TO MY FAMILY

THREE ESSAYS ON THE BEHAVIOR OF FRENCH STOCKS CROSS-LISTED ON THE GERMAN STOCK MARKETS

By

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A THESIS
SUBMITTED TO THE INSTITUTE OF ECONOMICS AND SOCIAL SCIENCES OF
BILKENT UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN BUSINESS ADMINISTRATION (FINANCE)
IN THE DEPARTMENT OF BUSINESS ADMINISTRATION
BILKENT UNIVERSITY
ANKARA

1 February 2002

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Business Administration (Finance).

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ABSTRACT

THREE ESSAYS ON THE BEHAVIOR OF FRENCH STOCKS CROSS-LISTED ON THE GERMAN STOCK MARKETS

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Ph. D. in Business Administration (Finance)

Supervisor: Assis. Prof. Dr. Zeynep Önder

1 February 2002

The behavior of French stocks that are cross-listed on the German stock markets is analyzed in this study. Using a sample of stocks that are listed both on the Paris Bourse and the Xetra, it is found that there is no change in the systematic risk for the domestic market (the Paris Bourse) and the foreign market (the Xetra) suggesting the integration of these markets for the overall sample. However, the findings with respect to the world market make the integration of the French stock markets with the world market questionable. Furthermore, the analysis of abnormal returns suggests that for some portfolios, such as the small- and medium-sized portfolios, the high book-to-market value ratio portfolio and the manufacturing, retailing and finance sectors, the markets may not be integrated.

The second chapter analyzes the changes in the liquidity and price volatility of the French stocks that are cross-listed on the Xetra. It is found that liquidity declines and the volatility of the stock prices increases after cross-listing for many stocks in the sample. These findings are against the expectations, since an increase in liquidity and a decline in volatility are expected, if the markets are integrated.

Finally, in the third chapter, price adjustment process between the two stock markets is examined by cointegration analysis. It is observed that between the French and the German stock markets there is a relationship and most of the time the stock prices on the German stock markets follow the stock prices on the French stock markets.

Key Words: Cross-listing, integration, cointegration, French and German stock markets

ÖZET

ALMAN HİSSE SENEDİ PİYASALARINDA İŞLEM GÖREN FRANSIZ HİSSE SENETLERİNİN DAVRANIŞLARI ÜZERİNE ÜÇ MAKALE

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1 Şubat 2002

Bu çalışmada Alman hisse senedi piyasalarında eş zamanlı olarak işlem gören Fransız hisse senetlerinin davranışları incelenmektedir. Hem Paris Borsasında hem de Xetra da listelenen Fransız hisse senetleri kullanılarak piyasalar arasında entegrasyonu öngörecek şekilde yerli ve yabancı piyasa sistematik risklerinde bir değişiklik olmadığı bulunmuştur. Fakat, dünya piyasası ile ilgili bulgular Fransız hisse senedi piyasasının dünya hisse senedi piyasasıyla entegrasyonunu sorgulanabilir kılmaktadır. Bunların ötesinde, anormal getirilerin analizi küçük ve orta piyasa değerine sahip portföyler, büyük piyasa-defter oranına sahip portföyler ve üretim, perakende alım-satım ve finans sektörleri gibi bazı portföyler için segmentasyonun olabileceğini öngörmektedir.

İkinci bölüm Xetra da listelenen Fransız hisse senetlerinin likiditesinde ve fiyat oynaklığındaki değişimler incelenmektedir. Örnekteki bir çok hisse senedi için eş zamanlı kotasyondan sonra likidite düşmüş ve oynaklık artmıştır. Bu bulgular beklentilere ters düşmektedir, çünkü eğer piyasalar entegre ise eş zamanlı kotasyondan sonra likidite artar ve oynaklık azalır.

Son olarak, coentegrasyon analizi yöntemiyle Alman ve Fransız hisse senedi piyasalarındaki fiyat ayarlama süreci incelenmektedir. Alman ve Fransız hisse senedi piyasaları arasında bir ilişki olduğu ve çoğu zaman Alman hisse senedi piyasalarındaki fiyatların Fransız hisse senedi piyasasındaki fiyatları takip ettiği gözlemlenmiştir.

Anahtar Kelimeler: Eş zamanlı kotasyon, entegrasyon, coentegrasyon, Avrupa hisse senedi piyasaları

ACKNOWLEDGEMENTS

I want to thank my family, for their continuous and enormous support they made available during the preperation of this thesis. I am extremely grateful to them for being always near me whenever I needed. In my success their contribution cannot be ignored.

Special thanks are due to the supervisor of my thesis, Assis. Prof. Dr. Zeynep Önder, for her guidance throughout this study. I have benefited immensely from her advices.

I would like to thank the committee members, Prof. Dr. Kürşat Aydoğan, Assis. Prof. Dr. Erdem Başçı, Assis. Prof. Dr. Aslıhan Salih and Assis. Prof. Dr. Nuray Güner for their helpful comments.

I thank my sister, Güzin Bayar, also, for sharing her knowledge in econometrics with me in our valuable discussions.

I am greatful to Prof. Dr. Edwin Elton, Prof. Dr. Marco Pagano, Prof. Dr. Charles Corrado, Prof. Dr. Henri Servaes, Prof. Dr. Joel Horowitz, Assis. Prof. Dr. Aydın Yüksel, and Assis. Prof. Dr. Mehmet Caner who spared their valuable time in answering my questions during the preparation of this thesis.

I want to send my special thanks to Dr. Güner Gürsoy for his very important hints and suggestions.

I appreciate the co-author of my first articles, Ercan Balaban, for his contributions in fulfillment of the publication requirement for the Ph.D. programme .

I want to send my thanks to my colleague Özgür Toy and Elif Dayar.

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CHAPTER I

INTEGRATION OF THE FRENCH AND THE GERMAN STOCK MARKETS: EVIDENCE FROM CROSS-LISTED FRENCH STOCKS

1.1 INTRODUCTION

The European Union is one of the major organisations in the world attempting the economic, financial, and political integration of its member countries. Since its foundation with the 1957 Roma Act, the European Union (EU) has made major progresses towards the financial integration of member countries, which include Germany, France, Belgium, the Netherlands, Luxembourg, Italy, Greece, Finland, the UK, Ireland, Denmark, Portugal, Spain, Sweden, Austria and Norway.

One of the changes in the integration of the European financial markets is the Investment Service Directive enacted in January 1996. It authorizes a European intermediary to operate in financial markets not only in the domestic country, but also in other EU countries as well. This development is important for the free flow of capital between EU countries.

Moreover, some changes in the trading mechanisms and regulations of the European stock exchanges have been made to bring domestic regulations into a line with those applying to the European single capital market (Pagano and Roell (1990)).

For example, in France, the Modernisation of Financial Activities Act enacted on July 2, 1998, requires that the organizational structure of the French capital markets is in to the line with that of the other EU capital markets.

Finally, in January 1999, the single currency, the Euro, was adopted in the capital market transactions of the member states selected by the European Council. The single currency has made foreign investments easier among the countries that participated in European Monetary Union. The European Monetary Union includes Germany, France, the Netherlands, Belgium, Luxembourg, Spain, Portugal, Italy, Ireland, Austria, and Finland. Because the policies applied by the European Monetary Union have kept the fluctuations in the foreign exchange rates at a minimum level, the adaptation of the Euro has totally eliminated the effects of foreign exchange fluctuations on investments.

Considering all of the progress made to now for the integration of capital markets in Europe, it is interesting to examine whether capital markets in the European Union have been actually integrated. This article examines the systematic risk and abnormal returns of the cross-listed French stocks to investigate the integration of the French and German stock markets for the time period between 1998 and 2000. In the analysis, French stocks that are cross-listed on the Xetra, the new electronic exchange in Germany, are used, and their behavior before and after cross-listing are examined. The time period covered in the article is important to observe the effects of the two recent and important developments for the integration of the countries, the Investment Service Directive on January 1, 1996 and adaptation of the single currency, the Euro, on January 1, 1999.

There are several reasons for the selection of these two exchanges. First, as can be observed on Table1.1(a)[1], the Paris Bourse and the Xetra are among the most important stock markets in Europe in terms of the number of domestic and foreign stocks listed on the exchange. In addition to the number of stocks listed, according to Table 1.1(b), market capitalization of the French and German stock markets are high and increasing over time between 1997 and 2000. In 1999, the market capitalization of the Paris Bourse reached 1,500 billion Euro.[2] On the other hand, the Xetra is a new electronic trading stock market in Germany. Even though the Xetra has a very short history, there are 2,366 foreign stocks and in total 4,220 stocks listed on the Xetra. Furthermore, the Xetra, as an electronic trading system has a very important role in keeping and improving competitive position of the German stock markets with respect to other European stock exchanges as identified in Srinivasan (1999). The significant increase in the competition observed in the business of the exchange of financial securities has required recent innovations in trading technologies and the use of electronic trading systems to attract order flows away from existing trading institutions.

Second, France and Germany are geographically close countries, and they are also two member countries of the European Monetary Union. After January 1 1999, both countries started to trade their stocks in the same currency, the Euro. This eliminates the exchange rate risk faced by the international or domestic investors when they trade foreign stocks. Moreover, the number of French stocks listed on the German stock markets is greater than the number of French stocks listed on the London Stock Exchange which is one of the greatest stock markets in Europe. As of February 2000, there are 18 French stocks traded on the London Stock Exchange and 94 French stocks traded on the Xetra.

Finally, for many firms disclosure level is an important factor in making cross-listing decisions. Disclosure requirements on the French and German capital markets are similar. According to Saudagaran and Biddle (1995), the United States has the highest disclosure requirements in the world. The second is Canada and the third is the United Kingdom. They show that the French and German stock markets rank fifth and seventh respectively. Hence these markets are very close to each other in terms of their disclosure requirements. Cheung and Lee (1995) state that for signalling purpose, only very powerful firms prefer listing on the foreign markets with higher disclosure levels, however for firms to list on a market with less disclosure requirements reduces their cost. Since German stock market does not have very a different position with respect to French stock market, the disclosure level in Germany would not be a factor for the cross-listing decision of French firms.

In the finance literature, the cross-listed stocks are used to test the integration of the capital markets. Their empirical test depends on the theoretical model of Alexander, Eun, and Jankiramanan (1987). Their model shows that if stock markets are segmented, given that covariance of the stock with the domestic market index is greater than its covariance with the foreign market index, after cross-listing the expected return declines. For example, several researchers including Jorion and Schwarts (1986), Foerster and Karolyi (1999), Serra (1999) and Miller (1999) draw important implications about stock market integration and segmentation from the reaction of some stock prices to international cross-listing.

In recent years, an increase in the cross-listing of the stocks has been observed. For example, 383, 730 and 930 foreign stocks were being traded on the German stock markets in 1996, 1997 and 1998, respectively[3]. This rise in the number of cross-listed stocks has increased the use of the cross-listing of stocks in the test of the integration of the capital markets. However, most of the previous studies examine the integration of the US capital markets with the stock markets in other countries.

Unlike previous studies that examine the cross-listing in the US markets, the aim of this study is to examine the stock price performance and the changes in systematic risk of the cross-listed French stocks in the German market. The results of this study provide implications about the integration of two European stock markets, German and French. Furthermore, when all of the efforts up to now in the European Monetary Union (EMU) and the European Union (EU) towards the integration of the member countries are considered, finding an answer in this article to the research question, "Does the evidence on the change of the behavior of French stocks cross-listed on a German market imply the integration of these two capital markets?", will be very interesting in terms of assessing the effects of the progresses taken in the EMU and the EU towards integration.

Other factors might affect the behavior of cross-listed stocks. Therefore, unlike most of the previous studies examining the integration of the markets using cross-listed stocks, the effects of some confounding events, such as cross-listing on another stock market, dividend payments, and earnings announcement that might affect the behavior of the cross-listed stocks are eliminated in this study. Hence, by eliminating the effects of these events, it is assumed that the cross-listing on the Xetra is the only event affecting the returns of cross-listed French stocks.

In the chapter, there are six sections. In section two, the literature about cross-listing of stocks is explained. In section three, information about the Paris Stock Exchange and the Xetra are provided. In section four, hypotheses and data are identified. In sections five and six, empirical method is explained and results are presented respectively. Finally, section seven concludes the chapter and states future researches.

1.2 LITERATURE REVIEW

In this section, theoretical and empirical papers examining the behavior of cross-listed stock prices are explained. The behavior of cross-listed stocks has attracted the attention of many researchers. Many studies have found that stock returns in domestic markets decline after stocks are cross-listed, and several hypotheses have been developed to explain this decline. The most frequently cited explanations for the behavior of stocks after their cross-listings are (1) the liquidity hypothesis (Amihud and Mendelson (1986)), (2) the investor recognition hypothesis (Merton (1987)), and (3) the markets segmentation hypothesis (Alexander, Eun, and Jankiramanan (1987)). These hypotheses have been tested empirically on several markets.

1.2.1. The Liquidity Hypothesis:

The liquidity hypothesis is offered by Amihud and Mendelson (1986). They theoretically explain the decline in rate of return after cross-listing with respect to the liquidity measured by the bid-ask spread. According to this hypothesis, if the stock is cross listed on a more liquid market than its domestic market, investors will require lower rate of return after cross-listing. Hence, the increase in the liquidity will result in a decline in rate of return.

Many researchers have empirically tested this hypothesis, such as Norohan, Sarin and Saudagaran (1996), and Van Ness, Van Ness and Pruitt (1999). Norohan, Sarin and Saudagaran (1996) investigate the effects of cross-listing on the spread and depth of the NYSE/AMEX stocks that are cross-listed on the London and Tokyo stock exchanges for the period between 1983 and 1989. They find some differences in the spread of stocks listed on these markets. For example, although there is no significant difference in the bid-ask spreads between the pre- and post-listing periods for the stocks listed on the Tokyo Stock Exchange, the bid-ask spread for the stocks cross-listed on the London Stock Exchange is found to be increased significantly. They explain this difference with trading volume in these markets. The thin trading of the stocks on the Tokyo Stock Exchange is considered as the reason for observing an insignificant change in the bid-ask spread after cross-listing. However, they explain the significant change in the spread for the London Stock Exchange with an increase in informed trading after cross-listings. Furthermore, they find an increase in the depth of quotes of the stocks on the US market after their cross-listings both on the London and Tokyo stock exchanges. Nevertheless, the increase in the depth disappears when they control the changes in return variance, volume, and price. These results conflict with Stoll (1978) and the liquidity hypothesis of Amihud and Mendelson (1986). Because, Stoll (1978) finds that the greater the competition between market makers, the lower the spread. Since cross-listing increases the competition, it is expected to observe a decline in the spread after cross-listing.

Norohan, Sarin and Saudagaran (1996) explain the increase in spread after cross-listing with the change in the level of informed trading. Using three different measures of the change in degree of asymmetric information after cross-listing using methodologies supported by Hasbrouck (1991), Madhavan and Smidt (1991) and George, Kaul and Nimalendran (1991), they find that informed trading increases after the stocks are cross listed on the London Stock Exchange. Hence, the results illustrate that since the informed trading increases, spreads do not decline. Although their results are inconsistent with the liquidity hypothesis, they support Freedman (1992) which shows that cross-listing increases informed trading, because with the cross-listing informed traders may hide transactions easier.

As another test of the liquidity hypothesis, Van Ness, Van Ness and Pruitt (1999) analyze the effects of the Nasdaq/Chicago Stock Exchange dual trading program on the behavior of 30 stocks from 1994 to 1996. They compare the pre- and post-listing spreads of the cross-listed stocks with respect to a control group which consists of stocks that have already been included in the dual trading program and are in the same industry. They show that the Chicago Stock Exchange specialists reduce absolute quoted spread levels after cross-listing both in the short (thirty days) and long (three years) terms.

In summary, even though there are conflicting results for the validity of the liquidity hypothesis of Amihud and Mendelson (1986), these conflicting empirical results suggest that there are other factors that might explain the decline in returns after cross-listing.

1.2.2 The Investor Recognition Hypothesis:

The second explanation offered for the decline in return after cross-listing is called Merton's (1987) investor recognition hypothesis. He claims that domestic market is not the only factor that determines the expected returns, but also the investor recognition factor affects returns. In informationally incomplete markets, investors invest only in those securities that they are aware of. Since they cannot attain complete diversification to totally eliminate non-systematic risk, they require high rates of return from their investments. Therefore, if a firm has a relatively small shareholder base, its recognition will be low, and firm-specific risk will be high. With the cross-listing, the number of investors that are aware of this stock increases reducing the required rate of return.

The test of this hypothesis requires a joint test with the liquidity hypothesis because of the negative relationship between the bid-ask spread and the number of shareholders (Demsetz (1968)). Kadlec and McConnel (1994) jointly test the investor recognition and the liquidity hypotheses using the US Over-the-Counter (OTC) stocks that are cross listed on the NYSE between 1980 and 1989. They observe both a decline in the bid-ask spread and an increase in the investors' base after cross-listing. Thus, their results support both hypotheses. Their results do not change, when they control the effects of some confounding events, such as earnings announcements, dividend changes, equity offerings, share repurchases, mergers and acquisitions, and stock split announcements between application and cross-listing weeks.

Like Kadlec and McConnel (1994), Foerster and Karolyi (1999) jointly test the investor recognition and the liquidity hypotheses for the non-US stocks that are cross listed on the US markets. Their data set covers the American Depository Receipts (ADRs)[4] of non-US firms from Canada, France, Italy, the Netherlands, Norway, Spain, the UK, Australia and Japan from 1976 to 1992. They observe only an increase in the investors' base after cross-listing, but the significance of this increase might be sensitive to the listing location in the US: the NYSE, the NASDAQ or the AMEX. They indirectly test the liquidity hypothesis assuming that the NYSE is more liquid market than the AMEX and the NASDAQ. However, they do not observe any positive effect of cross-listing on the NYSE when compared to cross-listings on the AMEX or the NASDAQ. So their results support only Merton's (1987) investor recognition hypothesis.

Like Foerster and Karolyi (1999), Miller (1999) using the data for ADRs (cross-listed either on the NYSE, NASDAQ, AMEX or OTC) from 35 developed and emerging countries between 1985 and 1995, jointly tests these hypotheses. He reports a decline in the spread and an increase in the investors' base after cross-listing, which is consistent with both of the hypotheses. The probable reason for the different results of Miller (1999) and Foerster and Korolyi (1999) may be the difference in the time periods or the difference between the countries covered in each study.

1.2.3 The Integration Hypotheses:

In the integrated capital markets, similar financial assets with similar risk characteristics provide the same expected returns, because investors in integrated capital markets can purchase different securities and diversify their portfolios completely. On the other hand, in the segmented capital markets because of some restrictions, investors cannot reach all of the financial securities. Since full diversification is not possible, the required rate of returns in segmented markets are higher than those in the integrated markets. However, the cross-listing of stocks makes investment in foreign securities possible. Investors can diversify their portfolios, and require lower expected returns after cross-listing. Therefore, if the markets are integrated before cross-listing, no change in the behavior of the stocks is expected to occur after cross-listing.

In the literature, there are basically two theoretical models examining the segmentation of markets using two types of segmentation, complete segmentation (Alexander, Eun, and Jankiramanan (1987)), and mild segmentation, (Errunza and Losq (1985)).

1.2.3.1 The Complete Segmentation Hypothesis:

Alexander, Eun, and Jankiramanan (1987) provide an explanation on the changes in the behavior of stock prices after cross-listing by examining an equilibrium asset pricing problem arising from the dual listing of stocks. They model the integration of the capital markets in which investors in the domestic market choose their portfolio weights, in order to maximize their expected utility with respect to their budget constraints. In the model, it is assumed that there are two completely segmented markets which are closed to foreign investors and only one security is cross-listed in another country. They show that the demand for the dually-listed security depends on the covariance of its return with the returns of all the pure foreign securities. The expected return on the dually-listed security depends on the covariance of its return with the returns on both the domestic and foreign market portfolios. They model that when capital markets are completely segmented before cross-listing, ceteris paribus, a decline in the required rate of return on the cross-listed stock is observed as long as the covariance of the returns on cross-listed security with the return on local market portfolio is larger than its covariance with the market portfolio of the stock exchange where it is cross-listed.

Following Alexander, Eun, and Jankiramanan (1987), several researchers such as Jorion and Schwarts (1986), Foerster and Karolyi (1993), Lau, Diltz, and Apilado (1994), Foerster and Karolyi (1999), Serra (1999), Oran (1999), Callagahn, Kleiman, and Sahu (1999), Miller (1999), Foerster and Karolyi (2000), and Errunza and Miller (2000), analyze the returns on cross-listed stocks to test the level of integration versus segmentation across capital markets. They compare the pre-listing return structure with the return structure of the post-listing period using event study methodology. They test the hypothesis that when markets are segmented, the expected rate of return of the stocks declines after cross-listing. For example, using return data for Canadian stocks cross-listed on the US markets, Jorion and Schwarts (1986), and Foerster and Karolyi (1993) examine integration versus segmentation of the Canadian stock market relative to the US stock markets between 1963 and 1982 and from 1981 to 1990 respectively. Jorion and Schwarts (1986) show that Canadian and the US stock markets are segmented. They suggest that legal barriers, such as restrictions on ownership of foreign securities, are the reasons for the segmentation. On the other hand, Foerster and Karolyi (1993) find that industry has a great effect on the behavior of cross-listed stocks; even though Canadian non-resource stocks are segmented from the US markets, resource stocks are not.

Lau, Diltz, and Apilado (1994), Foerster and Karolyi (1999), Serra (1999), Oran (1999), Callagahn, Kleiman, and Sahu (1999), Miller (1999), Foerster and Karolyi (2000), and Errunza and Miller (2000) are interested in the integration of the US capital markets with other markets in the world. In testing the integration of the markets, except for the study by Lau, Diltz, and Apilado (1994) all of these studies analyze the returns of ADRs. However Lau, Diltz, and Apilado (1994) investigate the behavior of the US stocks cross-listed on 10 foreign stock exchanges between 1962 and 1990. In this study, three critical dates related to cross-listing are considered: the date of application for cross-listing, the acceptance date by the foreign market, and the first trading date on the cross-listed market. No abnormal return is detected around the date of application. On the other hand, they find that abnormal returns are positive around the date of acceptance to the foreign exchange, and negative on the first trading date. However, negative abnormal returns in the post-listing period are observed only for the stocks listed on the Tokyo and Basel stock exchanges, but not on the Toronto, London, Geneva, Louisiana, Zurich, Paris, Frankfurt and Brussels stock exchanges.

Foerster and Karolyi (1999) explore the effects of cross-listing on the prices and risks of non-US stocks cross-listed on the US stock markets (the NYSE, the NASDAQ, and the AMEX) between 1976 and 1992. The analysis covers firms from Canada, Europe, and the Asia-Pacific Basin regions. They find that the average beta on the local market excess return is close to one. The average beta on the global market excess return is much smaller but still statistically different from zero in the pre-listing period. In the post-listing period, beta for the local market has a statistically significant decline. However, they do not observe any significant change in global market betas. In addition, they find abnormal returns even after adjusting for changes in risk. Therefore, the existence of abnormal returns around cross-listing cannot be explained by the changes in market risk. They find different results when they analyze countries separately. In Europe, there is a general increase in cumulative abnormal returns for the entire pre- and post- listing periods. In Asia, no significant change in abnormal return is observed. However, in Australia and

Canada, cumulative abnormal returns increase in the pre-listing period, but they decline after listing. The results for Canada are consistent with Jorion and Schwarts (1986), and Foerster and Karolyi (1993).

Another study investigating the integration of the US capital markets with the other markets is Serra (1999) which examines the effects of cross-listing on the NYSE, NASDAQ, and SEAQ-I for the stocks from 10 emerging markets between 1991 and 1995. She finds that adjusting for the changes in the risk structure, the abnormal returns are positive before cross-listing, but they decline after listing. This shows that the emerging stock markets are not integrated by the US stock markets.

However, unlike Serra (1999), Oran (1999) tests the integration of the US stock markets not only with emerging stock markets, but also developed stock markets. Oran (1999) measures the changes in risk and abnormal returns of the Canadian, European and Latin American stocks after the announcement of cross-listing on the NYSE between 1980 and 1996. He finds that when significant changes in the systematic risk occur; the beta coefficient on the domestic market index declines, and the beta coefficient of the world index increases after cross-listing. He observes that abnormal returns increase just before the announcement of cross-listing. He also tests whether the differences in accounting policies affect the abnormal returns after cross-listing, but no significant evidence supporting such a difference is found.

Different from many previous studies, Callagahn, Kleiman, and Sahu (1999) examine whether the listing location affects the performance of ADRs after cross-listing. They observe abnormal returns over the ten month-period after the listing on the NYSE, the NASDAQ or the AMEX between 1986 and 1993. However, the behavior of ADRs is sensitive to the listing location. For example, although stocks listed on the NYSE have positive abnormal returns, stocks listed on the NASDAQ/AMEX have negative abnormal returns after cross-listing. Moreover, results are sensitive to the domestic market; stocks originating from emerging markets have higher cumulative abnormal returns than stocks from developed markets. These results suggest that segmentation between the emerging markets and developed markets may be greater than segmentation between the two developed markets.

The last study looking into the integration of capital markets and analyzing the short-term performance of the stocks after cross-listing is Miller (1999). He examines ADRs from 35 countries between 1985 and 1995. He shows that after controlling for institutional and geographical differences, the countries with legal barriers for capital flows are segmented from the US market.

Unlike many previous studies that examine the short-term performance of cross-listed stocks, Foerster and Karolyi (2000) test the segmentation of the US stock markets with the Asian, Latin American and European capital markets focusing on long-run performance of equity offerings. They report that between 1982 and 1996 ADRs from Asia, Latin America and Europe experience significant negative abnormal returns during the three years period subsequent to their cross-listings. The decline in abnormal returns is more dramatic for the stocks from emerging markets in which accounting standards are lower than the ones in developed countries. Moreover, they find the significant positive relationship between abnormal returns and the ability of the offer to capture a large share of the US trading volume.

Another study measuring the long-run performance of the stocks is Errunza and Miller (2000). They also measure the performance of ADRs from 32 countries but using the shorter sample period, between 1985 and 1994. They point out that since the capital markets are segmented before cross-listing, with the issue of ADRs the integration between the markets increases reducing cost of capital for the firm.

Thus, it can be argued that most of the studies that test the integration of the capital markets using the model of Alexander, Eun, and Jankiramanan (1987) provide evidence for the segmentation of capital markets. Almost all of the studies show that the US stock markets are segmented even from the Canadian stock markets.

