	-1.26	1,472.29	-1.16	-0.5529	-0.7080	3.2490
		9/6/2007	494.47	-0.09	1,478.55	0.42	0.1534	-0.2463	3.0027
	9/7/2007	483.13	-2.32	1,453.55	-1.71	-0.7979	-1.5221	1.4805	
	9/10/2007	474.58	-1.79	1,451.70	-0.13	-0.0931	-1.6925	-0.2120	
	9/11/2007	486.70	2.52	1,471.49	1.35	0.5687	1.9531	1.7411	
	9/12/2007	486.20	-0.10	1,471.56	0.00	-0.0340	-0.0687	1.6724	
	9/13/2007	488.54	0.48	1,483.95	0.84	0.3384	0.1418	1.8142	
	9/14/2007	487.08	-0.30	1,484.25	0.02	-0.0271	-0.2722	1.5420	
	9/17/2007	479.25	-1.62	1,476.65	-0.51	-0.2655	-1.3551	0.1869	
	9/18/2007	483.84	0.95	1,519.78	2.88	1.2499	-0.2967	-0.1098	
	9/19/2007	494.68	2.22	1,529.03	0.61	0.2349	1.9808	1.8710	
	9/20/2007	491.44	-0.66	1,518.75	-0.67	-0.3375	-0.3196	1.5514	
	9/21/2007	491.35	-0.02	1,525.75	0.46	0.1692	-0.1876	1.3639	
	9/24/2007	492.94	0.32	1,517.73	-0.53	-0.2716	0.5947	1.9585	
	9/25/2007	490.96	-0.40	1,517.21	-0.03	-0.0515	-0.3510	1.6075	
	9/26/2007	498.02	1.43	1,525.42	0.54	0.2049	1.2229	2.8304	
	9/27/2007	502.00	0.80	1,531.38	0.39	0.1380	0.6580	3.4884	
	T ₃	9/28/2007	499.93	-0.41	1,526.75	-0.30	-0.1714	-0.2418	3.2466

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- Event Study on Morocco and Denmark -*

Appendix B – Event I – Moroccan Stock Index

		Moroccan Market							
	Date	MADEX	R _{im}	S&P 500	R _{mm}	E[R _{im}]	? _{im}	CAR	
[Estimation Window]	T ₀	7/4/2007	9,346.18	-0.28		0.03	0.2828	-0.5611	-0.5611
		7/5/2007	9,346.81	0.01	1,525.40	0.03	0.2828	-0.2760	-0.8371
		7/6/2007	9,431.06	0.90	1,530.44	0.33	0.2580	0.6393	-0.1978
		7/9/2007	9,402.39	-0.30	1,531.85	0.09	0.2780	-0.5824	-0.7802
		7/10/2007	9,339.67	-0.67	1,510.12	-1.43	0.4056	-1.0749	-1.8551
		7/11/2007	9,327.88	-0.13	1,518.76	0.57	0.2378	-0.3641	-2.2193
		7/12/2007	9,227.42	-1.08	1,547.70	1.89	0.1273	-1.2101	-3.4293
		7/13/2007	9,256.11	0.31	1,552.50	0.31	0.2597	0.0507	-3.3786
		7/16/2007	9,332.43	0.82	1,549.52	-0.19	0.3018	0.5193	-2.8593
		7/17/2007	9,334.87	0.03	1,549.37	-0.01	0.2865	-0.2604	-3.1196
		7/18/2007	9,327.21	-0.08	1,546.17	-0.21	0.3030	-0.3851	-3.5048
		7/19/2007	9,277.42	-0.54	1,553.08	0.45	0.2483	-0.7835	-4.2883
		7/20/2007	9,255.12	-0.24	1,534.10	-1.23	0.3889	-0.6296	-4.9178
		7/23/2007	9,283.76	0.31	1,541.57	0.49	0.2449	0.0641	-4.8538
		7/24/2007	9,288.84	0.05	1,511.04	-2.00	0.4536	-0.3989	-5.2527