1.2.3.2 The Mild Segmentation Hypothesis:

The second model concerning the segmentations of markets is the Mild Segmentation Model of Errunza and Losq (1985). Under the Mild Segmentation Model, one country's investors have unlimited access to another country's stocks but the investors of the other country are not allowed to invest in the foreign country's stocks. Therefore, a class of investors cannot trade a subset of securities due to some portfolio inflow restrictions imposed by the governments. The model derives risk and return bounds for foreign stocks that are part of the ineligible set to investors, and demonstrates that such shares should command a higher risk premium than the others. This is expected to be lower when investors can form portfolios with eligible securities that closely mimic the ineligible securities returns. Since international listing can be viewed in this context as a means of eliminating risk premium, it should be associated with an increase in share price, as in the complete segmentation model of Alexander, Eun, and Jankiramanan (1987). In the test of the both models, changes in abnormal returns are examined, and negative abnormal returns after cross-listing imply the segmentation of markets in the both models.

The introduction of the Multi-Jurisdictional Disclosure System in July 1991, makes the test of this hypothesis possible for the Canadian firms listed on the US stock markets. Because, this system relaxed the financial reporting requirements for Canadian companies listed on the US markets. Before July 1991, the reporting requirements in the US were discouraging for Canadian firms to enter to the US markets, but the reporting requirements in Canada were not discouraging for the US firms. Using a conditional asset pricing model subject to time varying volatility, Doukas and Switzer (2000) test the effect of the Multi-Jurisdictional Disclosure System. This type of segmentation can be considered as mild-segmentation. However, their results do not show any increase in the integration level of these two markets with the introduction of the Multi-Jurisdictional Disclosure System.

1.2.4 Analyses on Volatility and/or Returns After Cross-listing:

In addition to testing the three major hypotheses related to cross-listing, several researchers examine volatility and return behavior before and after cross-listing. Many studies in the literature, such as McConnell and Sanger (1987), Khan, Baker, Kennedy and Perry (1993), Jayaraman, Shastri, and Tandon (1993), Ko, Lee, and Yun (1997), and Martell, Rodriguez, and Webb (1999) examine volatility and return behavior before and after cross-listing.

Some studies examine the effects of domestic cross-listing. McConnell and Sanger (1987) is one of the early studies analyzing the abnormal returns of the US stocks after their cross-listings on the NYSE, over the time period between 1926 and 1982. They observe negative abnormal returns in the post-listing period, and try to find an explanation for this result. They investigate several explanations for this finding, including outlier observations, differences in the original market that the stock was traded, the issuance of new stock immediately following listing, the correction of an "over-reaction" that occurred on the announcement of listing, and the existence of a specific time period affecting whole sample period. However, none of these explanations are found to be valid.

Khan et al. (1993) is also one of the studies analyzing the effects of dual domestic listing on stock returns. Their sample consists of stocks cross-listed on the AMEX, the NYSE, the Pacific Stock Exchange and the Midwest Stock Exchange for the period between 1984 and 1988. Their analyses show the existence of negative abnormal returns in the post-listing period. They explain the negative abnormal returns in the post-listing period with the decline in volume and the increase in the bid-ask spread. Because increased competition created by cross-listing decreases volume, and specialists in the NYSE increase the bid-ask spread to compensate for their loss due to the decline in volume. This explanation is against the liquidity hypothesis. However, they did not empirically test the validity of these explanations.

Jayaraman, Shastri, and Tandon (1993) examine the effects of the listing of ADRs on the volatility and return of 95 stocks (44 Japanese stocks, 30 English stocks, and 21 stocks from several countries) between 1983 and 1988. Comparisons of variances and excess returns for the pre- and post-listing periods show that after listing both return and variance increase. It is found that the existence of informed traders increases volatility after cross-listing, because cross-listing leads the informed traders to trade on both markets, and to gain more due to information differentials in the markets.

Another study examining the behavior of stocks after cross-listing is Ko, Lee, and Yun (1997) which analyzes the changes in return and price volatility of 24 Japanese stocks after their cross-listings either on the NYSE or the OTC. They conclude that cross-listing does not create abnormal return, but increases volatility. Their results are not sensitive to the NYSE or the OTC listings.

The purpose of Doukas and Switzer (2000) is to explore the effect of cross-listing on abnormal returns of Canadian stocks cross-listed on the US stock markets between 1985 and 1996. However, since changes in integration level also affect the returns of the stocks, unlike previous studies, they examine the changes in market integration through time and the effects of cross-listing together to take into account effects of some potential changes in the integration level between the Canadian and the US stock markets on the stock returns. They identify the introduction of the Multi-Jurisdiction Disclosure System as a possible factor affecting the integration level between the Canadian and the American stock market. Nevertheless, the results do not show any increase in the integration level with the introduction of the Multi-Jurisdiction Disclosure System. In the pre-listing periods very significantly positive abnormal returns are observed. The effect of announcement is weaker for the stocks cross-listed on the AMEX than on the NYSE or the NASDAQ.

On the other hand, unlike other studies, Martell, Rodriguez, and Webb (1999) cannot reject the null hypothesis of no change in variance after cross-listing for ADRs listed on the Latin American stock markets between 1990 and 1994.

Thus, many studies in current literature show that after cross-listing, exposure to local market index and abnormal returns decline, but volatility of stock returns increases.

1.2.5 Integration of European Markets:

As can be seen from the summary table (Table 1.2) most of these studies provide support for the segmentation of capital markets by using cross-listing on the U.S. markets. They show that there are positive abnormal returns in the pre-listing period, and negative abnormal returns in the post-listing periods. In the literature, there are limited studies examining the integration of the European markets. Therefore, this study will try to fill this gap in the literature by providing recent evidence from the two leading European stock markets.

Although there are some studies examining the integration of the European markets, most do not examine the integration of capital markets using cross-listed stocks. For example Akdogan (1991) uses data from stock markets in the UK, Germany, France, the Netherlands, Belgium, Denmark, Italy, and Spain to test whether in international capital asset pricing model the return on the European market index is priced. He shows that after 1980 the systematic risk of the European index becomes significant. On the other hand, in recent years Centeno and Mello (1999), and Rouwenhorst (1999) support that the segmentation of financial markets is still observed among some countries in the European Union. Centeno and Mello (1999) test the integration of the money market and the bank loans markets for the six EU countries, Germany, the UK, France, Italy, Spain, and Portugal between 1985 and 1994, using a 6-month money market interest rates and 6-12-month commercial bank lending rates. They illustrate that even though the domestic money markets are closely linked, the domestic banking markets are segmented.

On the other hand, Rouwenhorst (1999) investigates whether the differences in the pricing of stocks between the European countries would disappear overtime using monthly returns of the stocks from the twelve European countries, Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom, for the period between 1978 and August of 1998. To estimate the realization of two common factors shared among all securities, industry factor and country factor, he develops a weighted least squares model of returns on a set of industry and country dummies for each month. By running a cross-sectional regression for each month he obtains a time-series of estimated industry and country effects, and examines the behavior of these series over time. He shows that the country effect is larger than the industry effect. Moreover, the country effect is greater in the European Monetary Union (EMU) countries than that in the non- EMU countries. This result suggests that rather than industry selection, country selection was still important for the pricing of stocks in the second half of 1990.

1.3 THE PARIS STOCK EXCHANGE AND THE XETRA

In this section, some information about the characteristics of the Paris Stock Exchange and the Xetra are provided. Since behavior of the French stocks cross-listed both on the Paris Bourse and the Xetra is analyzed in this study, information about the characteristics of these stock markets can be helpful in the interpretation of the results.

1.3.1 The Paris Stock Exchange:

The Paris Stock Exchange is a centralized order-driven market in which trading occurs continuously from 10:00 to 17:00. There are three phases in a typical trading day: The pre-trading phase, main trading phase and post-trading phase. The pre-trading phase is from 8:30 to 10:00. In this phase, orders are fed into the centralized order book without any transactions taking place. During this period, the entire limit order book can be observed by the brokerage houses, but only the five best limit orders can be observed by the individual investors. At 10:00 the market opens and the central computer automatically calculates the opening price at which the largest number of bids and asks can be met. Limit orders at the opening price are executed to the extent that matches are available.

Trading takes place on a continuous basis through members acting as brokers from 10:00 to 17:00. Clients place orders through technical facilities linked to member firms. Through routing systems orders are carried to member firms' order book in real time. Order books are first reformulated as market orders, and then automatically routed from member firms' books to the market.

The market is in its post- trading period from 17:00 to 17:05. As with the pre-trading, remaining orders are fed into the centralized order book without any transactions taking place, and at 17:05 the market closes with a call auction that determines closing prices.

The Paris Bourse is divided into two sub-markets called as the Premier Marche and the Second Marche. In the French Stock Exchange, there is also an over-the-counter market (OTC) called the Marche Libre.

The Premier Marche includes large French and foreign companies with a minimum capital of 1 billion French Franc. These companies are required to offer at least 25% of their capital to the public. To be listed on the Premier Marche, issuers must have three years of published financial statements showing profits for the two previous years before the listing.

The Premier Marche is divided into two sub-markets called the cash market and a monthly settlement market called the Reglement Mensue, (RM). On the cash market, a seller must transfer the securities sold to his/her broker's account after a transaction and the buyer must immediately pay the purchase price to his/her broker. Cash transactions are made for the least actively traded French and foreign stocks.

On the RM, the monthly settlement market, actual cash settlement and delivery of securities do not take place until the end of the trading month. Investors on the monthly settlement market may use a margin account, but they must meet an initial margin requirement representing a percentage of the total amount of their order, which may be adjusted as necessary. The most actively traded French and foreign shares on the official market are traded on a monthly settlement basis. The transaction can be in the French Franc (FF) or the Euro.

On the monthly settlement market, the RM, transactions are recorded on the trading date, but settlement may be deferred until the end of the month in accordance with a calendar published annually by the Paris Bourse. Transactions on the monthly settlement market, occurring before the so-called settlement date, are usually settled between brokers at the end of the current calendar month during the settlement period. The settlement date is the first day of the settlement period. Payment and delivery on the monthly settlement market take place at the end of the trading month. However, investors may request an immediate settlement provided that they dispose of the corresponding cash or shares and accept a specific charge from brokers. In this case, like for trades on the cash market, DVP, (delivery versus payment), meet international standards of "three days after the trade", (T+3), on clearing and settlement.

The Second Marche was set up for medium-sized and smaller companies with a minimum capital of 70-100 million FF. At least 10% of their capital is required to be offered to the public. The Second Marche operates as a cash market. This market is more flexible in terms of its listing requirements. To be listed on the Second Marche, issuers must have certified financial statements for the last two years. After three years of listing on the Second Marche, companies are reviewed and a decision is made whether to upgrade the company to the Premier Marche or keep it on the Second Marche.

The over-the-counter market also operates as a cash market. It is an unregulated market. Any buyer or seller, through a broker who issues buy or sell orders, may trade.

Both credit institutions and investment service providers, as members of the Paris Bourse, can deal with collection and transmission of client orders, order execution, asset management, and underwriting and placement of issues. There are four types of membership on the Paris Bourse:

1. Broker-dealer Individual Clearers: They clear only trades carried out on behalf of their clients or in their own name.

2. Broker-dealer Multi-clearers: They can clear both their own transactions and those of one or more member firms.

3. Pure Broker-Dealers: They rely on other member firms for their clearing.

4. Multi-clearers (non-traders): They are specialized in clearing the accounts of Pure Broker-dealers.

A foreign intermediary may become a member of the Paris Bourse. However, a member foreign company has to satisfy some requirements. Those are:

a) Authorization to provide investment services granted by the home authorities and attested to by a European passport.

b) Completion and execution of an application for the Paris Bourse membership including payments of fees for the services offered.

c) Fulfillment of the rules set by the home authority.

d) Respect of the conduct of business rules determined by the Conseil de Marches Finaciars as well as the operating rules of the Paris Bourse for equities and bond markets.

Foreign members are subject to the same fees as any local member. Fees can be classified into two groups:

1) Annual fixed fees:

i) The membership fee: For market supervision, compliance and markets promotion towards issuers, investors, and foreign exchanges.

ii) The trading fee: This fee is charged for services of organization and computerization for the market.

iii) The clearing fee: A fee paid for clearing and guarantee services relating to trades on the clearing system, called Relit system of the Paris Bourse.

2) Variable Fees: Variable fees are charged for orders, trade and the opening auction.

On July 1 1989, fixed commissions were abolished. Now commission rates are negotiated between clients and member firms.

In December 1996, 30 percent of the total French equity is held by foreign investors[5]. Foreign investors may freely buy or sell all listed equity on the monthly settlement (RM), cash, second and OTC markets. Securities purchased by foreign investors may be exported from France at any time. Foreign investors are not subject to capital gains tax and their trades are not subject to stamp duty. Dividends from French securities are subject to a withholding tax of 25 percent.

1.3.2 The Xetra:

The Xetra is the new electronic trading stock market of Germany. The Deutsch Bourse Group decided to develop and introduce a new international electronic trading system in May 1995. The establishment of the Xetra, the electronic trading system, occurred in four steps. On June 10, 1997, market participants received the Xetra screen-based trading system. In the second step, trading of stocks listed on the Xetra started on November 28, 1997. As a third step, on October 12, 1998, private investors could get in on screen-based professional trading through their bank. Finally, in the fourth step in 2000, the market participants could trade all of the securities listed not only on the Xetra but also on the Frankfurt Stock Exchange, electronically.

On the Xetra, regardless of their geographic location in the world, all market participants have equal access to the trading platform. However, in order to trade on the Xetra a trader must obtain license from one of the Germany's stock exchanges. If banks and financial intermediaries in Germany and in other countries employ certified traders, they can get a license. Investors can trade on the Xetra through their banking institutes as well.

Like the Paris Bourse, there are three phases of trading in the Xetra: The pre-trading phase, main trading phase and post-trading phase. On the Xetra, trading hours have been between 8:30 and 17:00 until June 2, 2000. After that time, operating time increased to 11.5 hours and the market closes at 20:00. The pre-trading and post-trading phases are the same for all of the equities whereas the main trading phase may vary from equity to equity depending on the type of the auction used in its trading process. Individual stocks can be traded in two different trading models, continuously trading in connection with auction, and several/single auction(s).

The pre-trading phase begins with an opening call auction. Market participants are able to enter orders and quotes. Information about the current order situation is provided continuously during the pre-trading phase. The indicative order price is displayed when orders are executable. The opening price is set according to the most executable volume on the basis of the order book situation.

The main trading phase differs for the two different trading systems, continuously trading in connection with auction, and several/single auction(s). Under continuously trading, in connection with the auction system, continuous trading starts after the termination of the opening auction. During continuous trading the order book is open, and it displays the limit and accumulated order volumes at each price.

A new limit order, market order or quotation is immediately checked for execution against orders on the other side of the order book. The orders are executed according to price/time priority.

Continuous trading can be interrupted by intra-day call auctions at pre-determined points in time. Intra-day auctions occur, similar to opening or closing auctions, and at the end of the each intra-day auction, continuous trading restarts. The aim of intra-day auctions is to increase the liquidity of the stock.

After the end of continuous trading, the post-trading phase is initiated by a closing auction. Like in the pre-trading phase, market participants are able to enter orders and quotes. In the closing auction, all order sizes are automatically matched in one order book. In this phase non-executed orders and limit orders are transferred to the next trading day.

Unlike continuous trading in connection with the auctions model, in the several/single auction(s) model, continuous trading phases do not take place, instead several/single auction(s) occur(s). An auction plan informs market participants about the time of the auction(s).

In the Xetra, there are seven sub-markets called DAX, MDAX, Neurer Market, Liquid Small Caps, Liquid Foreign Equipment, Illiquid Small Caps, and Illiquid Foreign Equities. The stocks on DAX, MDAX, Neurer Market, Liquid Small Caps, Liquid Foreign Equipment can be traded based on continuous trading, only for the stocks in Illiquid Small Caps, and Illiquid Foreign Equities is single/several auction(s) model is used.

There are three types of members depending on their business in the Xetra:

1. Members who buy and sell securities for their own account.
2. Members who buy and sell securities in their own name for the account of others.

3. Members who arrange contracts relating to the buying ad selling of assets which are tradable on the stock exchange.

Deutsche Borse offers the settlement system in the Xetra. Xetra trades are settled in accordance with the date of transactions. Payments and delivery occur two days after the transaction date.

For the stock exchange there are two types of commission called: kursmakler commission and a bank commission. In 1998, the kursmakler commission was 0.04 percent of the market price of DAX shares and 0.08 percent for all other securities. The size of the bank commission depends on the schedule of terms of the representative bank, and is charged for liquidation, settlement, investment counseling and analysis.

Only registered institutions, such as banks, as well as their representatives (traders) can directly trade on the Xetra. National or foreign individual investors can trade stocks through registered institutions or their representatives.

For German investors, all dividends are subject to a withholding tax of 25 percent. All dividends distributed to foreign investors are also subject to the flat withholding tax of 25 percent. In order to avoid double taxation most international conventions reduce the 25 percent flat-rate withholding tax to 15 percent.

1.4 HYPOTHESES AND DATA

1.4.1 Hypotheses:

France and Germany are two major countries in the European Union, and it is expected that the French and German stock markets are integrated since some progresses towards the integration of the capital markets of these countries have been achieved up to now. In this section, the hypotheses about impact of cross-listing on systematic risk and return behavior are developed in order to make some inferences about the integration of capital markets in these countries and the characteristics of the data set used in order to test these hypotheses are identified.

According to Alexander, Eun, and Jankiramanan (1987), if the French and German stock markets are integrated, no change in the behavior of the French stocks is expected after cross-listing. On the other hand, if they are segmented, with cross-listing investors will start to make investments into securities which are ineligible before cross-listing. So, cross-listing can be viewed in this context as a means of eliminating diversification risk and should be associated with an increase in share prices and a decline in expected rate of return (Doukas and Switzer (2000)). Moreover, if they are completely segmented markets, with a cross-listing, the domestic market index will not be the only factor affecting the return of the stocks, and the stock will start to be affected from the returns on the foreign market where the stock is cross listed. So, in completely segmented markets after cross-listing, the beta coefficient for domestic (French) market index is expected to decline and the beta for the foreign (German) market index is expected to increase. Similarly, if the world stock markets and the French stock markets are not integrated, the beta for the world index will increase and the beta for the French market index will decline after cross-listing.

Based on this model the following null hypotheses about the change in the returns and systematic risk of French stocks after their cross-listings on the Xetra are defined:

H_{10} : The beta for the French market index will not change after cross-listing.

H_{20} : The beta for the German market index will not change after cross-listing.

H_{30} : The beta for the world market index will not change after cross-listing.

H_{40} : There will be no change in the expected returns of the stocks after their cross-listings.

1.4.2 Sample Selection:

In order to test these hypotheses, French stocks that are cross-listed on the German electronic trading market called the Xetra are examined. There are 94 French stocks that began being traded on the Xetra during the sample period between November 29, 1997, the first trading date on the Xetra, and February 2000. Out of 94 stocks, 55 of them started to be traded on the Xetra during 1998, 18 of them during 1999, and the remaining ones (21) between January and February 2000.

Several restrictions are imposed on the stocks in order to eliminate the impact of other events that might affect the behavior of stock prices in addition to the cross-listing. First, the stocks that were cross listed on other exchanges on a day close to their first trading date on the Xetra are eliminated.[6] This procedure results in the exclusion of 54 French stocks whose first trading dates on other markets are close to the one on the Xetra. Hence, with this procedure the effects of other cross-listings on the behavior of the French stocks are eliminated.

Second, the stocks with the dividend payments close to the first trading day on the Xetra are excluded from the sample. It is known that stock prices react to dividend payments which are related to the tendency of stockholders to reinvest dividend income into the stock of the dividend paying firm (for example, see Ogden (1994)). With this increase in the demand for stock, its price increases. Therefore, stocks with dividend payment in –5 and +10 days window around the cross-listing date, are eliminated from the sample. Two more stocks are excluded from the sample because of this restriction. Hence, the sample size is reduced down to 38.

Third, only the stocks traded on the Reglement Mensue (RM) segment of the Paris Bourse are included in the sample. As explained in section three, stocks are traded on the different segments of the Paris Bourse depending on their trading volume and liquidity. In addition, trading procedures are different in these segments and it is known that there are some differences in the characteristics of the stocks that are traded on different segments of the Paris Bourse. For example, Biais, Bisiere, and Decamps (1999) find that market-sell orders are less frequent on the spot market segment than the Reglement Mensue, and the spot market segment reflects good news faster than the bad news. Furthermore, there are few restrictions on short selling on the RM, because the largest and most liquid stocks are traded on a monthly settlement basis on this segment. In order to eliminate the effects of the different characteristics of the segments on the pricing of the stocks, the stocks traded only on the Reglement Mensue are analysed. Since these stocks are large and highly liquid stocks, with this restriction the problem of non-synchronous trading is also eliminated. In the remaining sample, only 4 stocks are not traded on the Reglement Mensue, so the elimination of these stocks reduces our sample to 34 stocks.

Fourth, earnings announcement dates of the stocks in our sample are investigated. Using the intraday data of 37 French stocks listed on the Paris Bourse, Gajewski (1999) finds that trading volume and prices increase on earnings announcement days. According to French regulations, earnings are announced once a year either in February or March because net incomes are calculated only in the year-end financial statements which are published each year after the board of directors' meeting. When the first trading dates of stocks in the sample are compared with their earnings announcement dates, it is observed that the cross-listing dates are at least 40 days after the earnings announcement dates. Therefore, no stock is eliminated from the sample because of earnings announcements.

Out of 34 French stocks, 30 of them were cross-listed on the Xetra in 1998, 3 during 1999 and the remaining 1 stock in 2000. Except six stocks, all of the French stocks in the sample were currently trading on the Frankfurt Stock Exchange when they were cross-listed on the Xetra. Hence, cross-listing on the Xetra was not their first-time exposure to the German market. Three of the 34 French stocks were delisted from the Xetra during the sample period between November 1997, and February 2000. Delisted stocks are also included in the sample in order to eliminate any survivorship bias identified in Banz and Breen (1986).

The data source for these stocks is *Datastream*. Dividend payment dates and first trading dates on the Xetra are obtained from *Datastream* and the web page of the Xetra respectively. In the analyses, data for the daily closing price of the stocks, market and world indices, trading volume, and market and book values of the stocks are used. *Datastream* adjusts prices for dividend payments and stock splits. Continuously compounded returns are calculated using the closing price of the securities. If a security is not traded on any given day, no return for that security is calculated for either that day and the subsequent trading day.

1.5 METHOD

In this section the parametric and non-parametric methods employed in the test of these hypotheses are explained.

Event study methodology is used in the analysis. The event window is specified as -250 and +250 days with respect to the cross-listing date. Although in some studies announcement dates are advised to be used as an event date, the unavailability of announcement dates and the finding of Foerster and Karolyi (1999) that the patterns in cumulative abnormal returns around both announcement and listing dates are similar, lead us to use the cross-listing date as an event date. By specifying a quite large event window (approximately one year before and after cross-listing date), it is assumed that announcement dates are also included in the event window.

1.5.1 Test of Changes in Risk Parameters:

In order to examine the changes in the risk structure because of cross-listing, the following two-factor asset pricing model is estimated for the time series and cross-sectionally pooled sample of stocks using the Generalized Methods of Moments (GMM) with Newey and West (1987) autocorrelation and heteroskedasticity correction for error terms.

$$R_{it} = \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{Ft} + \beta_{iG}^{PRE} R_{Gt} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{Ft} D_{it}^{POST} + \beta_{iG}^{POST} R_{Gt} D_{it}^{POST} + \varepsilon_{it} \quad (1.1a)$$

t=-250,…,0,…,250 days

Where R_{it} refers to the continuously compounded rate of return calculated using closing prices of the stock i on day t; α_i 's are abnormal returns including risk free rates; β_{iF} is the coefficient on the French market index return, R_{Ft} ; β_{iG} denotes the coefficient on the orthogonalized German market index return, R_{Gt}[7] ; D_{it}^{LIST} is a dummy variable that is equal to 1 if the observed date is the listing date (t=0), and 0 otherwise; D_{it}^{POST} is a dummy variable that is equal to 1 if the observed date is from the post-listing period (t>0), and 0 otherwise; and ε_{it} is the error term.

Moreover, two additional models are estimated. Since the weight of the German market index in the world market index is less than the weight of the US market index, to measure the reaction of the stocks against the German market index is not enough to provide information about the reaction of the stock against the world market index, which is widely used in the studies that examine the integration of markets with cross-listed stocks. So, the first model examines the change in the systematic risk of the cross-listed stocks with respect to the French market index and the world market index:

$$R_{it} = \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{Ft} + \beta_{iW}^{PRE} R_{Wt} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{Ft} D_{it}^{POST} + \beta_{iW}^{POST} R_{Wt} D_{it}^{POST} + \varepsilon_{it} \quad (1.1b)$$

t=-250,…,0,…,250 days

Where β_{iW} denotes the coefficient on the orthogonalized return on the world market index return, R_{Wt}. Since, the correlation coefficient between the world index and the French market index is 0.7 and significant at 1 percent, the world market index is orthogonalized in order to eliminate a multicollinearity problem.

In the second model, the French market index, the German market index, and the world market index are included. So, the change in the sensitivity of the stock with respect to these three indices are examined together.

$$R_{it}= \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{Ft} +\beta_{iG}^{PRE} R_{Gtt} + \beta_{iW}^{PRE} R_{Wt} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{Ft} D_{it}^{POST} + \beta_{iG}^{POST} R_{Gt} D_{it}^{POST} + \beta_{iW}^{POST} R_{Wt} D_{it}^{POST} + \varepsilon_{it} \quad (1.1c)$$

t=-250,…,0,…,250 days

Like the previous models, in this model, in order to eliminate a multicollinearity problem, the German market index return is orthogonalized with respect to the French market index return, R_{Gt}. Similarly, the world market index return is orthogonaliezed with respect to the French market index and the German market index, R_{Wt}, because the correlation coefficient between the world index and German market index is 0.664 and significant at 1 percent.

The GMM method is used instead of the Ordinary Least Squares method (OLS) because in the pooled sample it is not possible to satisfy the assumptions of OLS about the non-existence of autocorrelation and heteroskedasticity in error terms. Moreover, by using the GMM model, the assumption that each of the right-hand side variables is uncorrelated with the residual is relaxed.

This model is similar to the model used in Foerster and Karolyi (1999). The major advantage of this model is that in the calculation of abnormal returns it takes into account the changes in risk parameters (β_{iF}, β_{iG} and β_{iW}) because of cross-listing or other factors over time. However, pooling the data may average risk measures, which can be considered as a disadvantage of this model. By calculating abnormal returns for each stock separately, the effects of this disadvantage are eliminated.

This study is different from Foerster and Karolyi's (1999) model, with respect to some aspects. First, all of the returns are denominated in the same currency, the French Franc. The French Franc is preferred to the Euro, because in *Datastream* a fixed exchange rate is used to convert the French Franc to the Euro during the period before the adaptation of the Euro (January 1999). Since the Euro did not exist before 1999, to use a fixed exchange rate to convert returns before 1999 from the French Franc to the Euro may be an unrealistic assumption. Second, any impact of the French market index on the German market index is eliminated using orthogonalized German market index returns. In other words, the multicollinearity problem is eliminated. Finally, as advised in Cable and Holland (1999), a market model rather than Capital Asset Pricing Model (CAPM) is used.

In addition to the estimation of this model for the whole sample, portfolios are formed based on their size, book-to-market value, and industry. If no adjustment for size and book-to-market value ratio is made, a downward bias in abnormal returns will be observed, since Dharan and Ikenberry (1995) show that small firms with stocks trading on the NASDAQ prefer to apply for listing on the NYSE or the AMEX just before a decline in their performance. Six portfolios are formed depending on the size of the firms and their book-to-market value ratio. First, the sample of 34 firms is divided equally into three groups depending on their size: small, medium and large. Second, the sample is classified into three portfolios based on their book-to-market value ratios: low, moderate and high. Market value and book-to-market value ratio of individual stocks and these portfolios are provided in

Table 1.3 (a) which shows that market value and book-to-market value of the portfolios are not very close to each other. In the computation of the book-to-market values, the look-ahead bias is eliminated as advised in Banz and Breen (1986)[8]. It is assumed that there are three months between the year-end date of the firm and the time at which balance sheet information is made available to the investors. Both the market value and book-to-market value portfolios are equally weighted portfolios. In order to see whether risk structures change depending on the size of stocks, the models specified in equations (1.1a, 1.1b, 1.1c) are re-estimated for these six portfolios separately. It is expected that the decline in abnormal returns and the beta coefficient for the French market index for the small-sized portfolio and high book-to-market value portfolio will be greater than the ones for the large sized portfolio and small book-to-market value portfolio.

Finally, since Foerster and Karolyi (1993), and Heston and Rouwenhorst (1994) find some industry differences, firms are classified according to the first digit of their SIC code in order to test whether cross-listing affects the risk structure of firms in different industries in a different way. The main models are also estimated for four sectors: retailing, manufacturing, finance, and service. In Table 1.3 (b), for each market value and book-to-market value portfolio, the number of stocks from the four sectors is presented. According to the table, the only major argument can be that most of the stocks in the finance sector are included in the highest book-to-market value portfolio. For the industry portfolios, it is expected that cross-listing mostly affects the stocks from the manufacturing and finance sectors which might have more interactions with other European countries than the firms in other industries. On the other hand, it is anticipated that the effects of cross-listing will be low for the stocks in the service sector because in general, firms in this sector operate in local environments rather than in a global environment.

1.5.2. Tests on Abnormal Returns:

1.5.2.1. Calculation of Abnormal Returns:

In the regression model, the stocks are pooled. Pooling the returns might block some effects. In order to eliminate the effects of pooling, the abnormal returns of each stock are calculated separately by using the following two-factor market model; an international version of the market model advised by Cable and Holland (1999) which compare the performances of different benchmarks in terms of the correct calculation of normal and abnormal returns of the stock:

$$R_{it} = \alpha_i + \beta_{iF} R_{Ft} + \beta_{iG} R_{Gt} + \varepsilon_{it} \qquad (1.2)$$

Equation (1.2) represents the two-factor model used to calculate the expected returns of stock i. Like in equations (1.1a), (1.1b) and (1.1c), β_{iF} is the coefficient on the French market index return, R_{Ft}, and β_{iG} is the coefficient of the German market index return orthogonaliezed with respect to the French market index return, R_{Gt}. Since the betas of the stocks might be different before and after cross-listing, two betas for each market, French and German, are estimated for each stock. The pre-listing period between -250 and –126 days is used to calculate pre-listing betas, and the post-listing period between +126 and +250 days is used to calculate post-listing betas. Abnormal returns are calculated as the difference between observed returns of firm i on day t and the expected return generated by the model. The abnormal return of stock i on day t, AR_{it} , is defined as follows:

$$AR_{it} = R_{it} - E(R_{it}) \qquad (1.3)$$

where $E(R_{it})$ is the expected return of stock i on day t estimated using the two-factor market model (equation 1.2). Cumulative abnormal returns, CAR_{iT}, are calculated for each stock i on date T by aggregating abnormal returns for all stocks in the sample up to day T:

$$CAR_{iT} = \sum_{t=1}^{T} AR_{it} \qquad (1.4)$$

Blume and Stambaugh (1983) show that returns calculated from closing prices contain an upward bias, because the last transaction may occur before the end of the period (non-synchronous trading). This observation is especially valid for small stocks which might be traded less frequently. Since the portfolio is re-balanced every day in the calculation of CAR, measurement errors are cumulated. In order to eliminate these measurement errors, the use of buy-and-hold abnormal returns (BHARs) rather than cumulative abnormal returns (CARs) is recommended especially in the long-run by Conrad and Kaul (1993), and Barber and Lyon (1997).

Thus, in order to eliminate the effects of measurement errors, in addition to CAR, BHAR is also calculated as follows:

$$BHAR_{iT} = \prod_{t=1}^{T}(1+R_{it}) - \prod_{t=1}^{T}(1+E(R_{it})) \quad (1.5)$$

where $BHAR_{iT}$ represents Buy and Hold Abnormal Return of stock i on day T.

1.5.2.2. Parametric Tests of Abnormal Returns:

The significance of abnormal returns is tested using both parametric and non-parametric statistics. For parametric tests, t-statistic is used as described in Barber and Lyon (1997):

$$CAR_{PT} = \frac{1}{N_T}\sum_{i=1}^{N_T} CAR_{iT} \quad (1.6)$$

and

$$\sigma_{CARpT} = \sqrt{\frac{1}{(N_T-1)}\sum_{i=1}^{N_T}(CAR_{iT} - CAR_{pT})^2} \quad (1.7)$$

Similarly,

$$BHAR_{PT} = \frac{1}{N_T}\sum_{i=1}^{N_T} BHAR_{iT} \quad (1.8)$$

$$\sigma_{BHARpT} = \sqrt{\frac{1}{(N_T - 1)} \sum_{i=1}^{N_T} (BHAR_{iT} - BHAR_{pT})^2} \qquad (1.9)$$

where N_T represents the number of stocks in the portfolio on day T; CAR_{PT} is the average cumulative abnormal return of stocks in portfolio p on day T; $BHAR_{PT}$ is the average buy-and-hold abnormal return of stocks in the portfolio p on day T; and σ_{CARpT} and σ_{BHARpT} represent the cross-sectional standard deviation of CARs and BHARs for stocks in portfolio p on day T, respectively. t-Statistics are given as follows:

$$t_{CAR} = \frac{CAR_{PT}}{(\sigma_{CARpT} / \sqrt{N_T})} \qquad (1.10)$$

and

$$t_{BHAR} = \frac{BHAR_{PT}}{(\sigma_{BHARpT} / \sqrt{N_T})} \qquad (1.11)$$

The abnormal returns are calculated for market value, book-to-market value, and industry portfolios as well. The market value and book-to-market value portfolios are re-balanced every 25 trading days.

1.5.2.3 Non-Parametric Tests of Abnormal Returns:

For the t-test to be optimal, the underlying distribution must be normal. However, this assumption does not hold in most of the cases in the real life. Especially when the number of stocks included in a portfolio is small, non-parametric tests are used in order to check the validity of our results. Since, in this study the number of stocks in each portfolio is small to satisfy normality assumption of t-test, the Corrado's (1989) Rank Test and the Wilcoxon Signed Rank Test are used to examine the significance of abnormal returns.

1.5.2.3.1. The Corrado's Rank Test:

The rank test is one of the commonly used non-parametric tests when the distribution of the series is not normal. In the rank test, instead of the observation itself, its ranking with respect to other observations is used in the test of its significance. The major advantage of the rank test is that the skewness of the distribution is not important. Moreover, Corrado and Zivney (1992), and Cowan and Sergeant (1996) show that the rank test is more powerful than other non-parametric tests. In this test, as explained in Corrado and Zivney (1992), first, CARs of each stock over the event period are ranked in ascending order.

Let K_{iT} denotes the rank of CAR of stock i on day T.

$$K_{iT} = \text{rank}\,(CAR_{iT}) \qquad T=-125,\ldots,0,\ldots 125 \text{ days}$$

If CAR of stock i is greater on day T than that on day J then, $K_{iT} \geq K_{iJ}$. Second, ranks are standardized for the missing returns in the period by dividing by one plus the number of non-missing returns, M_i, in the sample:

$$U_{iT} = K_{iT}/(1+M_i)$$

where U_{iT} represents the standardized ranks. U_{iT} has a uniform distribution with an expected value of 0.5. Then, the standard deviation of U_{iT} for all stocks over the entire sample period is calculated using the following formula:

$$S(U) = \sqrt{\frac{1}{251}\sum_{T=-125}^{125}[\frac{1}{\sqrt{N_T}}\sum_{i=1}^{N_T}(U_{iT} - 1/2)]^2} \qquad (1.12)$$

where N_t is the number of stocks with non-missing CAR on day t.

Finally, the following test statistic is used,

$$T_T = \sqrt{\frac{1}{\sqrt{N_T}}\sum_{i=1}^{N_T}(U_{iT} - 1/2)/S(U)} \qquad (1.13)$$

In the equations (1.12) and (1.13), (U_{iT} -1/2) represents the excess returns with uniform distribution, and significance of T_T is determined by comparing T_T with $t_{\alpha/2}$ from the student- t table.

1.5.2.3.2 The Wilcoxon Signed Rank Test:

A signed-rank test proposed by Wilcoxon is another non-parametric test used to test the difference in the distributions of two series considering the size of the paired-difference between those series.[9] It is a more powerful test than the sign test, because it considers both sign and magnitude of the difference. It gives more weight to a pair that has a large difference between two conditions than to a pair that has a small difference. According to the Wilcoxon Signed Rank Test, half of the differences in pairs is expected to be negative and the other half to be positive in testing the null hypothesis of no difference in distribution.

$$d_{iT} = CAR_{i,T} / \sigma_{i,CAR} \qquad (1.14)$$

$R_{iT} = \text{Rank}\ (|d_{iT}|)$

Let d_{iT} and R_{iT} represent the standardized CAR of stock i on day T and the rank of d_{iT} respectively.

Unlike Corrado's Rank Test that ranks the CARs of stock i during the sample period, the stocks are ranked on each day. Hence, if the absolute value of standardized CAR of stock i is greater than that of stock j on day T, stock i has a higher rank than stock j on day T.

If $|d_{iT}| \geq |d_{jT}|$, then $R_{iT} \geq R_{jT}$

R_{iT}: Rank of absolute values of normalized CARs of a stock i in a portfolio on day T.

If the normalized CARs of the stock are negative, its rank is multiplied by -1, otherwise it will remain as a positive number. If the number of the stocks in the portfolio is less than 25, (N<25), the normality assumption for the Z test does not hold[10]. So, all of the positive ranks on day T are summed (R_T^+). If R_T^+ is less than or equal to the critical value R_T, $R_T^+ \geq R_T$, then, the hypothesis that there is no abnormal return on day T is rejected.

R_{iT} if $d_{iT} \geq 0$

$-R_{iT}$ if $d_{iT} < 0$

R_T^+: Sum of positive ranks on day T.

When the number of the firms in the portfolio on a given day T is greater than or equal to 25, ($N_T \geq 25$), then R_T^+ is approximately normally distributed, with a mean, $E(R_T)$ and a standard deviation of $\sigma(R_T)$ defined as:

$$E(R_T) = \frac{N_T(N_T+1)}{4}$$

$$\sigma(R_T) = \frac{N_T(N_T+1)(2N_T+1)}{24}$$

The Z_T statistic is calculated as follows:

$$Z_T = \frac{R_T^+ - E(R_T)}{\sigma(R_T)} \qquad (1.15)$$

If $Z_T \geq Z_{T,\alpha/2}$, ($Z_{T,\alpha/2}$ is the critical value at α significance level), the hypothesis that there is no abnormal return on day T is rejected.

1.6 RESULTS

This section discusses the changes in the systematic risk of the stocks after cross-listing and the results of the parametric and non-parametric tests on abnormal returns.

Table 1.3 (c) presents the mean, standard deviation, skewness, and kurtosis of the daily returns for the whole period and for the pre- and post-listing periods separately. It is observed that for the overall sample the mean return is higher in the pre-listing period than in the post-listing period. This is also observed for market value, book-to-market value and industry portfolios. However, the difference in average returns between the pre-listing and post-listing periods is not found to be significantly different from zero. On the other hand, the standard deviations of the stocks are higher after they are cross-listed on the German market. In most of the portfolios after cross-listing kurtosis declines. This means that extreme returns are less frequently observed after cross-listing. Moreover, in most of the stocks the returns become more skewed to the left after the listing.

1.6.1 Test on the Changes in the Risk Parameters:

The results of the generalised methods of moments (GMM) model estimation for all stocks, size, book-to-market value, and industry portfolios are presented in Table 1.4(a), Table 1.4(b), and Table 1.4(c). In addition to estimated coefficients, t-statistics are also presented in parentheses. t-Statistics are calculated from heteroscedasticity and autocorrelation adjusted standard errors of estimates (Newey and West (1987)) . The probabilities corresponding to the Wald test are presented in a separate column in the tables. The adjusted R^2s suggest that the models are moderate in terms of explaining the returns of the French stocks cross-listed on the German market.

First, the impact of the German market on the returns of the cross-listed French stocks is examined in Table 1.4(a). For the whole sample, in the pre-listing period, the average beta on French market returns is close to one (0.8230) and the average beta on the German market returns is much smaller (0.1167). Both are found to be statistically significantly different from zero. The average domestic beta and the German market beta increase after cross-listing, but the increases are not found to be significant.[11] This finding is also supported by the Wald test. The p-value for the Wald test of a structural break around the cross-listing date suggests that there is no significant change in beta values. The insignificant change in beta for the German market as expected since, most of the stocks included in the sample exposed to the German market risk when they were cross-listed on the Frankfurt Stock Exchange. Hence the listing on the Xetra is not the first exposure to the German market.

Moreover, the insignificant change in the beta for the German market can be also explained with the introduction of the Investment Service Directive in 1996. Since with this directive any financial intermediary from any member country of the EU can trade securities regardless of their domestic country, the stocks have already been exposed to the German market risk before cross-listing. Therefore, the stock exchange where the stock was originally listed may not be important. The cross-listing does not seem to affect significantly the risk exposure to domestic and foreign

(German) markets. This finding suggests that the French and German stock markets are integrated for the overall sample.

For market value portfolios, results are parallel to the results for the overall sample: Beta coefficients for the French market index and the German market index do not change significantly after cross-listing and they are significantly different from zero in the pre-listing period. The results are similar regardless of the market value of the portfolio. The only difference is that in the pre-listing period, the beta coefficient for the German market index in large sized portfolio is not significantly different from zero, but it is significantly different from zero for small and medium-sized portfolios. These results suggest that large firms do not face the German market risk, and as size of the stocks increases, the German market risk declines. Moreover, on the cross-listing date in the portfolio of the large-sized stocks, reaction of the return is significantly negative. In other portfolios, there is no significant reaction. Consistent with this finding, the same behavior is observed also in the small book-to-market value portfolio. This means that on the cross-listing date, large sized stocks are more affected by the cross-listing than the other stocks. However, since the model used in this study is a market model rather than CAPM, returns include a risk free rate, and α_i^{LIST} does not exactly refer to abnormal return. Thus, in the interpretation of the results, the one to one correspondence between abnormal return and α_i^{LIST} cannot be provided.

In the model, it is observed that large-sized stocks have greater beta coefficients than small-sized stocks. This observation is counter intuitive since in general large stocks have less market risk than small stocks. This pattern is observed even when the same analysis is done by using weekly data instead of daily data. Even though the standard deviation of cross-listed small French stocks is greater than that of the large ones (Table 1.3 (c)), since the *Datastream's* French market index is a value-weighted index, the correlation analysis shows that correlation of large stocks with the French market index is greater than that of small stocks resulting in greater beta coefficients for large stocks. However, they have lower foreign market risk.

Like the market value portfolios, changes in the beta coefficients after cross-listing are not significant for all of the book-to-market value portfolios, except the portfolio with the highest book-to-market value ratio. In this portfolio, the beta coefficient for the French market index return increases significantly after cross-listing. The increase in both betas on the French and German markets for this group of stocks are found to be significant based on the result of the Wald test, suggesting the existence of a structural break in beta coefficients after cross-listing.

Finally, the general result is also valid for the industry portfolios, except those in the finance and retailing sectors. There is no significant change in the French or German market betas after cross-listing for the stocks in the manufacturing and service sectors. Although the pre-listing beta on the German market index for stocks in the finance sector is not significantly different from zero, it is found that beta on the German market increases significantly, but the beta on the domestic market does not change significantly after cross-listing. This result supports the finding of Centeno and Mello (1999) on the segmentation of the bank loan markets in Europe. On the other hand, in the retailing sector, the sensitivity of returns with respect to the French market index declines significantly after cross-listing. If firms in the retailing sector operate locally, and are not known internationally, cross-listing may increase the investor base reducing cost of obtaining capital in the domestic market or may reduce domestic risk exposure. This means that the effects of cross-listing on the systematic risk structure of stocks in the finance and retailing industries are significant.

Table 1.4(b) shows the results of the analysis of the changes in risk exposure to the world market with the cross-listing. It is found that the beta on the world market is negative and significant before cross-listing, but it increases significantly after cross-listing. These results suggest that the French market is not integrated with the world market. Risk exposure to the world market increases significantly for the portfolio of stocks in the medium market value and the lowest book-to-market value groups and in the finance and service sectors. The domestic beta of the stocks in the highest book-to-market value portfolio increases significantly after cross-listing. The significant increase in the beta coefficient for the French market is consistent with the significant change in Table 1.4 (a) for the high book-to-market value portfolio. On the other hand, since in the portfolios with low book-to-market value stocks and medium market value stocks, the size of the stocks is not small, with cross-listing large stocks are more well-known in the world than the small stocks, so they seem to be more sensitive, with respect to the world market than the other stocks. Moreover, in the retailing sector, a significant decline in the beta coefficient for the French market, and in the finance and service sectors significant increases in beta coefficient for the world market can be the signs of segmentation in these sectors.

In Table 1.4(c), the changes in the three coefficients are examined together. Since the world market index is orthogonalized twice with respect to both the French market and the German market indices, the beta coefficients of the portfolios for the world market index are very close to zero. When the three coefficients are included together, only significant changes in betas are observed in the small-sized portfolio, the highest book-to-market value portfolio and the retailing and finance sectors. The significant increase in the beta coefficient of the small-sized portfolio for the world market, the significant increase in the beta coefficient of the finance sector for the German market, and the significant decline in the beta coefficient of the retailing sector for the French market index are some evidence against the integration of the markets. The small-sized portfolio's exposure to the world market risk increases significantly after the listing. Because with the cross-listing, their interactions with foreign markets increase. The results suggest that the small stocks are integrated with the German market but not with the world market. Moreover, consistent with the previous results, after the listing a significant increase (decline) in the beta coefficient for the French market index is observed in the highest book-to-market value portfolio (retailing sector). In many portfolios during the pre-listing period, the beta coefficients for the German market index are significantly different from zero, and in beta coefficients of those portfolios for the German market index no significant change is observed after cross-listing. In addition to the Investment Service Directive, another reason for this behavior might be that most of these stocks had been cross listed on the Frankfurt Stock Exchange before they began trading on the Xetra, so when these stocks were listed on the Xetra it was not the first time they enter the German stock markets. Since these stocks had already been traded on the German stock market, they might have showed a weak reaction to the cross-listing, and their sensitivity with respect to German market index might not change after the listing. Except for the finance sector portfolio, none of the portfolios' sensitivity with respect to the German market index increases after cross-listing. Before listing, stocks in the finance sector are not sensitive to the German market index, but after listing a significantly positive increase is observed in the beta coefficient of the stocks in the finance sector. This result supports Centeno and Mello (1999) which show the segmentation of the bank loan markets in Europe.

1.6.2. Tests on Cumulative Abnormal Returns and Buy-and-Hold Abnormal Returns:

In this section, in order to examine the time series patterns of the abnormal returns on the pre- and post-listing dates, a two-factor model is estimated for each stock in the sample. Then, both cumulative abnormal returns, CARs, and buy-and-hold abnormal returns, BHARs, are estimated for each stock and the cross-sectional averages of these returns are calculated for whole sample.

In addition to the results of parametric t-test statistic, the non-parametric Rank Test and the non-parametric Wilcoxon Signed Rank Test results for the CARs and BHARs are also reported. Before analyzing the significance of CARs and BHARs, in order to get some idea about the behavior of the stocks, CARs and BHARs over the event window -125 and +125 days are presented in Figures 1-6.

Figure 1 and Figure 2 show CARs and BHARs for the overall sample and market value portfolios respectively. According to both figures, the highest increase in the abnormal returns before cross-listing and the largest decline in the abnormal returns subsequent to the cross-listing are observed in the small-sized stocks, because to be able to reach foreign investors cross-listing decision is more important for small firms than for the large firms. Moreover, the increase in the abnormal returns before cross-listing may be because of the announcement of the cross-listing decisions.

Figure 3 (CAR of book-to-market value portfolios), and Figure 4 (BHAR of book-to-market value portfolios) show the grand decline in the abnormal returns of the stocks with a high book-to-market value ratio. This result is consistent with the decline in the abnormal returns of the small stocks in Figure 1 and Figure 2. However, before cross-listing, the highest increases in CAR and BHAR are observed in the medium book-to-market value ratio portfolio.

Finally, Figure 5 and Figure 6 demonstrate CARs and BHARs for the industry portfolios respectively. In Figure 5, the largest decline occurs in CARs of stocks in the retailing sector. On the other hand, the most positive reaction before the listing comes from the stocks in the manufacturing sector. Moreover, in this sector, the decline after cross-listing is quite large. Unlike CARs, the declines in BHARs for the industry portfolios are quite similar (Figure 6). The reason for this difference can be due to the difference in the calculation of CARs and BHARs. However, in the pre-listing period like CARs, the highest increase in BHARs is experienced in the abnormal returns of stocks in the manufacturing and finance sectors.

1.6.2.1 Parametric Tests:

Tables 1.5, 1.6, 1.7, 1.8, 1.9 and 1.10 show the CARs and BHARs and their corresponding t-Statistics for the whole sample and for the ten portfolios which are grouped based on their market value, book-to-market value, and industries.[12] For the portfolio covering all of the stocks both CARs and BHARs are found to be significantly negative in the post-listing period especially 40 days after the listing (Table 1.5 and Table 1.6). However, before cross-listing, even though both CARs and BHARs are positive, only CARs are significant on some days around two months before the listing. This period may correspond to the announcement of the cross-listing, hence, market might have a positive reaction to the cross-listing decision.

The results are slightly different for the market value portfolios. For the small-sized portfolio, there are significantly positive abnormal returns before cross-listing date and significantly negative abnormal returns after it. On the other hand, in the portfolios of medium-sized stocks, only significant CARs and BHARs observed are just a few days before cross-listing and they are significantly negative. This can be interpreted as the slightly early reaction of the medium-sized stocks to the cross-listing.

For the portfolio of the largest stocks, BHARs and CARs are significantly positive on some days before the listing. Unlike BHARs, CARs are significantly negative after cross-listing. However, when compared with the small-sized portfolio, the number of days on which the large sized portfolio's CARs are significantly negative is very small. Thus, the results of the t-statistics are consistent with what was observed in Figure 1 (CAR of market value and all stocks portfolios), and Figure 2 (BHAR of market value and all stocks portfolios).

When the portfolios are formed based on the book-to-market values, results are found to be slightly different. In Table 1.7 and Table 1.8, the significance of CARs and BHARs of the book-to-market value portfolio are shown respectively. Generally, in the small book-to-market value portfolio, significant BHARs and CARs are not observed. In the medium book-to-market value stocks, as in the small-sized stocks, BHARs are significantly positive prior to the cross-listing and significantly negative after cross-listing. On the other hand, CARs are insignificant after cross-listing but significantly positive before it. After the listing, significantly negative abnormal returns are found also in the stocks with the highest book-to-market value ratios.

Finally, stocks are grouped into four portfolios according to their industries. Table 1.9 and Table 1.10 impose that for the stocks in the manufacturing sector, abnormal returns before and after cross-listing are significantly positive and negative respectively. In the finance and service sectors, statistically significant abnormal returns are not detected. Finally, for the stocks in the retailing sector, abnormal returns around one hundred days before cross-listing are significantly negative. It seems that cross-listing mainly affects the stocks in the manufacturing sector. The reason for this behavior can be the more interaction of the firms in the manufacturing sector with the firms from other countries when compared with the firms in other industries.

Thus, according to the results of t-test, the greatest reactions to the cross-listing are observed in the small-sized, high book-to-market value, and manufacturing sector portfolios. Size effect identified in Dharan and Ikenberry (1995), which say that small firms prefer to be cross listed on another market just before a decline in their performance, might be an explanation for the significant reaction observed for small stocks before and after cross-listing.

6.2.2. Non-Parametric Tests:

Since some assumptions of the parametric test do not hold, the abnormal returns are also tested non-parametrically. In this section, results of the non-parametric tests (Corrado's (1989) Rank Test and Wilcoxon Signed Rank Test) presented in tables between Table 1.11 and Table 1.22 are explained.

Table 1.11 and Table 1.22 display that in the portfolio of all stocks, rank test results show the existence of significantly negative CARs and BHARs around 100 days after cross-listing. However, abnormal returns are not significant before cross-listing.

Like portfolio of all stocks, in all of the market value portfolios, significantly negative BHARs are seen after cross-listing. Even though CARs are significantly negative after the listing for the small and medium-sized portfolios, they are insignificant for the large sized portfolio. Nevertheless, significantly positive CARs before the listing are detected only in medium and large-sized portfolios. So, unlike the t-test, the Rank Test shows that the medium-sized portfolio has significantly positive CARs preceding the cross-listing and significantly negative CARs and BHARs after cross-listing.