		7/25/2007	9,272.86	-0.17	1,518.09	0.47	0.2466	-0.4188	-5.6715
		7/26/2007	9,342.19	0.74	1,482.66	-2.36	0.4839	0.2610	-5.4105
		7/27/2007	9,401.82	0.64	1,458.95	-1.61	0.4210	0.2153	-5.1953
		7/30/2007		1.91	1,473.91	1.02	0.2001	1.7064	-3.4889
		7/31/2007	9,522.00	1.91	1,455.27	-1.27	0.3925	1.5139	-1.9750
	8/1/2007	9,557.03	0.37	1,465.81	0.72	0.2251	0.1421	-1.8329	
	8/2/2007	9,780.46	2.31	1,472.20	0.43	0.2492	2.0618	0.2289	
	8/3/2007	9,862.76	0.84	1,433.06	-2.69	0.5119	0.3261	0.5550	
	8/6/2007	9,859.40	-0.03	1,467.67	2.39	0.0854	-0.1195	0.4355	
	8/7/2007	9,889.48	0.30	1,476.71	0.61	0.2341	0.0705	0.5060	
	8/8/2007	9,886.12	-0.03	1,497.49	1.40	0.1684	-0.2024	0.3036	
	8/9/2007	9,972.70	0.87	1,453.09	-3.01	0.5383	0.3336	0.6372	
	8/10/2007	10,033.33	0.61	1,453.64	0.04	0.2825	0.3236	0.9608	
	8/13/2007	10,051.46	0.18	1,452.92	-0.05	0.2899	-0.1093	0.8515	
	8/14/2007		-0.28	1,426.54	-1.83	0.4395	-0.7244	0.1271	
[Event Window]	T ₁	8/15/2007	10,022.86	-0.28	1,406.70	-1.40	0.4032	-0.6882	-0.5611
	0	8/16/2007	9,929.52	-0.94	1,411.27	0.32	0.2585	-1.1941	-1.7552
	T ₂	8/17/2007	9,978.97	0.50	1,445.94	2.43	0.0820	0.4148	-1.3404
		8/20/2007		0.01	1,445.55	-0.03	0.2880	-0.2797	-1.6202
		8/21/2007		0.01	1,447.12	0.11	0.2766	-0.2684	-1.8885
		8/22/2007	9,979.79	0.01	1,464.07	1.16	0.1879	-0.1797	-2.0683
		8/23/2007	10,026.56	0.47	1,462.50	-0.11	0.2947	0.1729	-1.8954
		8/24/2007	10,133.46	1.06	1,479.37	1.15	0.1894	0.8711	-1.0243
		8/27/2007	10,207.00	0.72	1,466.79	-0.85	0.3574	0.3657	-0.6586
		8/28/2007	10,298.84	0.90	1,432.36	-2.38	0.4851	0.4107	-0.2479
		8/29/2007	10,360.64	0.60	1,463.76	2.17	0.1037	0.4946	0.2467
		8/30/2007	10,387.06	0.25	1,457.64	-0.42	0.3209	-0.0662	0.1805
		8/31/2007	10,388.00	0.01	1,473.99	1.12	0.1921	-0.1830	-0.0025
		9/3/2007	10,565.98	1.70		1.04	0.1983	1.5005	1.4980
[Post-Event Window]		9/4/2007	10,795.43	2.15	1,489.42	1.04	0.1983	1.9501	3.4481
		9/5/2007	11,154.65	3.27	1,472.29	-1.16	0.3828	2.8906	6.3387
		9/6/2007	10,798.08	-3.25	1,478.55	0.42	0.2501	-3.4989	2.8398
		9/7/2007	10,770.27	-0.26	1,453.55	-1.71	0.4288	-0.6867	2.1531
		9/10/2007	10,876.23	0.98	1,451.70	-0.13	0.2964	0.6826	2.8357
		9/11/2007	10,659.11	-2.02	1,471.49	1.35	0.1720	-2.1885	0.6472
		9/12/2007	10,545.02	-1.08	1,471.56	0.00	0.2853	-1.3614	-0.7142