In Table 1.13 and Table 1.14 the rank test results for CARs and BHARs of the book-to-market value portfolios are reported respectively. For the small book-to-market value portfolio, the Rank Test illustrates significantly positive CARs and BHARs before cross-listing and significantly negative CARs and BHARs after it. For the medium book-to-market value stocks CARs and BHARs are significantly positive before the listing. Finally, stocks with high book-to-market value have significantly negative abnormal returns after cross-listing. This result is consistent with what t-test illustrates for the highest book-to-market value portfolio.

Table 1.15 and Table 1.16 display significance of abnormal returns for the industry portfolios. Unlike the parametric t-test, the Rank Test finds significantly negative abnormal returns after cross-listing in the retailing and finance sectors.

However, the Rank Test does not present any significant negative abnormal returns for the manufacturing industry. On the other hand, in the retailing and finance sectors, before the listing CARs are significantly positive.

As another non-parametric test, the results of the Wilcoxon Test are presented in Tables 1.17 through 1.22. Table 1.17 and Table 1.18 imply that abnormal returns are not significant for the portfolio including all of the stocks. However, for the small-sized stocks, even though CARs and BHARs are not significantly positive before listing, they are significantly negative after it. Significantly negative CARs are experienced also in the medium-sized stocks. Nevertheless, prior to cross-listing, unlike in the small-sized stocks, in the medium-sized stocks, returns have significantly negative reaction to the cross-listing just few days before the cross-listing.

For the high market value portfolio, CARs are statistically significant neither prior to the cross-listing nor subsequent to it. But, BHARs are significantly negative after cross-listing.

The Wilcoxon Test shows that in the pre-listing period, none of the book-to-market value portfolios experience significant abnormal returns. However, in the post-listing period, CARs of the low and high book-to-market value portfolios and BHARs of the medium and high book-to-market value portfolios are significantly negative.

Finally, Table 1.21 and Table 1.22 report the Wilcoxon Test's results for the industry portfolios. They indicate that unlike the t-test, the Wilcoxon Test finds that in the retailing industry stocks have significantly positive abnormal returns before listing. On the other hand, in the manufacturing sector, significantly positive abnormal returns observed in results of the t-test cannot be observed in the results of the Wilcoxon Test. Nevertheless, like the t-test, BHARs and CARs are significantly negative after the dual-listing.

In the finance sector, the rank test and the Wilcoxon test results support each other in such a way that according to both methods BHARs are significantly negative. For the service sector, almost all of the parametric and non-parametric methods reach the same conclusion that stocks in the service sector do not experience significant abnormal returns.

The parametric and non-parametric tests of abnormal returns are summarized in Table 1.23 which illustrates that the small-sized and high book-to-market value stocks have significantly negative abnormal returns in the post-listing period. Thus, it can be argued these results are consistent with Dharan and Ikenberry (1995) which show that small-sized firms prefer to be listed on another market just before an expectation of a decline in their performance.

However, for the stocks with medium market value, the non-parametric test results reveal significantly positive abnormal returns before cross-listing and significantly negative abnormal returns after cross-listing, which cannot be observed using the parametric t-test. In addition, significantly negative CARs for the low book-to-market value portfolio are observed when the non-parametric methods are employed.

In the industry portfolios, the t-test shows that only stocks from the manufacturing sector have significant abnormal returns. However, the non-parametric test results illustrate that stocks in the finance and retailing sectors experience significantly negative abnormal returns in the post-listing period. Since the number of stocks included in each portfolio is not enough to satisfy the normal distribution assumption, differences between the t-test results and the non-parametric test results are observed. In this case, the results of the non-parametric tests can be used in the interpretation of behavior of abnormal returns. Moreover, among the non-parametric tests, the Corrado's Rank Test and the Wilcoxon Signed Rank Test, conflicting results especially in the pre-listing period are observed sometimes. For example, even though the Rank Test shows significant abnormal returns for the lowest and medium book-to-market value portfolios and the retailing and finance sectors before cross-listing, the Wilcoxon Signed Rank Test does not show any significant abnormal returns in the same period. For the Wilcoxon Signed Test not only the sign but also the magnitude of the difference is important. So, this conflict may illustrate that in the pre-listing period there are some positive abnormal returns for the lowest and medium book-to-market value portfolios and the retailing and finance sectors, but their magnitude are not great.

1.7 CONCLUSION

In this chapter, changes in the behavior of returns on French stocks after their cross-listings on a German stock market, the Xetra, are examined for all stocks in the sample and for some portfolios. It is observed that the sensitivity of stock returns with respect to the German market index does not change significantly in all of the portfolios except those in the finance sector. Since the French stocks cross-listed on the Xetra had already been traded on another German market, the Frankfurt Stock Exchange, before their cross-listings on the Xetra, it is possible not to observe significant changes in beta coefficients for the German market index.

On the other hand, significantly positive and significantly negative changes in the sensitivity for the French market index are detected in the high book-to-market value portfolio and the retailing sector portfolio respectively. For the retailing sector it might be thought that after the listing, the interaction of the firms in this sector with the foreign markets increases, so their exposure to French market risk declines.

In the three-factor model, where exposure to the French, German and world market indices are included, after cross-listing the world market risk increases only for the small-sized portfolio. This means that cross-listing mostly affects small stocks which may be more closed to the foreign markets before the listing. With cross-listing, they are more likely to expose to the world market risk.

In the analyses of abnormal returns, significantly negative abnormal returns after listing are observed mainly in the small and medium-sized stocks and the high and medium book-to-market value portfolios. One of the explanations for this behavior can be the preferences of the small firms about the timing of the cross-listing decision as identified in the Dharan and Ikenberry (1995). In addition, it can also be argued that investors in overreaction to the cross-listing of small firms, because through cross-listing small firms increase their interactions with foreign markets.

Of course, some differences between the parametric and non-parametric methods are observed in this study because of the small number of stocks included in each portfolio. It does not satisfy the normality assumption required for the parametric t-test. Major differences are detected in the industry portfolios, for example although the parametric t-test does not show significant abnormal returns in the retailing and finance sectors, the non-parametric methods illustrate significant abnormal returns in these industries.

In general, negative abnormal returns after cross-listing are observed more often in the manufacturing, retailing and finance sectors. The observations in the finance sector are consistent with Centeno and Mello (1999) which show segmentation of bank loan markets among the European countries. On the other hand, when compared with the other sectors, for example the service sector, the manufacturing sector requires major interactions with foreign markets in order to maintain a competitive position. Cross-listing helps firms in the manufacturing sector increase their interactions with foreign markets. Therefore, in this sector, the cross-listing decision is perceived positively, and it improves the integration of firms in the manufacturing sector with other similar firms in the world.

The results of the analyses in this study show some evidence in favor of partial segmentation between the French and German stock markets. Because, even though no significant change in systematic risks of stocks of the overall sample is observed, in some portfolios such as the small and medium-sized portfolio and the manufacturing, retailing and finance sectors, the Paris Bourse and the Xetra may not be integrated.

One limitation of this study is that 28 out of 34 French stocks included in the sample have already been traded on the Frankfurt Stock Exchange. Hence, the changes in abnormal returns and systematic risk of French stocks after cross-listing can be attributed to the difference between the Xetra and the Frankfurt Stock Exchange rather than to the segmentation between the French and German stock markets. All market participants have equal access for trading on the Xetra, regardless of their geographic location in the world. This characteristics of the Xetra can be identified as an advantage by the investors and may cause French firms to cross list their stocks on the Xetra, even though they have been already listed on the other German stock markets.

In addition to the examination of the changes in risk exposures and abnormal returns of the French stocks after their cross-listings, changes in liquidity and price volatility of the cross-listed stocks can also be analyzed in order to make some inferences about the integration of the French and German stock markets. This is the purpose of the second chapter in this thesis.

CHAPTER II

LIQUIDITY AND PRICE VOLATILITY OF CROSS-LISTED FRENCH STOCKS

2.1 INTRODUCTION

The integration of capital markets has received the attention of several researchers recently. Most of the studies examine whether several exchanges in the world have been integrated with the U.S. markets[13], and their results support segmentation hypothesis. Since the European Union aims for the economic, commercial and political integration of the European member countries, as a part of this integration, it is interesting to examine whether the European capital markets are integrated or segmented.

The cross-listed stocks provide a mechanism to test the integration of capital markets.[14] Errunza and Losq (1985) and Alexander, Eun, and Janakiramanan (1987) develop equilibrium models for the pricing of stocks that are traded on both domestic and foreign markets. These two studies provide some evidence regarding the integration of the capital markets, examining the abnormal returns of the cross-listed stocks. They show that if the markets are segmented, the equilibrium price will increase and the expected rate of return on the stock will decline after cross-listing. In the first chapter of this thesis, the changes in the risk and return structure of the stocks are examined after cross-listing. It is found that although the French and German markets can be considered as integrated, the integration of these markets for small stocks and the manufacturing, retailing and finance sectors is questionable. Because, in the post-listing period, significantly negative abnormal returns are observed for these portfolios. Moreover, for the retailing sector beta coefficient for the French market index significantly declines and for the finance sector the beta coefficient for the German market index significantly increase after cross-listing.

The effects of cross-listing on the volatility and liquidity of stocks when it is costly to acquire information in the market are examined by Domowitz, Glen and Madhaven (1998). Their theoretical model illustrates that price volatility declines and liquidity increases after cross-listing, when the markets are integrated. This model can be used to make some inferences about integration of markets.

If investment barriers, such as transaction cost, regulatory restrictions, taxes, and information limitations are the reasons for the existence of segmented markets, it is not expected to observe segmented markets in the European Union (EU) countries since several steps have been taken to create an integrated market. For example, after January 1999 European investors do not need to hedge their investments against changes in exchange rates because of the adaptation of the single currency, the Euro. In addition, since January 1996, with the Investment Service Directive, investment firms that satisfy the regulatory requirements in any EU country can trade on other EU markets, eliminating trading barriers for investment firms.

The objective of this chapter is the same with the objective of the first chapter; to analyze the changes in liquidity and volatility of prices of cross-listed French stocks after cross-listing on the Xetra, the electronic trading stock exchange market of Deutsche Bourse. However, in this chapter, using, the volatility and liquidity of the French stocks rather than the systematic risk and abnormal returns of them are examined before and after being listed. Using Domowitz Glen and Madhaven 's (1998) model it will be possible to make some inferences about the integration vs. segmentation of the French and German stock markets. In the literature, most of the previous studies which examine the integration of the capital markets, analyze the changes in systematic risk and abnormal returns after cross-listing. So, this study is different also from most of the previous studies in terms of providing evidence for the integration vs. segmentation of the capital markets by examining the volatility and liquidity of the stocks instead of systematic risk and abnormal returns of them. The time frame for this study is from November 29, 1997, the first trading date on the Xetra, to February 2000.

Also, unlike in most of the previous studies that examine the behavior of cross-listed stocks, several restrictions are imposed on the selection of cross-listed stocks for the sample in order to eliminate the impact of other factors, (such as cross-listing on another stock market, earnings announcements, and dividend payments…etc.), that might affect the behavior of stock prices. Therefore, the effects of the other events on the behavior of the stocks are eliminated.

The chapter is organized as follows. Section 2 presents relevant literature on liquidity and volatility/risk changes after cross-listing. Section 3 identifies data and a testable hypothesis. The method used in the analysis is presented in Section 4. Section 5 summarizes the results. Section 6 concludes the chapter.

2.2 LITERATURE REVIEW

In this section, previous studies examining the liquidity and(or) volatility/risk of the cross-listed stocks are explained. In the literature, when compared with the number of studies examining the return of the cross-listed stocks, the number of studies analyzing the liquidity and(or) volatility/risk of the stocks is very small. Since, the examination of changes in volatility in the test of integration of capital markets is a quite recent method (starting towards the end of 1990s) when compared with the examination of changes in the systematic risk of stocks. Howe and Madura (1990), Jayaraman, Shastri and Tandon (1993), Ko, Lee and Yun (1997), Domowitz, Glen and Madhavan (1998), Martell, Rodriguez and Webb (1999), Ramchand and Sethapakdi (2000), and Coppejans and Domowitz (2000) are some of the articles mainly discussing liquidity and(or) volatility/risk changes in the stocks after their cross-listings.

Howe and Madura (1990) conduct one of the initial studies testing the integration of the capital markets by analyzing changes in the systematic risk of cross-listed stocks. They use the US stocks listed either on Australia, Belgium, the Netherlands, Germany, France, Japan, or Switzerland between 1969 and 1984. They do not observe any significant change in domestic and foreign betas. Moreover, there is no significant change in the standard deviations of the stocks after cross-listing. Based on these results they claim that either markets are integrated or cross-listing does not reduce segmentation. However, in their analyses they do not convert their variables into a common currency. Since the same currency is not used in the analysis, fluctuations in the exchange rates may prevent us to observe some changes in the systematic risk. So, this weakness of the study might affect the results.

The second study, Jayaraman, Shastri and Tandon (1993) discuss the effects of listing ADRs on the volatility and return of 95 stocks from the British stock markets, Japanese stock markets and some stock emerging markets. The comparisons of variances and excess returns for the pre- and post-listing periods show that both return and variance increase in the post-listing period. They claim that the existence of informed traders increases volatility after cross-listing because cross-listing leads the informed traders to trade on both markets, and to earn more abnormal return due to information differentials in the markets.

Unlike Jayaraman, Shastri and Tandon (1993), Ko, Lee and Yun(1997) study the changes in return and price volatility of 24 Japanese firms after their cross-listings on either the NYSE or the OTC. They find that cross-listing does not create abnormal returns, but increases volatility. Their results are not sensitive to the NYSE or OTC listings.

Among the studies analyzing in liquidity and volatility changes, Domowitz, Glen and Madhaven (1998) is the only theoretical study which develops a model to examine the changes in volatility and liquidity of the stocks after cross-listing. In their model, under different levels of integration between markets investors maximize their expected utility in determining the market to trade and their optimal order, when information is costly. The volatility of stock price consists of two components in this model: a) base-level volatility arising from the bid-ask spread and variance of overnight public information, and b) volatility occurring due to microstructure frictions. The second component of the volatility is proportional to the expected daily volume which is a function of liquidity.

They show the changes in the liquidity and volatility after cross-listing in three types of markets. The first case is when the markets are integrated, i.e.

information on prices and quotas are transparent in both markets, volatility will decline and liquidity will increase after cross-listing of the stocks. Since in integrated capital markets information flow is perfect, the total number of traders increases and the bid-ask spread declines because of inter-market price competition. Second, in fragmented (segmented) markets, information flow is very poor, and because of poor information flow, the volatility of the stock price increases after cross-listing. Moreover, since there is no prefect information flow between the markets, the number of total traders does not increase and if the trading in foreign market is cheaper, some of the traders may start to trade on the foreign market. With the effect of order flow migration, liquidity declines in the domestic market. Finally, when there is a partial segmentation between capital markets, domestic marketmakers observe foreign prices with noise, and the effects of the cross-listing are concentrated in some segments of the market. In these markets, because of order flow migration, liquidity may decline. The change in volatility depends on the information flow between markets. If the information flow is poor or if new investors in the foreign market have low quality information signals, volatility will increase after cross-listing. However, if intermarket information links are relatively good and the new investors trading on the foreign market contribute price discovery , volatility will decline after cross-listing.

Domowitz, Glen and Madhaven (1998) test their model empirically by using Mexican stocks cross-listed as ADRs between 1989 and 1993. They measure the liquidity with volume and the price volatility with the square of the first order difference of the prices. The results show that after cross-listing liquidity declines and volatility increases and with increased competition, spreads decline on the

Mexican Stock Exchange. Thus, they reject the hypothesis about the integration of the capital markets.

Unlike Domowitz, Glen and Madhaven (1998), Martell, Rodriguez and Webb (1999) are interested in ADRs not only from Mexico but also from Argentina, Brazil, Chile and Venezuela. They analyze the changes in return and volatility of 23 ADRs over a sample period between 1990 and 1997. They measure the volatility with the market adjusted variance ratios that are calculated by dividing the market adjusted return variance in the post-listing period by that in the pre-listing period. The variance of each stock is adjusted for market volatility by dividing it with the contemporaneous variance of the local market index return. They fail to reject the null hypothesis of no change in volatility of the stocks after their cross-listings. However, the volatility of the stock price is affected by trading volume. Martell , Rodriguez and Webb (1999) do not make any adjustment in volatility for the changes in volume.

On the other hand, Coppejans and Domowitz (2000) do make the necessary volume adjustments in the calculation of volatility of Mexican stocks cross-listed on the US stock markets as ADRs over the period from 1990 to 1993. Moreover, to control the effects of economy wide events on the volatility of the cross-listed stocks, they use control groups consisting of Mexican stocks which are not traded as ADRs. They find that the volatility of stocks that are cross-listed as ADRs increases after cross-listing implying the segmentation of the Mexican and the US markets.

Final study identified in the literature review section, Ramchand and Sethapakdi (2000), examine the changes in the systematic risk of cross-listed US stocks to test the integration of the US stock markets with other foreign markets between 1986 and 1999. They illustrate that after cross-listing, the volatility of stock price and systematic risk decline. The decline in systematic risk is proportional to the issue sold abroad; the greater the proportion of the issue sold abroad, the larger the decline in beta. Furthermore, the decline in the systematic risk is observed even after controlling for leverage, volume, and issue characteristics (such as size). They conclude that to issue stocks in a foreign market increases the value of the firm and reduces their cost of capital.

Thus, most of the studies analyzing the volatility of the stocks show that volatility of the stock price increases after cross-listing. Moreover, many of the studies examining the volatility/risk of the stocks are aiming at testing the integration of capital markets. Several of them imply segmentation of the US markets with other capital markets.

Finally, in the literature previous studies analyze the changes in liquidity and(or) volatility/risk of the stocks to provide implication for the integration of the US stock markets with the other markets. However, there is no study examining the changes in liquidity and(or) volatility/risk of the European stocks to make some inferences about the integration among the European markets.

2.3 DATA AND HYPOTHESIS

In the development of the hypothesis Domowitz, Glen and Madhaven's (1998) model is employed. Because of recent developments and the elimination of several restrictions for trading on the European markets, it can be assumed that there is a perfect information flow between the French and German stock markets, and these markets are integrated. When the French stocks are cross-listed on the Xetra, it is expected that volatility of the stock prices will decline and liquidity of the stock will increase after cross-listing on the Paris Bourse. So, it can be assumed that if the French and German markets are integrated, the volatility of the prices of the French stocks will decrease and their liquidity will increase on the Paris Bourse after cross-listing.

However, if the markets are not integrated, liquidity in the French market will decline and the volatility of the stock prices may increase or decrease depending on the quality of the information flow between the markets.

The hypothesis is tested for French stocks cross-listed on the Paris Bourse and the Xetra between November 29, 1997 and February 2000. During this period, 93 French stocks started to be traded on a German electronic market, the Xetra. Out of the 93 French stocks, 53 of them were cross-listed in 1998, 18 of them in 1999, and 21 of them in the first and second months of 2000.

Several factors might affect the volatility and liquidity of the stocks besides the cross-listing. In analyzing the impact of cross-listing on market quality measured by price volatility and liquidtiy, the impact of the other factors has to be eliminated. Unlike most of the previous studies, in this study, the impact of other events such as; cross-listing on other stock markets, dividend payments, and earnings announcements on the behavior of cross-listed stocks are considered. First, 54 French stocks entering other stock markets either 100 days before or 50 days after its cross-listing date on the Xetra are excluded from the sample. This restriction removes the effects of cross-listing on other stock markets in addition to the Xetra on the behavior of the French stocks.[15]

Second, the stocks with dividend payments close to the cross-listing dates are eliminated from the sample. As Ogden (1994) explains, stockholders have a tendency to reinvest their dividend income in the stock of the dividend paying firm. Hence, dividend payments might affect the demand for the stocks and their behavior. Two stocks which had dividend payments 5 days before or 10 days after their cross-listings are excluded from the sample.

Third, in the Paris Bourse, there are different segments and in each segment, the operating procedures and size of the stocks are different. Among the segments of the Paris Bourse, in the Reglement Mensue, (RM), large and highly liquid stocks are traded on a monthly settlement basis. Biais, Bisiere and Decamps (1999) show that, because of the difference in trading procedures, investors place different types of orders and stocks react differently to some news in these segments. For example, market sell orders are less frequent on the spot market segment than the segment called Reglement Mensue. To eliminate the effects of different segments on the pricing of the stocks, four stocks traded on other segments of the Paris Bourse are dropped. Only the stocks traded on the Reglement Mensue are included in the sample.

Finally, since Gajewski (1999) shows that on earnings announcement dates, the trading volume and price of the stock rise, the influence of earnings announcements is also considered. In France, the net incomes of the firms are announced only in the final report which is published in the second or third month of the year. However, since all of the stocks are cross-listed on the Xetra at least 40 days after their earnings announcements, no stock is eliminated from the sample because of this restriction.

After all these eliminations 34 French stocks that are traded on the Reglement Mensue segment of the Paris Bourse remain in the sample. Among the 34 French stocks, some stocks delisted from the Xetra before February 2000 are also included, so there is no survivorship bias as identified in Banz and Breen (1986). Furthermore, 28 of them were already listed on the Frankfurt Stock Exchange. Six stocks, Cpr. Paris, Gaz and Eaux, Labinal, Michline, Seb and Sge are listed only on the Xetra. The daily closing prices, opening prices, trading volume, market and book-to-market value of these 34 stocks were obtained from *Datastream*. *Datastream* adjusts prices for dividend payments and stock splits, and trading volumes for capital changes. The daily market index used in the model is *Datastream*'s value weighted French market index.

2.4 METHOD

In the analysis of price volatility and liquidity before and after cross-listing an empirical model similar to Domowitz, Glen and Madhaven 's (1998) model is used. In their model volatility is separated into two components: i) base-level volatility arising from the bid-ask spread and variance of overnight public information, and ii) transitory volatility arising from microstructure frictions and information asymmetry. Hence, the impact of these components on total volatility of stock prices is examined. The squared daily price change, $(\Delta P_t)^2$, is taken as a proxy for unobserved price variance, and it is assumed that base-level volatility of today may be related to price changes on the previous day. In the model, trading volume is inversely related to market liquidity.

Like the analyses in chapter one, in this analysis, the Generalized Method of Moments is preferred to the OLS and the hypothesis about the integration of the capital markets is tested using the following Generalized Method of Moments, GMM. :

$$(\Delta P_t)^2 = \gamma_0 + \gamma_1 D_t + \delta_0 (\Delta P_{t-1})^2 + \delta_1 (\Delta P_{t-1})^2 D_t + \lambda_0 V_t + \lambda_1 V_t D_t + \eta_t \qquad (2.1)$$

t=-250,…0,…,+250 days

where

P_t: The closing price of the stock on day t in the French Franc.

V_t: Trading volume on day t

D_t: A dummy variable which is equal to 1 after cross-listing date, and 0 otherwise.

γ_0: Base-level volatility

γ_1: Change in base-level volatility after cross-listing

$1/\lambda_0$: Market liquidity

$1/\lambda_1$: Change in market liquidity after cross-listing

δ_0: The effect of the previous day's volatility on today's volatility

δ_1: The change in the effect of the previous day's volatility on today's volatility after cross-listing.

η_t: The error term

The event window is specified as –250 and +250 days with respect to the cross-listing dates, and standard errors are corrected for autocorrelation and heteroskedasticity (Newey and West(1987)). It is expected that if the markets are integrated, γ_1 and λ_1 will be significantly negative. Hence they show a decline in volatility and an increase in liquidity after cross-listing.

Volatility, calculated from the closing prices, includes volatility during both trading hours and non-trading hours. In order to separate overnight public information volatility from trading hours' volatility, price changes during trading hours are calculated using the opening and closing prices. In this study, using opening price data, volatility only during trading hours which is square of the difference between closing price and opening price is calculated. Thus, the effect of overnight information flow on the price volatility of the stock price is eliminated. With this new model it becomes possible to measure whether the change in the base level volatility after cross-listing is the result of only bid-ask bounce or overnight information flow.

Moreover, as another extension of Domowitz Glen and Madhaven's (1998) model, the effect of market volatility on the stock volatility is controlled for. Since the change in volatility may be not only because of cross-listing but also the volatility in the market. In the new model, a new variable $(\Delta I_t)^2$, which measures the volatility in the French market index, is added into the original model.

$$(\Delta P_t)^2 = \gamma_0 + \gamma_1 D_t + \delta_0 (\Delta P_{t-1})^2 + \delta_1 (\Delta P_{t-1})^2 D_t + \lambda_0 V_t + \lambda_1 V_t D_t + \phi (\Delta I_t)^2 + \eta_t \qquad (2.2)$$

where

I_t: *Datastream's* French market index at the closing of day t .

These three major models are re-estimated using turnover rate as another measure of liquidity. By replacing trading volume with turnover rate, which is the ratio of trading volume to the number of shares outstanding, the adjustment for the stocks with different number of shares outstanding is made.

Finally, using opening and closing prices, changes in overnight volatility and trading-hour volatility are examined separately with the following model:

$$(\Delta P_t)^2 = \alpha_0(\Delta NP_{t-1})^2 + \alpha_1(\Delta NP_{t-1})^2 D_t + \delta_0(\Delta P_{t-1})^2 + \delta_1(\Delta P_{t-1})^2 D_t + \lambda_0 V_t + \lambda_1 V_t D_t + \eta_t \qquad (2.3)$$

where

$(\Delta P_t)^2$:Trading hour volatility of the stock on day t in the French Franc, $(PC_t\text{-}PO_t)^2$. PC_t: Closing price on day t. PO_t: Opening price on day t.

$(\Delta NP_t)^2$: Overnight volatility of the stock on day t in the French Franc, $(PO_t\text{-}PC_{t-1})^2$

$(\Delta P_{t-1})^2$:Trading hour volatility of the stock on day t-1 in the French Franc, $(PC_{t-1}\text{-}PO_{t-1})^2$

α_0: Measure of overnight volatility

α_1: Change in the overnight volatility after cross-listing

$1/\lambda_0$: Measure of market liquidity

$1/\lambda_1$: Change in market liquidity after cross-listing

δ_0: The effect of the previous day's trading hour volatility on today's trading hour volatility

δ_1: The change in the effect of the previous day's trading hour volatility on today's trading hour volatility after cross-listing.

Stocks are grouped based on their size, book-to-market value and industry. 34 French stocks in the sample are divided equally into six groups as small, middle and large depending on their market value and book-to-market value. Portfolios are equally weighted. In the computation of the book-to-market values, considering the existence of three months of lag between the year-end date of the firm and the time at which balance sheet information is available to the investors, look-ahead bias is eliminated (Banz and Breen (1986)).

2.5 RESULTS

In this section some descriptive statistics and the results of the four models, using volume and turnover, are discussed for the individual stocks and portfolios in tables Table 2.1 through Table 2.12. As presented in the first chapter, the mean return is found to be higher in the pre-listing period than the post-listing period (Table 1.3 (c)). However, the difference is not statistically significant. The standard deviations of the stock returns are higher after cross-listing. In most of the portfolios, after cross-listing, kurtosis declines and the returns become more skewed to the left.

In Table 2.1, it is shown that in the overall sample, average trading volume increases and the standard deviation and kurtosis of volume decline after cross-listing. The same pattern is observed in medium and large sized portfolios and all of the book-to-market value portfolios. However, a significant increase in the average trading volume is found only for the large market value and medium and high book-to-market value portfolios.

In the small market value portfolio and the retailing sector portfolio the average daily trading volume declines. However, they are not statistically significant. This may occur because of order flow migration after cross-listing. For small-sized stocks, the standard deviation and kurtosis of volume increase in the post-listing period. However, unlike in the small sized portfolio, in the retailing sector, the standard deviation declines. In the manufacturing, finance and service sectors average trading volume subsequent to the listing increases, but only in the finance and service sectors these increases are significant. Among the industries, an increase in the standard deviation is observed in only the finance sector portfolio. Except for the small-sized portfolio, and the finance and service sectors, all of the portfolios skew towards the right and kurtosis declines in the post-listing period.

Table 2.2 presents the changes in the average turnover which is equal to trading volume divided by the number of shares outstanding. Since trading volume might increase with the number of shares outstanding, turnover rate is also calculated. For all of the portfolios except for the large-sized portfolio and service sector portfolio, a decline in average turnover is observed after cross-listing. In the retailing sector, the manufacturing sector and the small-sized portfolios the declines are statistically significant. In the post-listing period, the standard deviation and kurtosis decline in all of the portfolios.

Table 2.3 illustrates average price volatility during a day (Close-to-close), trading hours (Open-to-close) and non-trading hours (Close-to-open) in the pre- and post- listing periods. Average volatilities are calculated as the square of the difference between two prices. In all of the portfolios, volatility during trading hours is found to be greater than the volatility during non-trading hours. Moreover, increases in volatilities during a day, trading hours, and non-trading hours are observed after cross-listing for all of the portfolios except the small market value and the high book-to-market value portfolios. These increases are found to be significant in the overall sample, the medium and large market value portfolios, the low book-to-market value portfolio and the finance sector and service sector. The increase in volatility after cross-listing implies imperfect information flow between the French and German capital markets. It suggests that after cross-listing, noise trading or informed trading on the Paris Bourse increases.

Table 2.4 shows the estimated percentage bid-ask spreads for each portfolio in the whole period, the pre-listing period and the post-listing period which can be useful in interpreting the changes in liquidity after cross-listing. The spreads are calculated using the Roll ‘s (1984) model, ($Spread=200[(-Cov(R_t, R_{t-1}))^{0.5}]$, where R_t is the return of the stock on day t). After cross-listing, in all of the portfolios, estimated spread increases. This increase in spread indicates an migration of the orders to the Xetra and a decline in liquidity after cross-listing.

In tables Table 2.5 to Table 2.11, the GMM results for the changes in the volatility and liquidity subsequent to the cross-listing are presented. The four models are estimated for each stock separately to eliminate the effects of averaging in portfolios. Table 2.5 illustrates the results for equation (2.1) in which changes in liquidity and close-to-close price volatility after cross-listing are examined. In 20 stocks out of 34 stocks increases in volatility after cross-listing are observed. In 9 stocks of that 20 stocks the increase in the volatility is statistically significant. On the other hand, 14 stocks have a decline in volatility after the listing and only 3 of them are statistically significant. In the table, the median value of the change in base level volatility, (γ_1), is equal to 0.908. In most of the stocks increase of volatility in the post-listing period is observed, when volatility is calculated from closing prices, this increase in price volatility cannot be explained with changes in volume since trading volume is controlled in the model. The reason for the increase in the volatility may be either poor information flow between the markets or the increase in the market volatility.

When liquidity changes are examined, in the 24 stocks declines in liquidity (positive λ_1) are seen. In 6 of those the declines are statistically significant. Only 10 stocks have an increase in liquidity and 5 of them have significant increases. From the table, the median value of λ_1 is positive and equal to 0.016.[16] The decline in the liquidity suggests the order flow migration from the Paris Bourse.

In Table 2.6, the results for each stock are presented, when open-to-close volatility and trading volume are used in the model. By using open-to-close volatility, overnight volatility is eliminated and it is observed that volatility increases (decreases) in 19 (14) stocks after their cross-listings.[17] Among these rises (declines) 6 (3) of them are statistically significant. The median value for the coefficient of base level volatility change is calculated as 0.591. It indicates that trading hour volatility increases after cross-listing.

Furthermore, 9 significant and 16 insignificant liquidity declines are observed in Table 2.6. Quite consistent with Table 2.5, 8 liquidity increases are found, and only 2 of them are significant. The median coefficient for liquidity change is equal to 0.020. Also in this model, the decline in liquidity refers to the order flow migration after cross-listing.

Table 2.7 presents the changes in volatility and liquidity after cross-listing, when the effects of market volatility are controlled in the model. As can be seen from the table, the number of stocks with volatility declines increases to 19, but only 4 of them are statistically significant. On the other hand, 15 stocks have volatility increases, and 6 out of 15 stocks have significant increases. Unlike in Table 2.5 and Table 2.6, in this table the median value of γ_1 is negative, -1.915. It means that some of the increases in the price volatility of the stocks observed in Table 2.5 are not only from the poor information flow between the capital markets, but also from the increase in market volatility. Interestingly, no significant change in the price volatility of stocks is observed for the stocks that are listed on the Xetra but not in the Frankfurt Stock Exchange.

In Table 2.7, however, consistent with Table 2.5 and Table 2.6, 24 liquidity declines and 10 liquidity increases are observed. 7 of the liquidity declines and 5 of the liquidity increases are significant. Similarly, inconsistent liquidity behavior is observed for the six stocks that are cross-listed on the Xetra but not on the Frankfurt Stock Exchange. When the volatility in the market is controlled for, a significant increase in liquidity is found for two stocks and for one stock, Gaz and Eaux one significant decline in liquidity is detected.

The changes in volatility and liquidity when turnover instead of trading volume is used are illustrated in tables 2.8 through 2.10. In these tables, the effect of the number of shares outstanding on trading volume is also considered. Table 2.8 shows that 20 stocks against 14 stocks have volatility increases in the post-listing period, and 9 of them have statistically significant increases against the 4 stocks which have significant declines in their volatilities. The median value of the coefficient of volatility changes is equal to 0.225.

Even though a different measure, turnover rather than trading volume, is used in Table 2.8, the results of the liquidity changes do not change much. Still the number of liquidity declines, 23, is greater than the number of liquidity increases, 11. Moreover, median value of the beta coefficient for the change in liquidity, $1.579\ 10^3$, is referring a decline in the liquidity.

When trading hour volatility is used in the model, Table 2.9 shows that in 19 stocks volatility increases, and in 14 stocks volatility declines are detected. 6 of the increases and 3 of the declines in volatility are statistically significant. The median coefficient of volatility change is 0.558 in this model. On the other hand, liquidity declines in 26 stocks, and 8 of them are statistically significant. The median of liquidity change coefficient is positive, 4.338 10^3, also supports the decline in liquidity.

In Table 2.10, the impact of market volatility on stock volatility is controlled, and the results illustrate that some of the volatility increases observed in previous tables are the results of the increase in market volatility. However, in spite of the elimination of market volatility, in 16 stocks volatility increases are observed, and 4 of 16 volatility increases are statistically significant. Similar to previous results, liquidity declines occur in 23 stocks. 9 of the liquidity declines and 4 of the liquidity increases are statistically significant. The median coefficient for liquidity changes, λ_1, is equal to 2.098 10^3.

Based on this data, it can be argued that both trading volume and turnover provide similar results. According to both models, liquidity decline is observed in most of the stocks. This result is consistent with increases in the spread which indicate liquidity declines as seen in Table 2.4. Without controlling for market volatility, in many stocks volatility increases. However, even though when market volatility is controlled, the number of stocks with volatility the declines becomes greater than with volatility increases.

Table 2.11 shows the estimates when the effects of overnight volatility and trading hour volatility of the previous date are examined separately. The number of stocks having an increase in overnight volatility (16) is almost equal to the number of stocks having a decline in overnight volatility (17) in the post-listing period. However, after cross-listing in 21 stocks trading hour volatility of the previous date increases and only in 12 stocks trading hour volatility of the previous date declines.

These results may imply an increase in noise trading after cross-listing. The median coefficients suggest that overnight volatility declines but on trading hour volatility increases after cross-listing.

On the other hand, the results for the changes in liquidity after cross-listing is consistent with the previous results. For 25 stocks (18 of them statistically significant) a decline in liquidity and for 8 stocks (7 of them statistically significant) an increase in liquidity are observed in the post-listing period.

In Table 2.12, median values of the changes in the volatility and liquidity of the stocks are presented for the market value, book-to-market value and industry portfolios to provide some information about the differences between the portfolios. In general, the greatest increase in volatility is observed for the medium-sized portfolio, medium book-to-market value portfolio and service sector portfolio. On the other hand, the highest decline in liquidity occurs in the large-sized portfolio, high book-to-market value portfolio, and service sector portfolio. Since companies in the service sector may be considered more domestic compared to the other sectors, and these firms may have the weakest interaction with the foreign firms, the cross-listing affects them more than the other sectors.

2.6 CONCLUSION

In this chapter, the changes in the volatility and liquidity of French stocks are examined before and after their cross-listing and the results indicate that in general, for many stocks volatility of stock prices during trading and non-trading hours increase after cross-listing. Furthermore, similar results are obtained when market volatility in the Paris Bourse is controlled for.

Unlike expectations, for many stocks liquidity is found to decline after cross-listing, suggesting migration of orders to the Xetra after cross-listing. All of these results suggest that for many stocks the results obtaineds are against the integration of the French and German markets during the period analyzed in this study.

Considering all of the efforts of the European Union for the integration of these markets, it is expected to observe complete integration of these two markets. According to Domowitz, Glen and Madhaven (1998), if these markets are integrated, it is expected that the volatility of stocks would decline and their liquidity would increase after cross-listing. However, the results of this chapter show that after cross-listing, the liquidity declines and the volatility of stock prices increases for most of the stocks. Thus, the results of the all models are consistent with Rouwenhorst (1999) which shows the lack of the integration between the French and German capital markets. Moreover, the increase in volatility of most of the stocks after cross-listing suggests that there may be can be the poor information flow between the French and German stock markets.

Nevertheless, there are some weakness in the measure of volatility and liquidity. First instead of volatility of returns, the square of the price change is used as a measure of volatility measure in the analysis.

Second, although similar results are obtained when volume and turnover are used in the analysis, the widely used measure of liquidity, bid-ask spread is not used in the analysis. It would be interesting to examine the behavior of bid-ask spread before and after cross-listing when the date become available.

CHAPTER III

COINTEGRATION BETWEEN THE FRENCH AND THE GERMAN STOCK MARKETS: EVIDENCE FROM CROSS-LISTED FRENCH STOCKS

3.1 INTRODUCTION

In the last five years, the developments towards the economical and financial integration of the member countries of the European Union (EU) have increased the interaction between capital markets of the member countries. One of these developments is the Investment Service Directive which was enacted in January 1996. According to this directive, any European intermediary company that operates in the domestic country's financial markets is allowed to operate in the financial markets of the other EU countries as well. Therefore, the free flow of capital between European Union countries becomes easier.

The second development is the adaptation of a single currency, the Euro, in January 1999. The existence of the single currency for EU members eliminated the foreign exchange risk in the capital market transactions of the European Monetary Union countries, Germany, France, the Netherlands, Belgium, Luxembourg, Spain, Portugal, Italy, Ireland, Austria, and Finland. This has made the capital market transactions between these countries attractive for European investors.

In the first and second chapters of this thesis, changes in the behavior of French stocks after cross-listing are examined, and the results show that some evidence imply the segmentation of the markets. However, the long-run relationship and the stock price adjustment process between these markets are not examined yet. Thus, this chapter analyses the cointegration and the price adjustment process between the capital markets of the two European Union countries, France and Germany. This will be accomplished by examining the prices of the French stocks cross-listed both on the Paris Bourse and the Frankfurt Stock Exchange from January 1999 to August 2001.

In the analysis, two problems observed in previous studies have been eliminated. First, unlike in many previous studies, in this paper, prices of the cross-listed stocks are used instead of market indexes. Since two price series are used for the same stock, any impact of stock characteristics on the cointegration and price adjustment processes are eliminated. Second, since the sample covers the time period after the adaptation of the Euro, the exchange rate risk problem has been removed. The prices for both the French and German stocks exchanges are expressed in terms of the Euro. Therefore, the effect of exchange rate fluctuations that are found to be a significant factor affecting the stock prices on the foreign market (Eun and Jang (1997)), will not be observed.

This chapter tests whether prices of the French stocks on the Frankfurt Stock Exchange can be predicted by that on the Paris Bourse or vice versa in recent years. In the literature, there are some studies analyzing the cointegration of capital markets in the European capital markets such as Arshanapalli and Doukas (1993), however they examine the periods before 1999, so this study can also be considered interesting in terms of providing recent evidence about the predictability of stock prices on the stocks markets of the two leading European countries.

There are six sections in the chapter. The second section provides a literature review. The third section gives brief information about the Frankfurt Stock Exchange. The fourth section discusses the method and the data. The fifth section presents the empirical results, and the final section concludes the chapter.

3.2 LITERATURE REVIEW

In cointegrated capital markets stock prices move together in the long-run and in those markets the price adjustment process in case of disequilibrium can be examined using error correction models. Cointegration analysis and error correction models are widely used in the literature in order to examine the interaction between capital markets. In these studies, interaction between both developed and emerging markets are analyzed. For example, Chan, Gup and Pan (1992) and Muradoglu and Metin (1999) investigate the cointegration between some emerging and developed capital markets. However, Arshanapalli and Doukas (1993), Harris, Mclnish, Shoesmith and Wood (1995) and Eun and Jang (1997) are interested only in the cointegration of developed stock markets.

One of the studies that examines cointegration of emerging and developed capital markets is by Chan, Gup and Pan (1992). They analyze the relationship between the Asian markets (Hong Kong, South Korea, Singapore, Taiwan, Japan) and the US markets from February 1983 to May 1987. The existence of unit root for daily and weekly price series are detected by Phillips-Perron Unit Root Tests. Then, as recommended in Engle and Granger (1987) the Augmented Dickey Fuller (ADF) test is employed to test the cointegration between the capital markets. They illustrate that United States and the major Asian markets are not pairwise cointegrated. In other words, the stock prices of one market cannot be predicted by that of another market.

Muradoglu and Metin (1999) investigate the degree of integration between some emerging stock markets, (Greece, Turkey, Portugal, Jordan, India, South Korea, Malaysia, Philippines, Taiwan, Thailand, Argentina, Brazil, Chile, Columbia, Venezuela and Mexico), and three developed markets, London, New York and Tokyo stock exchanges, between 1989 and 1998. Like many previous studies, they use the ADF test and the Engle and Granger's (1987) Cointegration Test to test for unit root and cointegration respectively. They report that the three developed markets are cointegrated with each other. Moreover, the emerging markets are affected by other emerging markets in the same region and by the three developed markets. These results about Asian markets conflict with the results of Chan, Gup and Pan (1992), which show that capital markets of South Korea, Taiwan, and Japan are not pairwise cointegrated. The reason for this conflict can be the different time periods covered in the studies.

On the other hand, Arshanapalli and Doukas (1993) study the changes in co-movements between five developed capital markets; the German, British, French, Japanese and American capital markets after the crash in October 1987. They analyze daily market indexes from January 1980 to May 1990. To assess the presence of the unit root in a stock price series, the Dickey Fuller and the Augmented Dickey Fuller unit root tests are employed. It is illustrated that the stock index series are integrated of order one. The results of the cointegration test show that even though during the pre-crash period there is no interaction between the US stock market and the French, German and UK stock markets, after the crash the US market is cointegrated with these markets. Moreover, no relationship is observed between the Japanese stock market and the European stock markets.

Unlike the studies mentioned before that examine cointegration with different market indexes, Harris et al. (1995) use the price series of the same stock, IBM, for the cointegration analysis of the three different stock markets, New York, Pasific and Midwest in 1990. In their study, they use the price series of the cross-listed stock rather than market index series in different markets. Hence, the effects of using different stocks in the cointegration tests are controlled. They examine existence of the unit root in the price series by utilizing the ADF test and they observe the unit root in transaction price data. In the test of cointegration, the Johansen test is employed. The results illustrate the cointegration of the series. Finally, the price adjustment process in the different markets is analyzed by using the error correction model. They show that the Midwest and Pasific stock exchanges respond to price changes in New York but not vice versa.

Eun and Jang (1997) also use cross-listed stocks from the New York, London and Tokyo stock exchanges and examine the daily stock price series of 56 firms (29 US, 9 UK, and 18 Japanese firms) between January 1988 and December 1990. Using the Granger Causality Test they find that changes in the home market affect the price on the overseas markets, and overseas markets succeeding on the home markets affect next opening overseas markets. Lastly, they investigate the effect of changes in exchange rate on the price series of the cross-listed stocks. They argue that even though changes in exchange rate have no effect on the price series of the domestic market, they affect the price series on the overseas markets.

It can be argued that in most of the studies cointegration between developed capital markets is observed. On the other hand, cointegration between emerging markets is not frequently observed. The reason for observing cointegration between the developed capital markets may be higher speed of information flow between developed countries than the speed of information flow between emerging markets. So, for investors in the diversification of the portfolio stocks of emerging markets can be identified as good instruments.

In this chapter, cointegration between the two developed markets, France and Germany is tested by the French stocks listing on the both Paris and Bourse and the Frankfurt Stock Exchange, consistent with the previous studies in the literature, the cointegration of these two developed capital markets is expected to be observed.

3.3 THE FRANKFURT STOCK EXCHANGE

The Frankfurt Stock Exchange, FWB, was founded in 1585. It is considered as one of the largest stock exchanges in Europe. Like the Xetra, it is is operated by the Deutsche Borse. Its computerized continuous trading system started in May 5, 1991. In this system, all shares on FWB had been traded between 8:30 and 17:00 from Monday to Friday until June 2, 2000. After June 2, 2000 trading hours are extended to 20:00. Operating system on FWB is similar to Xetra. The Exchange hours are divided into three consecutive phases as the Pre-Trading Phase, the Main Trading Phase, and the Post-Trading Phase. During the Pre-Trading Phase, orders can be entered, changed or cancelled in the electronic trading system out; the order book cannot be observed by traders. The Pre-Trading Phase is followed by the Main

Trading Phase during which securities can be traded continuously or with call auctions. The Board of Management shall decide upon the nature and manner of trading in the individual securities, in particular the number of auctions per day, whether said auctions shall be carried out with the order book closed or open, and the inclusion of securities in continuous trading. At the end of the Main Trading Phase, the electronic trading system shall continue to be available to the trading participants in the Post-Trading Phase for data entry.

3.4 DATA AND METHOD

Daily closing stock price of 27 French stocks cross-listed both on the Paris Bourse and the Frankfurt Stock Exchange are examined between January 1, 1999 and August 2001. The data were obtained from *Datastream*. In the sample selection process, only those French stocks which began trading on the Frankfurt Stock Exchange before December 31, 1998 are selected. Before 1999, 48 French stocks began trading on the Frankfurt Stock Exchange, however, since price data for some of the stocks are not available in *Datastream*, these stocks cannot be included in the sample. All of the stocks included in the sample are traded on the Reglement Mensue (RM) segment of the Paris Bourse where only the large and highly liquid stocks can be listed. The prices are adjusted for stock splits and dividend payments. For each stock there are two price series, one from the Paris Bourse and the other from the Frankfurt Stock Exchange. Daily prices are matched in the both markets. Holidays and non-trading days in one of the markets result in the elimination of that day from both price series. As observed in Table 3.1 after matching, each stock has more than

400 observations. Since if stocks are not traded in both markets on the same day, they are excluded from the sample, the number of the observations for each stock is different. All the stock prices are denominated on the same currency, the French Franc. Since the exchange rate between the Euro and the French Franc has been fixed, to use the stock prices in terms of either the Euro or the French Franc does not affect the results.

The stationarity of the price series is investigated for each stock applying the Augmented Dickey-Fuller (ADF) Unit Root Test (Dickey and Fuller, 1981) and the Phillips-Perron Unit Root Test at levels and the first difference. The ADF test statistics are calculated using the following equation:

$$\Delta P_t = \beta_0 P_{t-1} + \sum_{i=1}^{n} \beta_i \Delta P_{t-i} + \varepsilon_t \qquad (3.1)$$

Where

P_t: Stock price on day t (in log)

H_0: $\beta_0 = 0$

H_1: $\beta_0 \neq 0$

If the β_0 coefficient is significantly different from zero, then the null hypothesis that the price series contains unit root is rejected. In this study, the number of the lagged difference term, "n", to be included in the equation is determined using some procedures as Harris et al. (1995). First, n is set equal to 12, which is high enough to eliminate autocorrelation in the data set. Then, it is reduced by one until a significant beta coefficient at a minimum of 10 percent level is reached. Mackinnon's Critical Values are used in determining the significance of the beta coefficients.

In addition to the Augmented Dickey-Fuller Test, in the test of unit root, Phillips-Perron Test is also employed using the following equation:

$$\Delta P_t = \beta_0 P_{t-1} + \varepsilon_t \qquad (3.2)$$

Unlike the ADF test, there are no lagged difference terms in the Phillips-Perron Test. The equation is estimated by the ordinary least square and the t-Statistics are corrected for serial correlation using Newey-West Procedures. As advised in Newey and West (1987), the number of periods of serial correlation to include is set according to the number of observations in the sample.

After examination of the stationarity of price series by the ADF Test and Phillips-Perron Test, the relationship between the markets is analyzed using the following ordinary least square analysis for each stock

$$P_{iFt} = a + b P_{iPt} + \varepsilon_t \qquad (3.3)$$

Where

P_{iFt}: Price of the stock i on day t on the Frankfurt Stock Exchange (in log)

P_{iPt}: Price of the stock i on day t on the Paris Bourse (in log)

It is expected that the price on the foreign market (Frankfurt) is affected by the domestic market (Paris). Therefore, the price on the foreign market is defined as a dependent variable and the price on the domestic market is identified as an independent variable in the model.

If the two price series are linked to form an equilibrium relationship in the long-run, they will move together over time and the difference between them will be stable, even though the series itself may be nonstationary. So, for the nonstationary series, as advised by Engle and Granger (1987), cointegration analysis is conducted by using the following ADF Test:

$$\Delta \hat{\varepsilon}_t = \Psi_0 \hat{\varepsilon}_{t-1} + \sum_{i=1}^{k} \Psi_i \Delta \hat{\varepsilon}_{t-i} + \omega_t \qquad (3.4)$$

H0: $\Psi_0=0$

H1: $\Psi_0\neq0$

Again, first k is set equal to 12 and it is reduced by one until a significant beta coefficient at a minimum of 10 percent level is reached. Two variables are said to be cointegrated when their linear combination is stationary, ($\Psi_0\neq0$), even though each variable is nonstationary. However, if there is no cointegration between the series, the variables have no long-run link.

Engle and Granger (1987) show that the cointegrated series also have an error correction mechanism, and cointegration and error correction models provide mechanisms to analyze long-run price adjustments in internationally linked stock markets. As in Harris et al. (1995), Arshanapalli and Doukas (1993), and Centeno Mello (1999), the following error correction models are employed:

$$\omega_t = P_{iPt} - P_{iFt} \qquad (3.5)$$

$$\Delta P_{iFt} = \beta_0 \omega_{t-1} + \sum_{j=1}^{m} \beta_i \Delta P_{iPt-j} + \sum_{j=1}^{n} \alpha_i \Delta P_{iFt-j} + u_{1it} \qquad (3.6)$$

$$\Delta P_{iPt} = \theta_0 \omega_{t-1} + \sum_{j=1}^{m} \theta_i \Delta P_{iFt-j} + \sum_{j=1}^{n} \phi_i \Delta P_{iPt-j} + u_{2it} \qquad (3.7)$$

Where

β_0: The speed of adjustment how the stock price on the Frankfurt Stock Exchange changes in response to disequilibrium.

θ_0: The speed of adjustment how the stock price on the Paris Bourse changes in response to disequilibrium.

H_0: $\beta_0=0$

H_1: $\beta_0 \neq 0$

H_0: $\theta_0=0$

H_1: $\theta_0 \neq 0$

In the models, β_0 and θ_0 show error correction adjustments over the long run. Error correction adjustment occurs either on the Paris Bourse, on the Frankfurt Stock Exchange or on both for long-run equilibrium. It is expected that at any time equilibrium holds, ω_{t-1} is equal to zero. However, during periods of disequilibrium this term is nonzero and it measures the distance the system away from the equilibrium during day t.

In the error correction model, the lag lengths (m and n) are allowed to vary up to 4 lags, and the Akaike's Final Prediction Error (FPE) is calculated for each lag. The orders with the lowest FPE are chosen as the optimal. Standard errors are corrected for autocorrelation and heteroskedasticity (Newey and West (1987)).

3.5 RESULTS

The characteristics of the data set are presented in Tables 3.1 through 3.3. In Table 3.1, for each stock simple correlations between the prices of the same stock both on the Paris and the Frankfurt stock exchanges are calculated to get some idea about the interaction between the Paris Bourse and the Frankfurt Stock Exchange. Results illustrate the existence of a high correlation between these two markets. The smallest correlation coefficient is equal to 0.959, however, most are above 0.990. As can be seen from the table, stocks are from several industries. Since the stocks are from different industries, if the same behavior is observed in most of the stocks, it cannot be argued that the behavior is industry specific.

The existence of arbitrage opportunities is first examined by comparing the returns of the same stocks both on the Paris Bourse and the Frankfurt Stock Exchange. Since there is no exchange rate risk faced by investors with the adaptation of Euro, on January 1, 1999, it is possible to compare returns in the same currency. The returns of the cross-listed French stocks both on the Paris Bourse and the Frankfurt Stock Exchange are calculated and reported over the sample period and for each year separately in Table 3.2 and Table 3.3 respectively. Most of the stocks provided slightly higher returns on the Frankfurt Stock Exchange than those on the Paris Bourse in 2000 and 2001, as well as over the sample period between January 1999 and August 2001. On the other hand, in 1999 the returns of the majority of the stocks on the Paris Bourse are greater than the returns of the ones on the Frankfurt Stock Exchange. The mean difference between the average returns of the stocks on the Paris and the Frankfurt stock exchanges are compared using t-test but,no significant difference between the two average return series is observed for any stock. Since the difference between the returns is not significant, the arbitrage opportunity may not be profitable enough to cover trading cost. Moreover, if the markets are cointegrated, they might eliminate arbitrage opportunities.