		9/13/2007	10,542.21	-0.03	1,483.95	0.84	0.2153	-0.2420	-0.9562
		9/14/2007	10,658.76	1.10	1,484.25	0.02	0.2840	0.8155	-0.1407
		9/17/2007	10,647.11	-0.11	1,476.65	-0.51	0.3288	-0.4381	-0.5788
		9/18/2007	10,608.87	-0.36	1,519.78	2.88	0.0440	-0.4038	-0.9827
		9/19/2007	10,523.10	-0.81	1,529.03	0.61	0.2348	-1.0465	-2.0292
		9/20/2007	10,601.58	0.74	1,518.75	-0.67	0.3423	0.4007	-1.6285
		9/21/2007	10,537.70	-0.60	1,525.75	0.46	0.2471	-0.8515	-2.4800
		9/24/2007	10,501.73	-0.34	1,517.73	-0.53	0.3299	-0.6719	-3.1518
		9/25/2007	10,489.59	-0.12	1,517.21	-0.03	0.2886	-0.4042	-3.5561
	9/26/2007	10,441.41	-0.46	1,525.42	0.54	0.2404	-0.7008	-4.2568	
	9/27/2007	10,521.48	0.76	1,531.38	0.39	0.2530	0.5110	-3.7459	
	T ₃	9/28/2007	10,565.84	0.42	1,526.75	-0.30	0.3111	0.1096	-3.6362

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Appendix C – Event II – Danish Stock Index

		Danish Market							
	Date	OMXC20	R _{ic}	S&P 500	R _{mc}	E[R _{ic}]	? _{ic}	CAR	
[Estimation Window]	T ₀	1/30/2008	412.42	0.84	1,355.81	-0.48	-0.0938	0.9388	0.9388
		1/31/2008	407.83	-1.12	1,378.55	1.66	0.6703	-1.7895	-0.8507
		2/1/2008	416.83	2.18	1,395.42	1.22	0.5107	1.6721	0.8214
		2/4/2008	426.18	2.22	1,380.82	-1.05	-0.2988	2.5171	3.3385
		2/5/2008	415.36	-2.57	1,336.64	-3.25	-1.0840	-1.4876	1.8509
		2/6/2008	414.38	-0.24	1,326.45	-0.77	-0.1965	-0.0397	1.8112
		2/7/2008	409.53	-1.18	1,336.91	0.79	0.3570	-1.5343	0.2769
		2/8/2008	407.92	-0.39	1,331.29	-0.42	-0.0737	-0.3202	-0.0432
		2/11/2008	410.31	0.58	1,339.13	0.59	0.2862	0.2980	0.2548
		2/12/2008	427.02	3.99	1,348.86	0.72	0.3350	3.6568	3.9115
		2/13/2008	429.37	0.55	1,367.21	1.35	0.5589	-0.0101	3.9015
		2/14/2008	432.45	0.71	1,348.86	-1.35	-0.4057	1.1204	5.0219
		2/15/2008	423.97	-1.98	1,349.99	0.08	0.1065	-2.0869	2.9350
		2/18/2008	431.19	1.69		-0.09	0.0446	1.6440	4.5790
		2/19/2008	436.66	1.26	1,348.78	-0.09	0.0446	1.2160	5.7950
		2/20/2008	428.84	-1.81	1,360.03	0.83	0.3731	-2.1802	3.6148
		2/21/2008	433.49	1.08	1,342.53	-1.30	-0.3856	1.4641	5.0789
		2/22/2008	431.82	-0.39	1,353.11	0.78	0.3568	-0.7428	4.3362
		2/25/2008	440.45	1.98	1,371.80	1.37	0.5662	1.4126	5.7488
		2/26/2008	441.27	0.19	1,381.29	0.69	0.3227	-0.1367	5.6121
		2/27/2008	440.56	-0.16	1,380.02	-0.09	0.0438	-0.2048	5.4073