It is observed that the standard deviation is greater for more of the stock returns on the Frankfurt Stock Exchange than on the Paris Bourse in 2001 as well as the over all sample period. However, in 1999 and 2000, most of the stocks on the Paris Bourse have a higher standard deviation. The kurtosis of the returns on the Frankfurt Stock Exchange is greater than the kurtosis of the returns on the Paris Bourse for the majority of the stocks over the whole sample period and the sub-periods. Moreover, for the skewness, on the Frankfurt Stock Exchange, the number of stocks having returns skewed to the left is higher than on the Paris Bourse. Thus, even though some differences between the two series are observed, they are quite minor and for the average return, the differences are not statistically significant.

The stationarity of the logarithmic price series and their first order differences both on the Paris Bourse and the Frankfurt Stock Exchange are examined by the Augmented Dickey-Fuller and the Phillips-Perron Unit Root Tests. The results are presented in Table 3.4. Both methods show that for 25 of the 27 cross-listed stocks, even though the logarithmic stock price series on the two markets are not stationary, their first order differences are stationary. For all of the stocks, unit root at the first order difference is rejected at the 1 percent significance level. For one of the stocks, Peugeot, the two methods show that the logarithmic price series on the both markets are stationary. For the price series of this stock, the unit root is rejected at the 5 percent significance level. The only difference between the ADF and the Phillips-Perron tests are observed for Moulinex. Although the Phillips-Perron Test shows that the logarithmic price series both on the Paris and Frankfurt stock exchanges are stationary, according to the ADF Test, the price series is only stationary on the Frankfurt Stock Exchange. But, the price series on the Paris Bourse is stationary at the first order difference. Since the price series on the Paris Stock Exchange is significant at 10 percent, it can be argued that the difference is very minor.

In Table 3.5, the results of Engle and Granger's (1987) cointegration test are provided. For all of the stocks the null hypothesis that Ψ_0 is equal to zero is rejected at 1 percent. This shows that the French stock market and the German stock market are cointegrated. Even though the price series on these markets are not stationary, the difference between the price series is stationary and this shows the existence of a link between these two markets.

Since these markets are cointegrated, it is possible to examine price adjustment process between the markets using error correction models. Table 3.6 and Table 3.7 present the price adjustment process in the markets. In Table 3.6, the dependent variable is identified as the change in stock price on the Frankfurt Stock Exchange, and the error correction term, β_0, shows the speed of adjustment on the Frankfurt Stock Exchange for the deviations of the stock prices from the equilibrium. From the table it is observed that β_0 is significantly different from zero for all of the stocks. This means that when a deviation from equilibrium occurs, the prices of the stocks react to make necessary adjustments for the equilibrium. The table reveals that all of the stock prices on the Frankfurt Stock Exchange respond to deviations from the equilibrium. Their reactions are found to be significant at 1 percent .

In Table 3.7, the dependent variable is defined as the change in the stock price on the Paris Bourse. In this table, the speed of adjustment on the Paris Bourse for the deviations of the stock prices from the equilibrium is measured by θ_0. Even though significant responses are observed for some of the stocks prices, for most of them a significant response is not observed on the Paris Bourse. However, on the Frankfurt Stock Exchange adjustment towards the equilibrium is observed for all of the stock prices. The reason for this behavior can be explained by the dominance of the domestic market (Eun and Jang (1997)). Since the origin of the information regarding the French firms is France, the first reaction to the new information is observed on the Paris Bourse and then the Frankfurt Stock Exchange. Although, the dominance of German markets in Europe is observed (Hassapis, Pittis and Prodromidis (1999)), the results suggest that if information is created in another country, the German market may not be dominant.

3.6 CONCLUSION

With the important developments in the European Union towards financial integration, interaction between capital markets of the member countries has increased. Thus, especially after the introduction of the Euro and the adaptation of a fixed exchange rate between member countries in 1999, the examination of interaction between the stock markets of two European leading countries, France and Germany, might be interesting and beneficial for both European and foreign investors.

The aim of this chapter was to show the interaction between the two stock markets, the Paris Bourse and the Frankfurt Stock Exchange, using the daily price data for the French stocks cross-listed on these markets from January 1 1999, the adaptation of the Euro, to August 2001. The results show the cointegration of the markets. Moreover, error correction models point out that the price adjustment process occurs on both of the markets, but since the adjustments for equilibrium occur more frequently on the Frankfurt Stock Exchange than on the Paris Bourse, the dominance of the German stocks markets in Europe cannot be proved. On the other hand, an explanation for this difference concerns the information flow. Since France is the domestic country for the French stocks, information reaches the Paris Bourse first. Then, it reaches the Frankfurt Stock Exchange.

Existence of cointegration and a price adjustment process between the Paris Bourse and the Frankfurt Stock Exchange reduces the arbitrage opportunities. It is not valid to infer that there exists arbitrage opportunity in these markets.

The results should be interpreted with caution because there is a time difference between the closing times of the Paris Bourse and the Frankfurt Stock Exchange. In the analysis, closing prices are used. Hence, even though the Frankfurt Stock Exchange was closed, stocks were continued to be traded on the Paris Bourse. However, when the trading hours on the Frankfurt Stock Exchange were extended in June 2001, trading continued in this exchange after the Paris Bourse was closed.

CHAPTER IV

CONCLUSION

Integration of the capital markets requires that the securities with the same risk level provide the same expected return. Since integration of the capital markets is important for investors for diversification purpose and the identification of arbitrage opportunities, many studies examine the integration of the capital markets. However, most of these studies test the integration of the US capital markets with the other capital markets and show the segmentation of the US capital markets with these markets. There are very few studies examining the integration of the capital markets in Europe. So, the purpose of this thesis is to examine the behavior of the French stocks cross-listed on the French and German stock markets and make some inferences about the integration and price adjustment process of stock markets of the two European countries, France and Germany. Moreover, since one of the objectives of the European Union is to integrate capital markets of its member countries and since up to now for that purpose some important progresses have been achieved, to test integration and price adjustment process of the two European capital markets might be very interesting to be able to see the effects of operations of the European Union. The first two chapters present the analysis of changes in the behavior of French stocks after cross-listing and the third chapter examines the price adjustment process between the French and German stock markets.

In the first chapter, changes in the systematic risk and abnormal returns of the French stocks after their cross-listings on the German stock market, the Xetra, are examined. The results indicate that no significant change in systematic risk is observed for the portfolio of all stocks in the sample suggesting integration of these markets. However, significant changes in systematic risk of some portfolios are found, for example, the high book-to-market value portfolio, and the retailing and finance sectors. In the retailing sector a decline in systematic risk for French market index and in the finance sector an increase in systematic risk for German market index are found. These results are against the integration of the two European capital markets only in the retailing and finance sectors. Moreover, integration of the French stock market with the world market is examined and the results show that a significant increase in sensitivity of the small-sized stocks with respect to the world market index refers to the segmentation of the French stock markets with the world stock markets for the small stocks.

In addition the changes in systematic risk of the stocks, in the first chapter, changes in abnormal returns of the French stocks after cross-listing are tested by using both parametric and non-parametric methods. Since the number of firms included in each portfolio is small, in addition to parametric tests, some non-parametric tests are also used to obtain more reliable results. For the market value and book-to-market value portfolios, results of the parametric and non-parametric tests are quite consistent. They show that after cross-listing significantly negative abnormal returns are observed in the small and medium market value and medium and high book-to-market value portfolios. These results imply segmentation of these markets and importance of the size of the firm in cross-listing of the stocks.

For the industry portfolios, sometimes the parametric and non-parametric tests provide conflicting results, for example in the retailing and finance sectors. In such cases it is considered that non-parametric tests provide correct results.

According to the non-parametric tests, in the retailing, manufacturing and finance sectors, the segmentation of the stock markets is implied.

In the second chapter, liquidity and volatility of French stocks after cross-listing are examined. In the analysis, the model developed by Domowitz Glen, and Madhaven (1998) is applied to the French and German stock markets. According to this model, if the capital markets are integrated, liquidity of the stocks increases and volatility of the stocks declines after cross-listing. The results illustrate that in the post-listing period for most of the stocks liquidity declines and volatility increases. Thus, consistent with the first chapter the results may imply the segmentation of the markets.

In the third chapter, price adjustment process and the relationship between the German and French stock markets are investigated by using Engle and Granger’s (1987) cointegration analysis techniques. Because of the availability of data the French stocks cross-listed on the Frankfurt Stock Exchange instead of the Xetra are used. In the analysis it is found that the German and the French stock markets are cointegrated. Moreover, error-correction models show that stock prices on the German stock markets follow the prices on the Paris Bourse. Since France is the domestic market for the French stocks, and information for the firms originates from France, prices on the German stock markets might follow the prices on the French stock markets.

There are some limitations of this study. First of all, even though the impact of some events (such as, cross-listing on other stock markets, dividend payments, and earnings announcements) that might affect the behavior of the cross-listed stocks, are taken into account by eliminating some stocks, it resulted in a decline in the sample size. So, in this thesis the number of stocks included in some portfolios is very small to satisfy normality assumption of some parametric tests, such as the t-test. However, in order to overcome this weakness, some non-parametric tests are used, in addition to the parametric tests.

Second, the announcement dates of the cross-listing decisions are not obtained. The analyses are done by using cross-listing dates rather than announcement dates. However, by setting the event window quite large, the effects of this weakness on the results are tried to be eliminated a little bit.

Third, the time period covered is quite short, because many French stocks began trading on the German stock markets after January 1, 1998. Therefore, the beginning period is restricted by this date.

Finally, as a future study, examining changes in behavior of European stocks after their cross-listings on the other European stock markets might be very interesting to provide some implications about the integration of the other European stock markets. In addition, when enough number of Turkish stocks are cross-listed on the European capital markets, to examine the integration level between capital markets of Europe and Turkey which is a candidate in the EU for a membership will be very interesting. Moreover, as an extension of this study, the effect of cross-listing can be examined using the stocks that are cross-listed on the German stock markets for the first time.

ENDNOTES

[1] Factbook2000.(2001).[Online]. Available: http://www.Xetra.de/INTERNET/THE XETRA/index_e.htm (2001)

[2] Statistics. (2000). [Online].Available: http://www.bourse-de-paris.fr (2001)

[3] Factbook 1999. (2000). [Online]. Available: http://www.exchange.de

[4] ADR is a vehicle for investors to register and earn dividends on a non-US stock without direct access to the overseas market itself. US depository banks hold the overseas securities in custody in the country of origin and convert all dividends and other payments into US dollar to receipt holders in the US.

[5] Statistics. (2000). [Online].Available: http://www.bourse-de-paris.fr (2001)

[6] Listing dates on the other stock markets were obtained from the web pages of the markets. The stocks cross-listed on another stock market in -100 and +50 days around the cross-listing date on the Xetra are eliminated, because Foerster and Karolyi (1993, 1999) observed significant effects of cross-listing on the behaviour of the stocks in the event window of -100 days and 50 days with respect to cross-listing date of the stock.

[7] The Pearson correlation coefficient between the French market index and the German market index is 0.76 and significant at 1 percent. When return on the German market index is used in equation (1.1a), multicollinearity between the French market index return and the German market index return leads to inconsistent results between results of t statistics and Wald test. So, as advised in Elton, Gruber, Das and Hlavka (1993) to eliminate the effects of multicollinearity, German market index return is regressed on French market index return and residuals are identified as $R_{Gt.}$ Nevertheless, Pagan (1984) states that to use residual generated regressors in the model causes a bias in standard errors. As a solution he advises two steps least square estimation rather than ordinary least square model. However, since in the real life to find a variable which explains return of the French market perfectly but not correlated with the return of the German market is not possible.

[8] Balance sheet information reported at the end of the year is not available to investors until sometime later in the next year. In the calculation of book-to-market value, if book value is divided by market value before the book value information becomes available to investors, look-ahead bias occurs.

[9] The non-parametric sign test also provides information about the direction of the differences within pairs. However, it ignores the magnitude of the difference.

[10] If the number observation is greater than 25, it can be assumed that the series are normally distributed (Mendenhall, James, and Beaver, 1989)

[11] In the regression the data are pooled, so that the beta coefficients can be identified as the average of the all stocks. To check the validity of the results for each stock, the model is re-estimated for each of the stocks separately, and it is observed that the results are similar to the results of the pooled data.
Moreover, the stocks are grouped according to their first trading dates on the Xetra as the ones started to be traded in 1998, and those cross-listed after the adaptation of the Euro (January 1999). The analyses are repeated for each group. No significant change in beta coefficients after cross-listing is observed for both groups.

[12] In this section, interpretations about CAR and BHAR are made depending on all of the observations between -125 and 125 days. However, since only few selected days are shown in Tables 5-10, some explanations may not be observed from the tables.

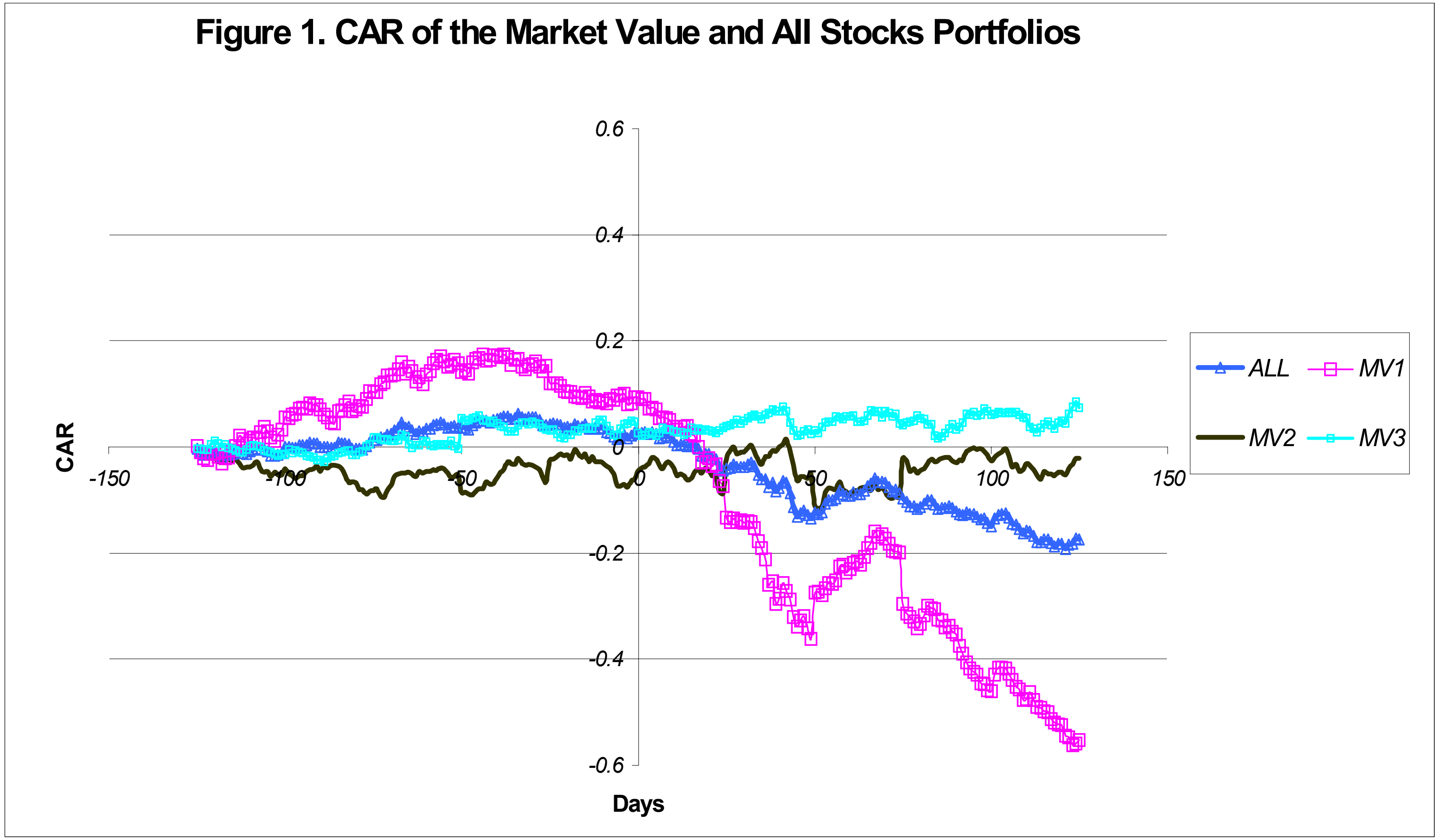
[13] There are few studies in the literature that have not examined the U.S. markets. For example, Serra (1999) examines stocks listed on the emerging markets and London (SEAQ-I) in addition to the U.S. markets; Centeno and Mello (1999) analyse the integration of the European money markets; Rouwenhorst (1999) investigates the importance of industry or country effects in stock returns in the European stock markets. He shows that country effect is more important than the industry effect in European stock markets.

[14] In recent years, an increase in the cross-listings of stocks has been observed. For example, in 1996, 383, in 1997, 730 and in 1998, 930 foreign stocks were cross-listed on the German stock exchanges. There are several reasons for cross-listing of stocks. Saudagaran (1988) groups them into four categories: financial factors, management and public relations, political factors, and employee motivation. First, if firm's stocks are traded on a segmented and illiquid domestic market, cross-listing on a liquid market reduces the cost of capital. Second, cross-listing increases the potential investor base and hence, the demand for the stock. Moreover, cross-listing may create an opportunity for foreign acquisitions and mergers. In addition, since it rises corporate visibility, marketing efforts of the firm may become easier. Third, cross-listing eliminates some problems that a foreign investor may face because of the differences in language, currency, financial reporting system, and auditing practices. Finally, if the firm has foreign subsidiaries, the listing of the stock in the foreign country may increase the motivation of foreign employees. Furthermore, Saudagaran and Biddle (1995) identify two more reasons for cross-listing: disclosure level and existence of large markets for the firm's product. They show that firms will more likely to list on foreign stock exchanges with lower financial disclosure levels than their domestic market, and they prefer to list on foreign stock exchanges in the countries where they have large market share for their products.

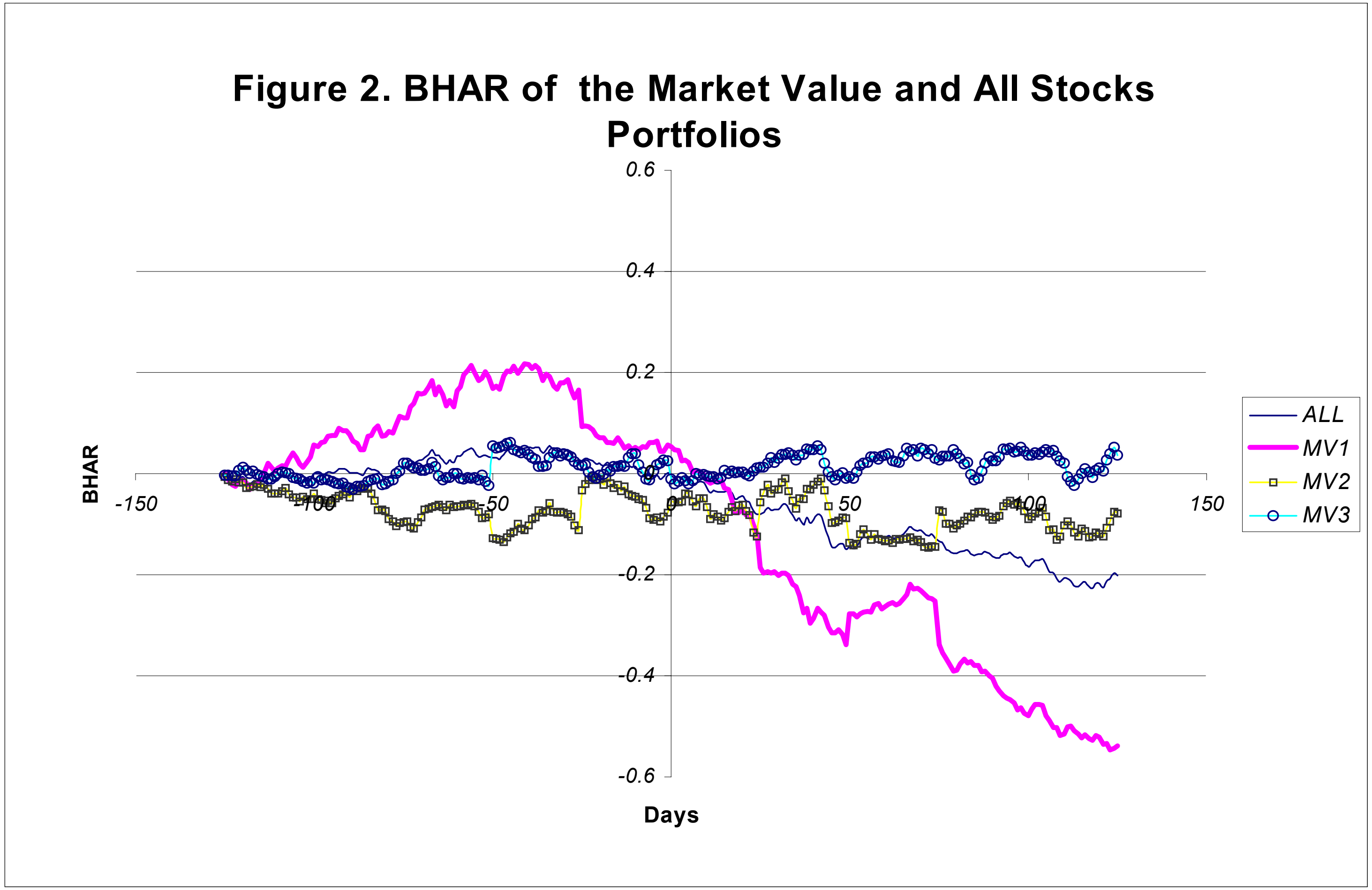
[15] The event window of (-100 and +50) days is determined based on the findings of Foerster and Karolyi (1993, 1999) and Jayaraman, Shastri, and Tandon (1993) which observe that the effects of cross-listing on the behavior of the stocks are significant during the event window of -100 and +50 days with respect to the cross-listing date.

[16] To consider the possibility that the relationship between trading volume and price volatility is non-linear rather than linear, another model is estimated in which volume is replaced by square of the volume. However, the results do not change.

[17] Since opening price data for Air France is not available, in Table 2.6 and Table 2.9, 33 stocks are included.

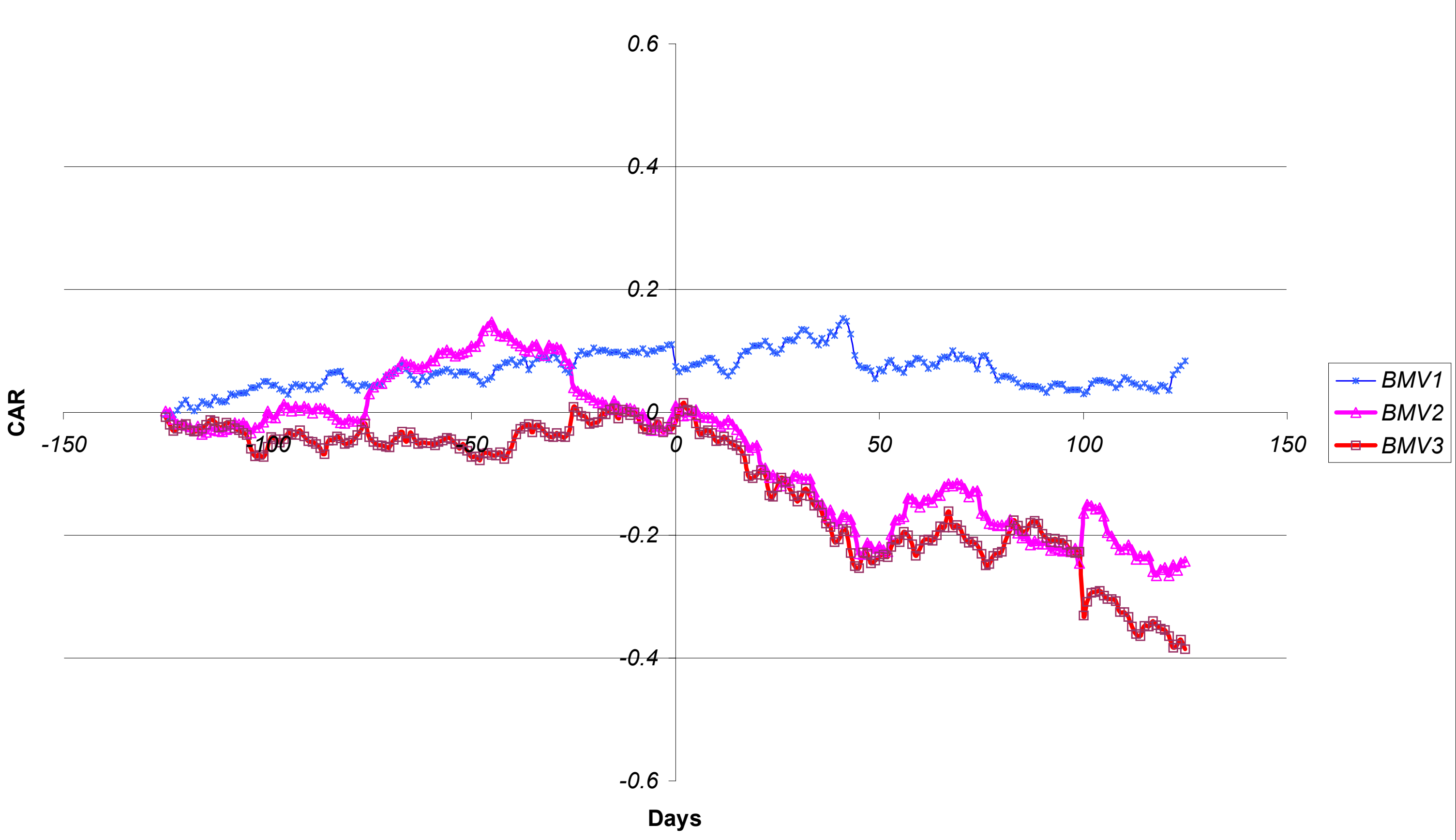


Note: ALL: The portfolio of all stocks, MV1: The portfolio of stocks with the smallest market value, MV2: The portfolio of stocks with medium market value and MV3: The portfolio of stocks with the largest market value



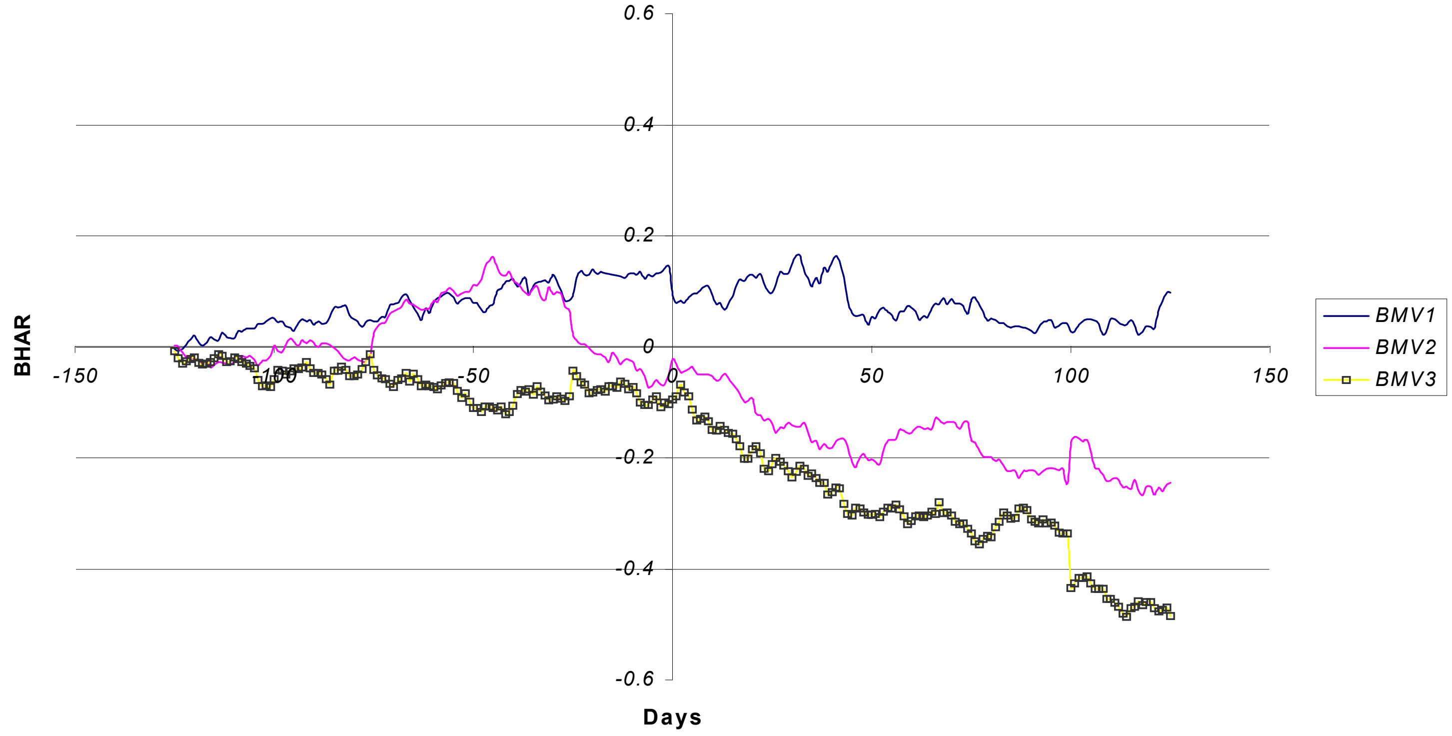
Note: ALL: The portfolio of all stocks, MV1: The portfolio of stocks with the smallest market value, MV2: The portfolio of stocks with medium market value and MV3: The portfolio of stocks with the largest market value

Figure 3. CAR of the Book-to-Market Value Portfolios



Note: BMV1: The portfolio of stocks with the lowest book-to-market value ratio, BMV2: The portfolio of stocks with medium book-to-market value ratio and BMV3: The portfolio of stocks with the highest book-to-market value ratio

Figure 4. BHAR of the Book-to-Market Value Portfolios



Note: BMV1: The portfolio of stocks with the lowest book-to-market value ratio, BMV2: The portfolio of stocks with medium book-to-market value ratio and BMV3: The portfolio of stocks with the highest book-to-market value ratio

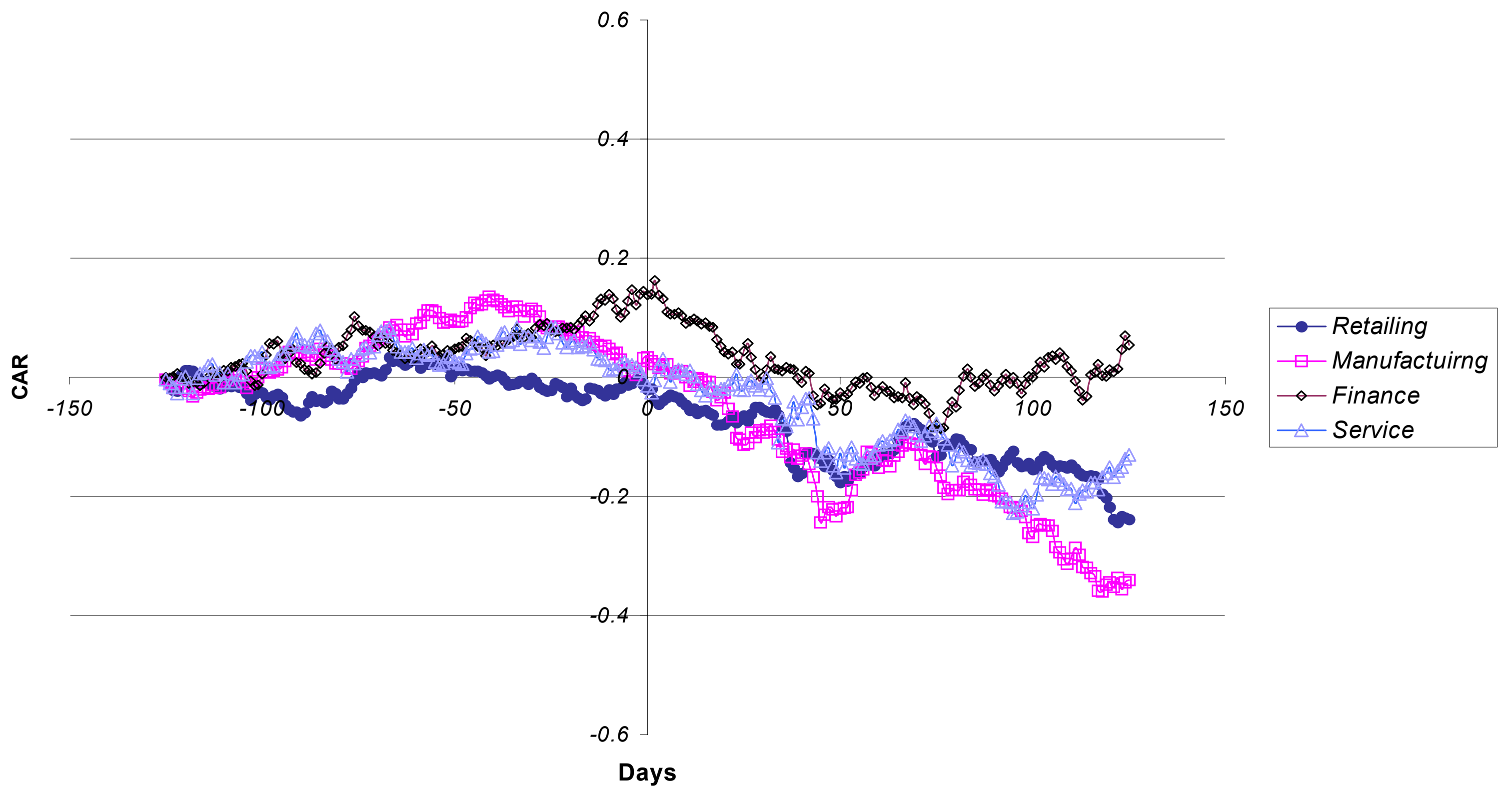


Figure 5. CAR of the Industry Portfolios

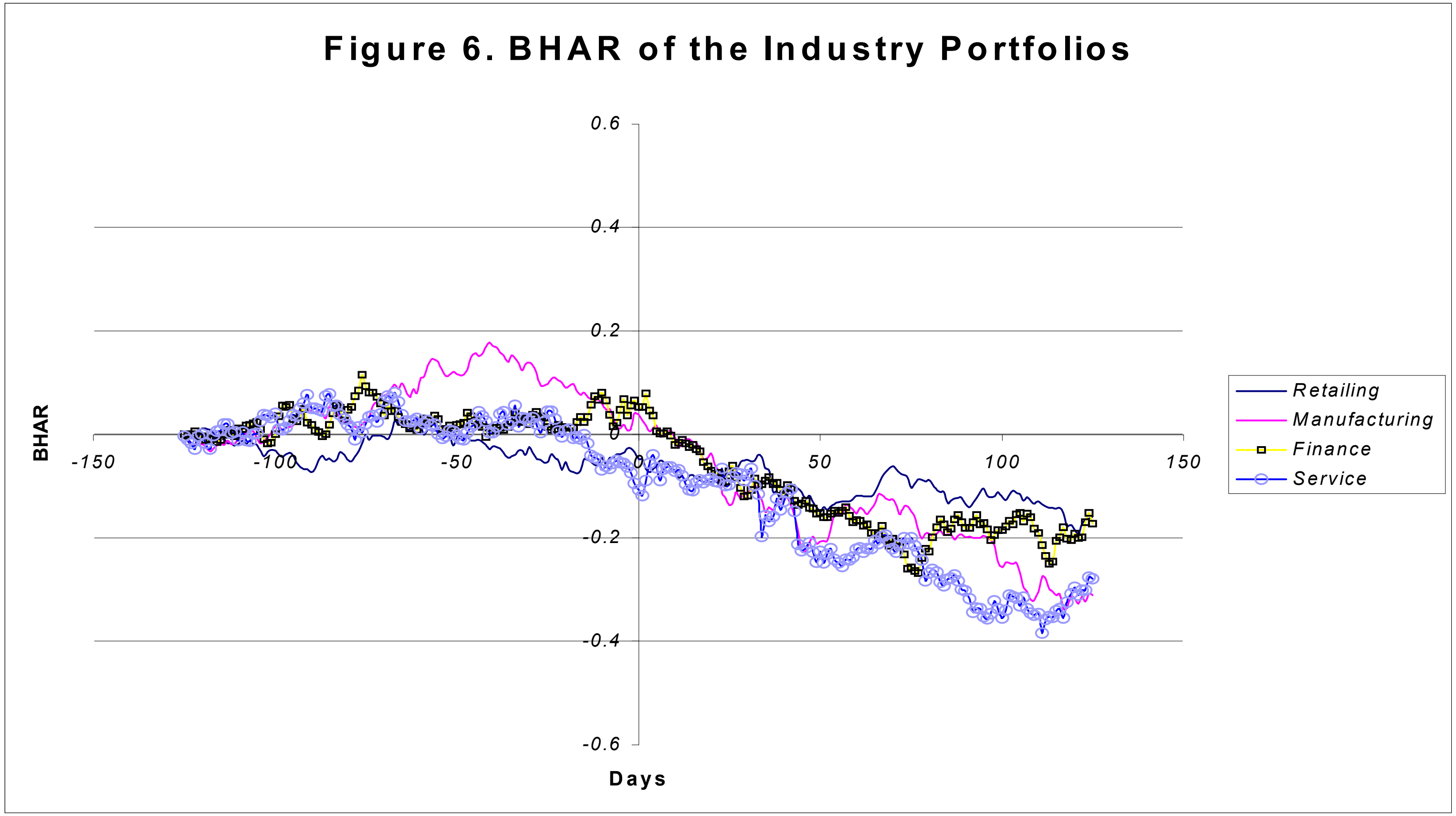


Figure 6. BHAR of the Industry Portfolios
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
BHAR
-150
-100
-50
0
50
100
150
Days
Retailing
Manufacturing
Finance
Service

Table 1.1(a) Number of Shares Listed on the Major European Stock Exchanges in 1999

Country	Stock Exchanges	Number of Domestic Shares	Number of Foreign Shares	Total
Belgium	Brussels	159	119	278
Finland	Helsinki	147	3	150
France	Paris	968	176	1144
Netherlands	Amsterdam	233	154	387
Norway	Oslo	195	20	215
Germany	The Xetra	795	2366	4220
Germany	Frankfurt	1428	2792	3161
Sweden	Stockholm	277	23	300
Spain	Madrid	723	4	727

Source: Fact book 2000. (2001). [Online]. Available: http://www. Xetra.de/INTERNET/THE XETRA/index_e.htm (2001)

Table 1.1(b) Market Capitalization of the Major European Stock Markets (US$ Million, End-of-Period Levels)

Country	1997	1998	1999	2000
Belgium	136,965	245,657	184,942	182,481
Finland	73,322	154,518	349,409	293,635
France	674,368	991,484	1,475,457	1,446,634
Netherlands	468,736	603,182	695,209	640,456
Norway	66,503	46,944	63,696	65,034
Germany	825,233	1,093,962	1,432,190	1,270,243
Sweden	272,730	278,707	373,278	328,339
Spain	290,383	402,180	431,668	504,219
UK	1,996,225	2,374,273	2,933,280	2,576,992

Source: Standard and Poor's Emerging Stock Markets Factbook 2001

Table 1.2 Summary of Literature Review

I. Liquidity Hypothesis: Amihud and Mendelson (1986)			
	Market	**Time**	**Findings**
1. Noronha, Sarin and Saudagaran (1996)	US stocks on London and Tokyo Stock Exchange	1983-1989	Due to increases in informed trading, spreads do not decline after cross-listing
2. Van Ness, Van Ness and Pruit (1999)	Nasdaq/Chcago Stock Exchange Dual Trading Programme (Domestic Dual Listing)	1994-1996	Chicago stock exchange specialists reduce absolute quoted spread levels after cross-listing
II. Investor Recognition Hypothesis: Merton (1987)			
Joint Test of Liquidity and Investor Recognition Hypotheses: Demsetz (1968): A large number of shareholders are associated with a smaller bid-ask spread.			
	Market	**Time**	**Findings**
1. Kadlec and McConnel (1994)	US OTC firms cross-listed on NYSE (Domestic Dual Listing)	1980-1989	Supports both investment recognition and liquidity hypotheses
2. Forester and Karolyi (1999)	ADRs of non US firms from Canada, Europe, and Asia Pasific Region	1979-1992	Supports only investment recognition hypothesis
3. Miller (1999)	ADRs from 35 countries	1985-1995	Supports both investment recognition and liquidity hypotheses
III. Integration Hypothesis			
i) Complete Segmentation Hypothesis: Alexader, Eun and Jankiramanan (1987)			
	Market	**Time**	**Findings**
1. Jorrion and Schwarts (1986)	Canadian stocks on US Exchange Markets	1963-1983	Canadian and North American Stock Exchange markets are segmented (due to legal barriers)
2. Foerster and Karolyi (1993)	Canadian stocks on US Exchange Markets	1981-1990	Industry has a great effect on the behavior of cross-listed stocks
3. Lau, Dilts and Apilado (1994)	US stocks on 10 stock exchanges	1962-1990	Negative abnormal after the cross-listing for the firms listing on Tokyo and Basel Stock Exchanges
4. Forester and Karolyi (1999)	Non US stocks cross-listed in US markets	1976-1992	US market is segmented from Australian and Canadian Markets

Table 1.2 (Continued)			
	Market	**Time**	**Findings**
5. Serra (1999)	Stocks of 10 emerging markets listed on NYSE/NASDAQ or SEAD-I	1991-1995	Segmented
6. Oran (1999)	Non US firms cross-listed on NYSE	1980-1996	Segmented
7. Callagahn, Kleiman and Sahul (1999)	ADRs on NYSE, NASDAQ or AMEX	1986-1993	Emerging markets are segmented from US markets
8. Miller (1999)	ADRs	1985-1995	Segmented
9. Forester and Karolyi (2000)	Non US firms cross-listed on NYSE	1982-1996	Segmented
10. Errunza and Miller (2000)	ADRs from 32 countries	1986-1993	Segmented
ii) Mild Segmentation Hypothesis: Errunza and Losq (1987)			
	Market	**Time**	**Findings**
1. Doukas and Switzer (2000)	Canadian stocks on US markets	1985-1996	No change in integration level
IV. Test of Changes in Volatility and/or Return			
	Market	**Time**	**Findings**
1. Khan. Baker, Kennedy and Perry (1993)	US on Pasific and Midwest Stock Exchanges	1984-1989	Bid-ask spread is increased to compensate their loss due to the decline in volume
2. McConnel and Sanger (1987)	US stocks on NYSE (Domestic Dual Listing)	1926-1982	Negative abnormal returns after cross-listing
3. Jayaraman, Shastri and Tandon (1993)	ADRs	1983-1988	Variance increases after cross-listing
4. Ko, Lee and Yun (1997)	Japanese stocks on NYSE or OTC	1990-1994	No abnormal return, but an increase in variance

Table 1.2 (Continued)

	Market	Time	Findings
5. Doukas and Switzer (2000)	Canadian stocks on US markets	1985-1996	Significantly positive abnormal returns before cross-listing
6. Martell, Rodriguez and Webb (1999)	ADRs in Latin American Stock Exchanges	1990-1994	No change in variance
V. Integration of European Markets			
	Market	**Time**	**Findings**
1. Akdogan (1991)	European stock markets	1980-1989	Increase in integration
2. Centeno and Mello (1999)	European money and bank loan markets	1985-1994	Segmented bank loan markets
3. Rouwenhorst (1999)	European stock markets	1978-1998	Country effect is greater than industry effect

Table 1.3(a) Average Market Value and Book-to-Market Value of the Stocks and the Portfolios

Average market value (in thousand FF) and book-to-market value of the stocks and the portfolios are for –250 and 250 days interval with respect to cross-listing date

Stocks	Average Market Value	Average Book-to-Market Value Ratio	Stocks	Average Market Value	Average Book-to-Market Value Ratio
Accor	48041.080	0.030	Moulinex	3983.040	0.235
Air France	23374.240	0.624	Peugeot	46347.280	1.176
Altran	10308.940	0.003	Renault	58061.960	0.750
Bnp	90753.410	0.675	Saint Gobain	80915.420	0.348
Bull	9854.080	0.300	Scor	11098.130	0.564
Canal +	42010.370	0.000	Seb	10236.680	0.276
Cap Gemini	51945.710	0.005	Sge	18560.230	0.000
Carrefour	146358.660	0.007	Societe Generale	93904.340	0.166
Casino Guichard	33076.800	-0.028	Sommer	4547.090	0.302
Ccf	34643.160	0.500	Suez Lyon.	131782.450	0.172
Christian Dior	32072.120	-1.015	Thomson	29539.940	0.389
Club Medirranee	7496.860	0.205	Portfolios		
Cpr Paris	3611.170	1.002	All stocks (N=34)	50991.937	0.329
Credit Lyonn.	7424.770	0.133	MV1 (N=11)	6380.547	0.546
Danone	102659.790	0.069	MV2 (N=11)	28604.133	0.201
Dmc	724.535	2.362	MV3 (N=12)	112407.867	0.236
Euro Disney	6739.680	0.823	BMV1 (N=11)	47748.189	-0.078
France Telecom	383822.060	0.230	BMV2 (N=11)	73972.808	0.218
Gaz & Eaux	8985.980	0.433	BMV3 (N=12)	32899.575	0.804
Labinal	6582.130	0.070	Retailing (N=5)	70340.859	0.573
Lafarge	51536.770	0.257	Manufacturing (N=14)	54387.269	0.237
Lvmh	109112.750	0.128	Finance (N=6)	40499.365	0.557
Michelin	33614.250	0.001	Service (N=4)	28555.833	0.266

N: Number of stocks included in the portfolio

Table 1.3(b) Number of Stocks in the Market Value and Book-to-Market Value Portfolios from the Retailing, Manufacturing, Finance, and Service Sectors

Sectors	MV1	MV2	MV3	BMV1	BMV2	BMV3	Total
Retailing	2	0	3	1	3	1	5
Manufacturing	5	5	4	4	6	4	14
Finance	2	2	2	0	1	5	6
Service	2	0	2	2	1	1	4

Note: MV1: The portfolio of stocks with the smallest market value, MV2: The portfolio of stocks with medium market value and MV3: The portfolio of stocks with the largest market value BMV1: The portfolio of stocks with the lowest book-to-market value ratio, BMV2: The portfolio of stocks with medium book-to-market value ratio and BMV3: The portfolio of stocks with the highest book-to-market value ratio

Table 1.3 (c) Descriptive Statistics of Logarithmic Returns for the Pre- and Post-Listing Periods

Δ Avg. Return: Difference between average logarithmic return in the pre-listing period and in the post-listing period
Pre-Listing Period: -250,…,-1 days and Post-Listing Period: 0,…,250 days with respect to cross-listing dates

	Whole Period				Pre-Listing Period				Post-Listing Period				ΔAvg. Return	
Portfolios	Avg. Return	Std. Dev.	Skewness	Kurtosis	Avg. Return	Std. Dev.	Skewness	Kurtosis	Avg. Return	Std. Dev.	Skewness	Kurtosis	t-Statistic	Number of Stocks
All Stocks	0.0003	0.0102	-0.4436	3.1539	0.0009	0.0086	-0.1049	6.1917	-0.0002	0.0116	-0.5038	1.5857	1.3458	34
Market Value Portfolios														
MV1 (Small)	-0.0006	0.0127	-0.3043	2.3583	0.0002	0.0108	-0.0429	5.6286	-0.0013	0.0143	-0.3409	0.7890	1.3018	11
MV2 (Medium)	0.0006	0.0110	-0.5069	2.3176	0.0008	0.0093	-0.1423	1.8861	0.0004	0.0124	-0.6178	1.9332	0.4896	11
MV3 (Large)	0.0010	0.0127	-0.0243	1.1425	0.0017	0.0113	0.1816	1.8685	0.0003	0.0140	-0.0774	0.5855	1.4595	12
Book-to-Market Value Portfolios														
BMV1 (Lowest)	0.0008	0.0111	-0.2355	3.5935	0.0012	0.0097	0.3825	6.3433	0.0004	0.0124	-0.4835	2.0542	0.9363	11
BMV2 (Moderate)	0.0001	0.0119	-0.0362	2.1206	0.0006	0.0107	0.2022	4.9182	-0.0004	0.0129	-0.1345	0.5774	0.9750	11
BMV3 (Highest)	0.0003	0.0130	-0.4365	2.3190	0.0009	0.0105	-0.1881	0.8756	-0.0003	0.0150	-0.4394	1.9591	1.0640	12
Industry Portfolios														
Retailing	0.0000	0.0131	-0.0050	1.4549	0.0007	0.0127	0.3762	1.8902	-0.0006	0.0136	-0.2969	1.0261	1.1944	5
Manufacturing	0.0002	0.0125	-0.5482	2.9037	0.0010	0.0103	-0.3272	5.9931	-0.0006	0.0143	-0.5296	1.3630	-1.4067	14
Finance	0.0005	0.0137	-0.1442	0.7143	0.0013	0.0122	-0.0824	1.3432	-0.0003	0.0151	-0.1175	0.2334	1.3682	6

Service	**0.0009**	**0.0173**	**-0.4427**	**2.7585**	**0.0016**	**0.0144**	**0.1622**	**2.0436**	**0.0001**	**0.0198**	**-0.6063**	**2.2806**	**1.0708**	**4**

Table 1.4(a) Market Model Regressions Used to Test Changes in Beta Coefficients of French and German Market Indices With the Pooled Data

We estimate the following market model for each of the portfolio groups:

$$R_{it} = \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{iFt}^{PRE} + \beta_{iG}^{PRE} R_{iGt}^{PRE} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{iFt}^{POST} D_{it}^{POST} + \beta_{iG}^{POST} R_{iGt}^{POST} D_{it}^{POST} + \varepsilon_{it}$$

$t=-250,\ldots,0,\ldots,250$

In the model, R_{it} is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day t after the effects of French stock index are eliminated. Moreover, dummy variables, D_{it}^{LIST}, (=1 if t=0, and 0 otherwise), and D_{it}^{POST} (= 1 if t>0, and 0 otherwise) are used. For the robust t statistics, Newey West's procedure is used against the heteroskedasticity and autocorrelation in standard errors.