		2/28/2008	437.61	-0.67	1,367.68	-0.90	-0.2440	-0.4279	4.9794
		2/29/2008	431.24	-1.47	1,330.63	-2.75	-0.9036	-0.5627	4.4167
		3/3/2008	427.43	-0.89	1,331.34	0.05	0.0957	-0.9831	3.4336
		3/4/2008	424.49	-0.69	1,326.75	-0.35	-0.0467	-0.6436	2.7900
		3/5/2008	430.11	1.32	1,333.70	0.52	0.2631	1.0522	3.8422
		3/6/2008	427.79	-0.54	1,304.34	-2.23	-0.7179	0.1770	4.0192
		3/7/2008	421.58	-1.46	1,293.37	-0.84	-0.2248	-1.2374	2.7818
		3/10/2008	411.65	-2.38	1,273.37	-1.56	-0.4796	-1.9040	0.8778
		3/11/2008	412.93	0.31	1,320.65	3.65	1.3778	-1.0674	-0.1896
[Event Window]	T ₁	3/12/2008	416.59	0.88	1,308.77	-0.90	-0.2459	1.1284	0.9388
	0	3/13/2008	413.62	-0.72	1,315.48	0.51	0.2591	-0.9746	-0.0359
	T ₂	3/14/2008	411.78	-0.45	1,288.14	-2.10	-0.6730	0.2271	0.1913
		3/17/2008		0.08	1,276.60	-0.90	-0.2446	0.3247	0.5160
		3/18/2008	412.11	0.08	1,330.74	4.15	1.5591	-1.4789	-0.9630
		3/19/2008	405.02	-1.74	1,298.42	-2.46	-0.8009	-0.9344	-1.8974
		3/20/2008		1.24	1,329.51	2.37	0.9212	0.3208	-1.5766
		3/24/2008		1.24	1,349.88	1.52	0.6193	0.6226	-0.9540
		3/25/2008	417.26	2.98	1,352.99	0.23	0.1587	2.8186	1.8645
		3/26/2008	418.96	0.41	1,341.13	-0.88	-0.2376	0.6442	2.5087
		3/27/2008	424.68	1.36	1,325.76	-1.15	-0.3348	1.6908	4.1996
		3/28/2008	427.34	0.62	1,315.22	-0.80	-0.2083	0.8327	5.0323
		3/31/2008	428.10	0.18	1,322.70	0.57	0.2790	-0.1013	4.9309
		4/1/2008	435.01	1.60	1,370.18	3.53	1.3353	0.2659	5.1968
		4/2/2008	435.72	0.16	1,367.53	-0.19	0.0075	0.1556	5.3524
		4/3/2008	429.00	-1.55	1,369.31	0.13	0.1230	-1.6773	3.6750
		4/4/2008	430.66	0.39	1,370.40	0.08	0.1050	0.2812	3.9562
		4/7/2008	438.43	1.79	1,372.54	0.16	0.1323	1.6558	5.6120
		4/8/2008	436.86	-0.36	1,365.54	-0.51	-0.1059	-0.2529	5.3592
		4/9/2008	431.27	-1.29	1,354.49	-0.81	-0.2134	-1.0745	4.2847
[Post-Event Window]		4/10/2008	429.24	-0.47	1,360.55	0.45	0.2359	-0.7078	3.5770
		4/11/2008	421.43	-1.84	1,332.83	-2.06	-0.6581	-1.1782	2.3988
		4/14/2008	418.11	-0.79	1,328.32	-0.34	-0.0444	-0.7465	1.6523
		4/15/2008	422.18	0.97	1,334.43	0.46	0.2404	0.7283	2.3806
		4/16/2008	428.58	1.50	1,364.71	2.24	0.8774	0.6271	3.0077
		4/17/2008	425.62	-0.69	1,365.56	0.06	0.0988	-0.7919	2.2158
		4/18/2008		-1.30	1,390.33	1.80	0.7182	-2.0141	0.2017
		4/21/2008	420.14	-1.30	1,388.17	-0.16	0.0211	-1.3170	-1.1153
		4/22/2008	418.00	-0.51066	1,375.94	-0.88	-0.2392	-0.2714	-1.3867
		4/23/2008	420.30	0.54873	1,379.93	0.29	0.1800	0.3688	-1.0180
	4/24/2008	422.62	0.55047	1,388.82	0.64	0.3058	0.2447	-0.7733	
	4/25/2008	429.84	1.69396	1,397.84	0.65	0.3077	1.3863	0.6130	
T ₃	4/28/2008	425.65	-0.97956	1,396.37	-0.11	0.0391	-1.0186	-0.4057	

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Appendix D – Event II – Moroccan Stock Index

		Moroccan Market							
	Date	MADEX	R _{im}	S&P 500	R _{imm}	E[R _{im}]	? _{ic}	CAR	
[Estimation Window]	T ₀	1/30/2008	11,377.21	0.41	1,355.81	-0.48	0.2595	0.1503	0.1503
		1/31/2008	11,423.82	0.41	1,378.55	1.66	0.3279	0.0810	0.2313
		2/1/2008	11,459.83	0.31	1,395.42	1.22	0.3136	0.0011	0.2325
		2/4/2008	11,534.01	0.65	1,380.82	-1.05	0.2411	0.4041	0.6366
		2/5/2008	11,484.89	-0.43	1,336.64	-3.25	0.1708	-0.5976	0.0389
		2/6/2008	11,524.96	0.35	1,326.45	-0.77	0.2503	0.0980	0.1370
		2/7/2008	11,566.98	0.36	1,336.91	0.79	0.2998	0.0641	0.2011
		2/8/2008	11,564.84	-0.02	1,331.29	-0.42	0.2613	-0.2798	-0.0787
		2/11/2008	11,555.04	-0.08	1,339.13	0.59	0.2935	-0.3783	-0.4570
		2/12/2008	11,615.27	0.52	1,348.86	0.72	0.2979	0.2220	-0.2349
		2/13/2008	11,633.92	0.16	1,367.21	1.35	0.3179	-0.1575	-0.3924
		2/14/2008	11,674.77	0.35	1,348.86	-1.35	0.2316	0.1190	-0.2734
		2/15/2008	11,810.41	1.16	1,349.99	0.08	0.2774	0.8777	0.6043
		2/18/2008	11,991.23	1.52		-0.09	0.2719	1.2476	1.8519
		2/19/2008	11,866.82	-1.04	1,348.78	-0.09	0.2719	-1.3148	0.5371
		2/20/2008	11,900.26	0.28	1,360.03	0.83	0.3013	-0.0199	0.5172
		2/21/2008	12,098.69	1.65	1,342.53	-1.30	0.2334	1.4203	1.9376
		2/22/2008	12,103.56	0.04	1,353.11	0.78	0.2998	-0.2596	1.6780
		2/25/2008	11,999.76	-0.86	1,371.80	1.37	0.3185	-1.1798	0.4982
		2/26/2008	12,051.92	0.43	1,381.29	0.69	0.2967	0.1370	0.6351
		2/27/2008	12,058.16	0.05	1,380.02	-0.09	0.2718	-0.2200	0.4151
		2/28/2008	12,077.68	0.16	1,367.68	-0.90	0.2460	-0.0843	0.3308
		2/29/2008	11,995.56	-0.68	1,330.63	-2.75	0.1870	-0.8692	-0.5384
		3/3/2008	11,930.04	-0.55	1,331.34	0.05	0.2764	-0.8241	-1.3625
		3/4/2008	11,802.18	-1.08	1,326.75	-0.35	0.2637	-1.3412	-2.7037
		3/5/2008	11,885.12	0.70	1,333.70	0.52	0.2914	0.4089	-2.2949
		3/6/2008	11,951.71	0.56	1,304.34	-2.23	0.2036	0.3551	-1.9398
		3/7/2008	11,999.14	0.40	1,293.37	-0.84	0.2477	0.1483	-1.7914
	3/10/2008	12,029.45	0.25	1,273.37	-1.56	0.2249	0.0273	-1.7641	
	3/11/2008	12,123.51	0.78	1,320.65	3.65	0.3912	0.3877	-1.3764	
[Event Window]	T ₁	3/12/2008	12,340.33	1.77	1,308.77	-0.90	0.2459	1.5268	0.1503
	0	3/13/2008	12,374.43	0.28	1,315.48	0.51	0.2911	-0.0151	0.1352
	T ₂	3/14/2008	12,283.70	-0.74	1,288.14	-2.10	0.2076	-0.9435	-0.8083
		3/17/2008	12,253.30	-0.25	1,276.60	-0.90	0.2460	-0.4938	-1.3021
		3/18/2008	12,171.62	-0.67	1,330.74	4.15	0.4074	-1.0762	-2.3783
		3/19/2008	12,165.56	-0.05	1,298.42	-2.46	0.1962	-0.2460	-2.6243
		3/20/2008		-0.50	1,329.51	2.37	0.3503	-0.8515	-3.4758
		3/24/2008	12,104.74	-0.50	1,349.88	1.52	0.3233	-0.8245	-4.3003
		3/25/2008	12,140.89	0.30	1,352.99	0.23	0.2821	0.0161	-4.2842
		3/26/2008	12,088.09	-0.44	1,341.13	-0.88	0.2466	-0.6824	-4.9666
		3/27/2008	12,118.72	0.25	1,325.76	-1.15	0.2379	0.0152	-4.9514
		3/28/2008	12,098.46	-0.17	1,315.22	-0.80	0.2492	-0.4165	-5.3680
		3/31/2008	12,138.11	0.33	1,322.70	0.57	0.2928	0.0344	-5.3336
		4/1/2008	12,047.65	-0.75	1,370.18	3.53	0.3874	-1.1354	-6.4691
		4/2/2008	11,856.66	-1.60	1,367.53	-0.19	0.2685	-1.8665	-8.3356
		4/3/2008	12,050.86	1.62	1,369.31	0.13	0.2789	1.3457	-6.9898
	[Post-Event Window]		4/4/2008	12,158.52	0.89	1,370.40	0.08	0.2773	0.6121
		4/7/2008	12,289.82	1.07	1,372.54	0.16	0.2797	0.7944	-5.5833
		4/8/2008	12,302.63	0.10	1,365.54	-0.51	0.2584	-0.1542	-5.7375
		4/9/2008	12,272.14	-0.25	1,354.49	-0.81	0.2488	-0.4969	-6.2344
		4/10/2008	12,233.12	-0.32	1,360.55	0.45	0.2890	-0.6074	-6.8419
		4/11/2008	12,223.57	-0.08	1,332.83	-2.06	0.2090	-0.2871	-7.1289
		4/14/2008	12,005.96	-1.80	1,328.32	-0.34	0.2639	-2.0602	-9.1891
		4/15/2008	12,013.96	0.07	1,334.43	0.46	0.2894	-0.2228	-9.4119
		4/16/2008	12,075.51	0.51	1,364.71	2.24	0.3464	0.1646	-9.2473
		4/17/2008	12,047.64	-0.23	1,365.56	0.06	0.2767	-0.5078	-9.7550
		4/18/2008	12,030.74	-0.14	1,390.33	1.80	0.3322	-0.4725	-10.2276
		4/21/2008	12,089.88	0.49	1,388.17	-0.16	0.2698	0.2206	-10.0070
		4/22/2008	12,029.47	-0.50	1,375.94	-0.88	0.2465	-0.7474	-10.7543
		4/23/2008	11,954.97	-0.62	1,379.93	0.29	0.2840	-0.9052	-11.6595
		4/24/2008	11,882.86	-0.61	1,388.82	0.64	0.2952	-0.9002	-12.5598
		4/25/2008	11,834.55	-0.41	1,397.84	0.65	0.2954	-0.7028	-13.2626
		T ₃	4/28/2008	11,885.51	0.43	1,396.37	-0.11	0.2714	0.1583