	Before Cross-Listing (-250 , -1Days)			Cross-Listing Date	After Cross-Listing (1 , 250 Days)			Wald Test	
Portfolios	α_i^{PRE}	β_{iF}^{PRE}	β_{iG}^{PRE}	α_i^{LIST}	α_i^{POST}	β_{iF}^{POST}	β_{iG}^{POST}	**P -Value**	**Adj.R^2**
All Stocks	-0.0001	0.8230	0.1167	-0.0036	-0.0004	0.0398	0.0170	0.489	0.196
	(-0.320)	(33.170)***	(4.550)***	(-0.790)	(-1.000)	(1.130)	(0.380)		
Market Value Portfolios									
MV1 (Small)	-0.0005	0.6169	0.1988	0.0030	-0.0010	0.0099	-0.1019	0.417	0.099
	(-1.150)	(13.630)***	(4.460)***	(0.480)	(-1.410)	(0.160)	(-1.310)		
MV2 (Medium)	-0.0001	0.6949	0.1443	-0.0016	0.0003	0.0660	0.1130	0.200	0.165
	(-0.090)	(15.220)***	(3.030)***	(-0.170)	(0.510)	(1.030)	(1.430)		
MV3 (Large)	0.0002	1.1428	0.0318	-0.0096	-0.0003	0.0158	0.0308	0.868	0.361
	(0.680)	(36.400)***	(0.830)	(-2.300)**	(-0.490)	(0.320)	(0.440)		
Book-to-Market Value Portfolios									
BMV1 (Lowest)	0.0002	0.8449	0.1096	-0.0169	0.0001	-0.0789	0.0733	0.243	0.193
	(0.490)	(19.640)***	(2.250)**	(-2.480)**	(0.230)	(-1.310)	(0.970)		
BMV2 (Moderate)	-0.0005	0.8914	0.1303	-0.0046	-0.0001	-0.0121	-0.0743	0.583	0.208
	(-1.320)	(20.940)***	(3.140)***	(-0.770)	(-0.100)	(-0.210)	(-1.020)		
BMV3 (Highest)	0.0001	0.7512	0.1151	0.0100	-0.0011	0.1907	0.0468	0.008	0.190
	(0.150)	(18.350)***	(2.690)**	(1.250)	(-1.700)	(2.950)***	(0.590)		

Table 1.4 (a) (Continued)

Portfolios	Before Cross-Listing (-250 , -1Days) α_i^{PRE}	β_{iF}^{PRE}	β_{iG}^{PRE}	Cross-Listing Date α_i^{LIST}	After Cross-Listing (1 , 250 Days) α_i^{POST}	β_{iF}^{POST}	β_{iG}^{POST}	Wald Test P -Value	$Adj.R^2$
Industry Portfolios									
Retailing	-0.0005	0.9475	0.1455	-0.0021	-0.0003	-0.2065	-0.0829	0.019	0.206
	(-0.820)	(14.750)***	(2.510)**	(-0.340)	(-0.320)	(-2.510)**	(-0.890)		
Manufacturing	0.0001	0.8420	0.1510	-0.0039	-0.0008	0.0847	-0.0439	0.237	0.198
	(0.130)	(22.770)***	(3.620)***	(-0.560)	(-1.370)	(1.580)	(-0.600)		
Finance	0.0003	0.9412	0.0848	-0.0027	-0.0010	0.0824	0.2106	0.065	0.266
	(0.550)	(17.460)***	(1.520)	(-0.360)	(-1.150)	(0.950)	(2.020)*		
Service	0.0008	0.7670	0.0867	-0.0099	-0.0009	0.1635	-0.0596	0.228	0.193
	(1.240)	(11.380)***	(1.140)	(-0.770)	(-0.900)	(1.640)	(-0.430)		

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 1.4(b) Market Model Regressions Used to Test Changes in Beta Coefficients of French and The World Market Indices With The Pooled Data

We estimate the following market model for each of the portfolio groups:

$$R_{it} = \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{iFt}^{PRE} + \beta_{iG}^{PRE} R_{iWt}^{PRE} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{iFt}^{POST} D_{it}^{POST} + \beta_{iG}^{POST} R_{iWt}^{POST} D_{it}^{POST} + \varepsilon_{it}$$

$t=-250,\ldots,0,\ldots,250$

In the model, R_{it} is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iWt} is the logarithmic return of the Datastream's World market index on day t after the effects of French stock index are eliminated. Moreover, dummy variables, D_{it}^{LIST}, (=1 if t=0, and 0 otherwise), and D_{it}^{POST} (= 1 if t>0, and 0 otherwise) are used. For the robust t statistics, Newey West's procedure is used against the heteroskedasticity and autocorrelation in standard errors.

	Before Cross-Listing (-250 , -1Days)			Cross-Listing Date	After Cross- Listing (1 , 250 Days)			Wald Test	
Portfolios	α_i^{PRE}	β_{iF}^{PRE}	β_{iW}^{PRE}	α_i^{LIST}	α_i^{POST}	β_{iF}^{POST}	β_{iW}^{POST}	**P -Value**	**Adj.R^2**
All Stocks	-0.0001	0.8303	-0.0801	-0.0004	-0.0034	0.0451	0.1263	0.017	0.194
	(-0.550)	(32.500)***	(-2.220)**	(-1.090)	(-0.760)	(1.260)	(2.420)**		
Market Value Portfolios									
MV1 (Small)	-0.0006	0.6324	-0.1713	-0.0009	0.0033	0.0089	0.1134	0.488	0.097
	(-1.420)	(13.190)***	(-2.490)**	(-1.250)	(0.540)	(0.140)	(1.140)		
MV2 (Medium)	-0.0001	0.7006	-0.0092	0.0001	-0.0015	0.0791	0.1548	0.086	0.161
	(-0.150)	(14.800)***	(-0.140)	(0.240)	(-0.140)	(1.230)	(1.720)*		
MV3 (Large)	0.0002	1.1460	-0.0548	-0.0003	-0.0095	0.0173	0.1019	0.394	0.361
	(0.580)	(36.240)***	(-1.120)	(-0.530)	(-2.260)**	(0.350)	(1.310)		
Book-to-Market Value Portfolios									
BMV1 (Lowest)	0.0001	0.8546	-0.1071	0.0001	-0.0165	-0.0733	0.1826	0.079	0.191
	(0.330)	(18.940)***	(-1.670)	(0.120)	(-2.460)**	(-1.190)	(2.080)**		
BMV2 (Moderate)	-0.0006	0.8974	-0.0830	0.0000	-0.0047	-0.0108	0.0772	0.700	0.207
	(-1.460)	(20.350)***	(-1.470)	(-0.050)	(-0.790)	(-0.190)	(0.840)		
BMV3 (Highest)	0.0000	0.7578	-0.0574	-0.0011	0.0100	0.1995	0.1167	0.003	0.189
	(0.040)	(18.320)***	(-0.880)	(-1.790)	(1.250)	(3.110)***	(1.290)		

Table 1.4 (b) (Continued)

Portfolios	Before Cross-Listing (-250 , -1Days) α_i^{PRE}	β_{iF}^{PRE}	β_{iW}^{PRE}	Cross-Listing Date α_i^{LIST}	After Cross- Listing (1 , 250 Days) α_i^{POST}	β_{iF}^{POST}	β_{iW}^{POST}	Wald Test P -Value	$Adj.R^2$
Industry Portfolios									
Retailing	-0.0005	0.9479	-0.0051	-0.0004	-0.0027	-0.2003	0.0215	0.056	0.204
	(-0.830)	(14.390)***	(-0.070)	(-0.360)	(-0.420)	(-2.400)**	(0.190)		
Manufacturing	0.0000	0.8501	-0.0863	-0.0008	-0.0038	0.0866	0.1295	0.102	0.197
	(-0.050)	(21.750)***	(-1.490)	(-1.390)	(-0.550)	(1.560)	(1.520)		
Finance	0.0003	0.9484	-0.0842	-0.0011	-0.0024	0.0995	0.2531	0.072	0.262
	(0.450)	(17.450)***	(-0.980)	(-1.330)	(-0.310)	(1.180)	(2.030)*		
Service	0.0006	0.7809	-0.1770	-0.0009	-0.0094	0.1470	0.2641	0.063	0.194
	(1.010)	(11.220)***	(-1.560)	(-0.820)	(-0.730)	(1.430)	(1.670)*		

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 1.4 (c) Market Model Regressions Used to Test Changes in Beta Coefficients of French, German and The World Market Indices With The Pooled Data

We estimate the following market model for each of the portfolio groups:

$$R_{it} = \alpha_i^{PRE} + \beta_{iF}^{PRE} R_{iFt}^{PRE} + \beta_{iFG}^{PRE} R_{iGt}^{PRE} + \beta_{iG}^{PRE} R_{iWt}^{PRE} + \alpha_i^{LIST} D_{it}^{LIST} + \alpha_i^{POST} D_{it}^{POST} + \beta_{iF}^{POST} R_{iFt}^{POST} D_{it}^{POST} + \beta_{iG}^{POST} R_{iGt}^{POST} D_{it}^{POST} + \beta_{iG}^{POST} R_{iWt}^{POST} D_{it}^{POST} + \varepsilon_{it}$$

$t=-250,\ldots,0,\ldots,250$

In the model, R_{it} is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, R_{iGt} is logarithmic return of the Datastream's German stock market index after the effects of French stock market index is eliminated, and R_{iWt} is the logarithmic return of the Datastream's World market index on day t after the effects of French stock market index and German market index are eliminated. Moreover, dummy variables, D_{it}^{LIST}, (=1 if t=0, and 0 otherwise), and D_{it}^{POST} (= 1 if t>0, and 0 otherwise) are used. For the robust t statistics, Newey West's procedure is used against the heteroskedasticity and autocorrelation in standard errors.

	Before Cross-Listing (-250 , -1Days)				Cross-Listing Date	After Cross Listing (1 , 250 Days)				Wald Test	
Portfolios	α_i^{PRE}	β_{iF}^{PRE}	β_{iG}^{PRE}	β_{iW}^{PRE}	α_i^{LIST}	α_i^{POST}	β_{iF}^{POST}	β_{iG}^{POST}	β_{iW}^{POST}	P -Value	Adj.R^2
All Stocks	-0.0001	0.8227	0.1177	-0.0006	-0.0004	-0.0036	0.0409	0.0145	0.0008	0.435	0.196
	(-0.280)	(33.150)***	(4.590)***	(-1.300)	(-1.000)	(-0.790)	(1.150)	(0.330)	(1.150)		
Market Value Portfolios											
MV1 (Small)	-0.0005	0.6151	0.2016	-0.0017	-0.0010	0.0029	0.0144	-0.1117	0.0026	0.155	0.099
	(-1.090)	(13.610)***	(4.520)***	(-1.660)	(-1.390)	(0.480)	(0.230)	(-1.420)	(2.000)*		
MV2 (Medium)	0.0000	0.6945	0.1456	-0.0006	0.0003	-0.0018	0.0678	0.1093	0.0011	0.267	0.165
	(-0.080)	(15.210)***	(3.060)	(-0.760)	(0.520)	(-0.170)	(1.060)	(1.390)	(0.880)		
MV3 (Large)	0.0002	1.1428	0.0316	0.0002	-0.0003	-0.0096	0.0137	0.0349	-0.0007	0.873	0.361
	(0.670)	(36.400)***	(0.830)	(0.360)	(-0.520)	(-2.300)**	(0.280)	(0.500)	(-0.660)		
Book-to-Market Value Portfolios											
BMV1 (Lowest)	0.0002	0.8446	0.1106	-0.0005	0.0001	-0.0169	-0.0802	0.0749	0.0000	0.402	0.193
	(0.510)	(19.620)***	(2.270)**	(-0.570)	(0.200)	(-2.480)**	(-1.330)	(0.990)	(-0.010)		
BMV2 (Moderate)	-0.0005	0.8914	0.1310	-0.0006	-0.0001	-0.0046	-0.0106	-0.0776	0.0010	0.674	0.208
	(-1.290)	(20.940)***	(3.150)***	(-0.660)	(-0.100)	(-0.770)	(-0.190)	(-1.060)	(0.730)		
BMV3 (Highest)	0.0001	0.7508	0.1163	-0.0008	-0.0011	0.0100	0.1946	0.0388	0.0017	0.013	0.190
	(0.170)	(18.340)***	(2.710)***	(-1.030)	(-1.660)	(1.250)	(3.000)***	(0.490)	(1.140)		

Table 1.4 (c) (Continued)

	Before Cross-Listing (-250 , -1Days)				Cross-Listing Date	After Cross Listing (1 , 250 Days)				Wald Test	
Portfolios	α_i^{PRE}	β_{iF}^{PRE}	β_{iG}^{PRE}	β_{iW}^{PRE}	α_i^{LIST}	α_i^{POST}	β_{iF}^{POST}	β_{iG}^{POST}	β_{iW}^{POST}	P -Value	Adj.R^2
Industry Portfolios											
Retailing	-0.0005	0.9474	0.1462	-0.0006	-0.0003	-0.0021	-0.2001	-0.0955	0.0021	0.028	0.205
	(-0.800)	(14.750)***	(2.520)**	(-0.510)	(-0.270)	(-0.340)	(-2.430)**	(-1.010)	(1.220)		
Manufacturing	0.0001	0.8415	0.1533	-0.0015	-0.0009	-0.0039	0.0836	-0.0434	0.0010	0.319	0.198
	(0.190)	(22.750)***	(3.680)***	(-1.870)	(-1.430)	(-0.560)	(1.550)	(-0.590)	(0.970)		
Finance	0.0003	0.9407	0.0859	-0.0005	-0.0009	-0.0027	0.0914	0.1926	0.0029	0.072	0.266
	(0.560)	(17.450)***	(1.530)	(-0.560)	(-1.050)	(-0.360)	(1.060)	(1.850)*	(1.350)		
Service	0.0007	0.7671	0.0851	0.0014	-0.0009	-0.0099	0.1606	-0.0529	-0.0020	0.172	0.192
	(1.180)	(11.380)***	(1.110)	(2.000)*	(-0.900)	(-0.760)	(1.610)	(-0.380)	(-1.350)		

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 1. 5 t-test Statistics of Cumulative Abnormal Returns, (CAR) for the Market Value Portfolios, and the Portfolio Covering All of the Stocks

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, R_{it} is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day t after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium, and Portfolio 3: Large

			Market Value Portfolios					
	All Stocks (N=34)		Portfolio 1 (N=11)		Portfolio 2 (N=11)		Portfolio 3 (N=12)	
Days	CAR	t-Stat	CAR	t-Stat	CAR	t-Stat	CAR	t-Stat
-125	-0.0042	-1.8053*	-0.0046	-0.8681	-0.0030	-0.7272	-0.0050	-1.7003
-115	-0.0139	-1.5611	-0.0334	-1.7809	0.0035	0.1999	-0.0121	-1.3853
-100	-0.0016	-0.0854	0.0151	0.3594	0.0083	0.2177	-0.0260	-1.6873
-80	0.0093	0.3551	0.0385	0.7104	-0.0135	-0.2362	0.0035	0.1496
-60	0.0462	1.5319	0.1214	2.0610*	-0.0189	-0.3041	0.0370	1.3302
-40	0.0617	1.6378	0.1547	1.9239*	-0.0156	-0.2077	0.0472	1.7311
-30	0.0509	1.3950	0.1233	1.5452	-0.0269	-0.3694	0.0558	2.2140**
-20	0.0372	0.9292	0.1511	1.7012	-0.0771	-1.1368	0.0377	1.1474
-10	0.0240	0.5553	0.1280	1.2830	-0.1033	-1.4643	0.0454	1.3197
-5	0.0109	0.2315	0.1375	1.2519	-0.1347	-1.8038	0.0282	0.9206
-4	0.0166	0.3481	0.1414	1.2555	-0.1287	-1.7058	0.0355	1.1255
-3	0.0095	0.2001	0.1281	1.1290	-0.1311	-1.7657	0.0296	1.0054
-2	0.0128	0.2722	0.1282	1.1116	-0.1231	-1.7803	0.0316	0.9920
-1	0.0178	0.3703	0.1424	1.2117	-0.1196	-1.6967	0.0296	0.8941
0	0.0133	0.2799	0.0522	0.5178	-0.0310	-0.2949	0.0182	0.5534
1	0.0142	0.2970	0.0451	0.4550	-0.0190	-0.1672	0.0134	0.4069
2	0.0172	0.3562	0.0418	0.3962	-0.0122	-0.1102	0.0192	0.6082
3	0.0163	0.3400	0.0307	0.2896	-0.0151	-0.1375	0.0294	1.0396
4	0.0190	0.3965	0.0334	0.3172	-0.0110	-0.1006	0.0308	1.0685
5	0.0134	0.2789	0.0318	0.3131	-0.0200	-0.1748	0.0244	0.8347
10	-0.0039	-0.0814	-0.0060	-0.0583	-0.0327	-0.2879	0.0220	0.8479
20	-0.0313	-0.6179	-0.0618	-0.5863	-0.0445	-0.3771	0.0088	0.3324
30	-0.0630	-1.1940	-0.1367	-1.2745	-0.0775	-0.6507	0.0179	0.5198
40	-0.1025	-1.5353	-0.2834	-1.9192*	-0.0791	-0.6115	0.0418	1.2480
60	-0.1260	-2.0009**	-0.2969	-2.3653**	-0.1005	-0.7645	0.0073	0.1610
80	-0.1411	-2.1554**	-0.3435	-2.7075**	-0.0714	-0.5355	-0.0195	-0.3543
100	-0.1782	-2.3933**	-0.4614	-3.2012***	-0.1020	-0.7170	0.0116	0.2311
115	-0.1952	-2.4070**	-0.5079	-3.2426***	-0.0866	-0.5481	-0.0081	-0.1681
125	-0.1982	-2.1267**	-0.5609	-2.8454**	-0.1001	-0.6224	0.0444	0.8450

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

In portfolio of all stocks:

Between days –125 and –117 abnormal returns : Significantly negative

On some days between –67 and –34 abnormal returns: Significantly positive

Between days 43 and 125 abnormal returns : Significantly negative

In Portfolio 1:

On some days between –68 and –22 abnormal returns: Significantly positive

Between days 37 and 125 abnormal returns : Significantly negative

In Portfolio 3:

Between days –50 and –28 abnormal returns: Significantly positive

Between days 39 and 125 abnormal returns: Significantly negative

Table 1.6 t-test Statistics of Buy and Hold Abnormal Returns, (BHAR) for the Market Value Portfolios, and the Portfolio Covering All of the Stocks

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, R_{it} is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day t after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium, and Portfolio 3: Large

			Market Value Portfolios					
	All Stocks (N=34)		Portfolio 1 (N=11)		Portfolio 2 (N=11)		Portfolio 3 (N=12)	
Days	BHAR	t-Stat	BHAR	t-Stat	BHAR	t-Stat	BHAR	t-Stat
-125	-0.0042	-1.8053*	-0.0046	-0.8681	-0.0030	-0.7272	-0.0050	-1.7003
-115	-0.0150	-1.6753*	-0.0347	-1.9024*	0.0033	0.1867	-0.0138	-1.5099
-100	-0.0030	-0.1521	0.0159	0.3592	0.0090	0.2386	-0.0312	-1.8721*
-80	0.0081	0.2747	0.0409	0.6423	-0.0146	-0.2466	-0.0012	-0.0395
-60	0.0468	1.2011	0.1439	1.6724	-0.0349	-0.5012	0.0328	0.8946
-40	0.0636	1.1959	0.1967	1.5774	-0.0459	-0.5024	0.0419	1.0526
-30	0.0435	0.8669	0.1446	1.2264	-0.0677	-0.7615	0.0528	1.4424
-20	0.0231	0.4067	0.1740	1.2984	-0.1293	-1.4665	0.0246	0.5188
-10	0.0039	0.0624	0.1489	1.0251	-0.1748	-1.8274*	0.0347	0.6392
-5	-0.0161	-0.2554	0.1553	1.0400	-0.2030	-2.1074*	-0.0020	-0.0426
-4	-0.0083	-0.1298	0.1604	1.0572	-0.1940	-2.0129*	0.0073	0.1490
-3	-0.0167	-0.2630	0.1466	0.9523	-0.1969	-2.0578*	-0.0013	-0.0288
-2	-0.0141	-0.2209	0.1481	0.9479	-0.1936	-2.1152*	0.0016	0.0319
-1	-0.0073	-0.1103	0.1683	1.0387	-0.1890	-2.0385*	-0.0017	-0.0311
0	-0.0156	-0.2403	0.0110	0.0978	-0.0391	-0.2384	-0.0185	-0.3519
1	-0.0193	-0.2974	0.0011	0.0100	-0.0342	-0.1955	-0.0257	-0.4941
2	-0.0162	-0.2532	-0.0025	-0.0219	-0.0295	-0.1766	-0.0176	-0.3528
3	-0.0183	-0.2939	-0.0155	-0.1348	-0.0387	-0.2377	-0.0039	-0.0884
4	-0.0157	-0.2482	-0.0144	-0.1253	-0.0332	-0.1988	-0.0024	-0.0525
5	-0.0219	-0.3426	-0.0166	-0.1502	-0.0387	-0.2230	-0.0129	-0.2810
10	-0.0423	-0.6702	-0.0564	-0.5072	-0.0605	-0.3536	-0.0142	-0.3669
20	-0.0670	-1.0507	-0.1071	-0.9892	-0.0671	-0.4026	-0.0300	-0.8238
30	-0.1009	-1.5560	-0.1800	-1.6471	-0.1107	-0.6741	-0.0195	-0.4151
40	-0.1229	-1.7678*	-0.2761	-2.2211*	-0.1115	-0.6734	0.0071	0.1654
60	-0.1662	-2.3664**	-0.3183	-2.7866**	-0.1560	-0.9154	-0.0360	-0.6220
80	-0.1910	-2.4428**	-0.3826	-3.1181**	-0.1377	-0.7256	-0.0643	-0.9400
100	-0.2225	-2.6454***	-0.4664	-3.5683***	-0.1835	-0.9093	-0.0347	-0.5721
115	-0.2475	-2.5765***	-0.5189	-3.6844***	-0.1640	-0.6745	-0.0752	-1.3274
125	-0.2366	-2.2536**	-0.5370	-3.2526***	-0.1754	-0.6855	-0.0174	-0.2670

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes: In portfolio of all stocks:
- Between days –125 and –115 abnormal returns : Significantly negative
- Between days 24 and 125 abnormal returns : Significantly negative

In Portfolio 1:
- On some days between –124 and –115 abnormal returns: Significantly negative
- Between days -67 and -52 abnormal returns : Significantly positive
- Between days 34 and 125 abnormal returns : Significantly negative

In Portfolio 2:
- Between days –10 and –1 abnormal returns: Significantly negative
- Between days 39 and 125 abnormal returns: Significantly negative

In Portfolio 3:
- Between days –104 and –100 abnormal returns: Significantly negative
- Between days -46 and 45 abnormal returns: Significantly positive
- Between days 112 and 113 abnormal returns: Significantly negative

Table 1.7 t-test Statistics of Cumulative Abnormal Returns, (CAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250
In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Moderate and Portfolio 3: High

	Book to Market Value Portfolios					
	Portfolio 1 (N=11)		Portfolio 2 (N=11)		Portfolio 3 (N=12)	
Days	CAR	t-Stat	CAR	t-Stat	CAR	t-Stat
-125	-0.0044	-1.3235	-0.0034	-0.7007	-0.0048	-1.1508
-115	0.0154	1.0738	-0.0325	-1.6595	-0.0239	-2.7048**
-100	0.0556	2.2361**	-0.0022	-0.0559	-0.0536	-1.9868*
-80	0.0560	1.3249	0.0031	0.0579	-0.0278	-0.6798
-60	0.0989	1.4051	0.0828	2.0516*	-0.0357	-0.9955
-40	0.0889	1.1026	0.1473	2.6008**	-0.0418	-0.8677
-30	0.0749	0.9642	0.1205	2.2664**	-0.0351	-0.6639
-20	0.0681	0.7757	0.0530	1.0172	-0.0055	-0.0808
-10	0.0388	0.4171	0.0269	0.4765	0.0079	0.1021
-5	0.0441	0.4864	0.0003	0.0035	-0.0098	-0.1121
-4	0.0480	0.5220	0.0074	0.1078	-0.0037	-0.0413
-3	0.0433	0.4644	0.0036	0.0511	-0.0161	-0.1868
-2	0.0477	0.5166	0.0039	0.0551	-0.0111	-0.1292
-1	0.0546	0.5686	0.0175	0.2510	-0.0157	-0.1791
0	0.0373	0.3828	0.0106	0.1602	-0.0063	-0.0737
1	0.0321	0.3376	0.0053	0.0830	0.0051	0.0547
2	0.0409	0.4452	-0.0069	-0.1161	0.0177	0.1745
3	0.0444	0.4932	-0.0040	-0.0677	0.0086	0.0839
4	0.0503	0.5654	0.0034	0.0557	0.0032	0.0320
5	0.0435	0.4675	0.0053	0.0887	-0.0086	-0.0861
10	0.0391	0.4354	-0.0156	-0.2669	-0.0353	-0.3466
20	0.0555	0.5448	-0.0489	-0.9683	-0.0947	-0.9472
30	0.0315	0.3066	-0.0401	-0.7493	-0.1705	-1.6537
40	0.0323	0.2925	-0.0838	-1.1350	-0.2433	-1.7262
60	-0.0021	-0.0173	-0.0931	-1.0573	-0.2697	-2.4564**
80	-0.0023	-0.0177	-0.1177	-1.3031	-0.2899	-2.6447**
100	-0.0258	-0.1776	-0.1400	-1.4483	-0.3529	-2.7147**
115	-0.0032	-0.0206	-0.1730	-1.7808	-0.3915	-2.6948**
125	0.0163	0.0994	-0.1643	-1.3911	-0.4259	-2.4174**

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 1:

Between days –103 and –98 abnormal returns: Significantly positive

In Portfolio 2:

Between days –62 and –26 abnormal returns: Significantly positive

On –87 day abnormal return: Significantly negative

In Portfolio 3:

Between days –124 and –100 abnormal returns: Significantly negative

Between days 39 and 125 abnormal returns: Significantly negative

Table 1.8 t-test Statistics of Buy and Hold Abnormal Returns, (BHAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Moderate and Portfolio 3: High

	Book to Market Value Portfolios					
	Portfolio 1 (N=11)		Portfolio 2 (N=11)		Portfolio 3 (N=12)	
Days	**BHAR**	**t-Stat**	**BHAR**	**t-Stat**	**BHAR**	**t-Stat**
-125	-0.0044	-1.3235	-0.0034	-0.7007	-0.0048	-1.1508
-115	0.0148	0.9838	-0.0332	-1.7178	-0.0257	-2.9875**
-100	0.0559	1.9874*	-0.0028	-0.0715	-0.0570	-2.1934*
-80	0.0595	1.1592	-0.0024	-0.0391	-0.0294	-0.7006
-60	0.1200	1.2455	0.0841	1.7917	-0.0543	-1.2593
-40	0.1198	0.9553	0.1626	2.2973**	-0.0788	-1.2790
-30	0.0949	0.8170	0.1202	1.8578*	-0.0740	-1.0783
-20	0.0912	0.6668	0.0315	0.4848	-0.0469	-0.5392
-10	0.0519	0.3571	0.0028	0.0378	-0.0391	-0.3877
-5	0.0503	0.3601	-0.0313	-0.3643	-0.0632	-0.6021
-4	0.0558	0.3955	-0.0224	-0.2633	-0.0541	-0.5060
-3	0.0519	0.3608	-0.0276	-0.3221	-0.0697	-0.6813
-2	0.0558	0.3846	-0.0299	-0.3471	-0.0638	-0.6236
-1	0.0670	0.4379	-0.0151	-0.1752	-0.0682	-0.6573
0	0.0447	0.2933	-0.0263	-0.3225	-0.0611	-0.5990
1	0.0352	0.2405	-0.0361	-0.4580	-0.0571	-0.5118
2	0.0424	0.3066	-0.0524	-0.7060	-0.0386	-0.3256
3	0.0432	0.3262	-0.0481	-0.6751	-0.0500	-0.4221
4	0.0529	0.3916	-0.0409	-0.5437	-0.0591	-0.5024
5	0.0470	0.3337	-0.0389	-0.5323	-0.0739	-0.6400
10	0.0387	0.2852	-0.0586	-0.8643	-0.1070	-0.8995
20	0.0604	0.4188	-0.0910	-1.6969	-0.1618	-1.4419
30	0.0266	0.1890	-0.0701	-1.3018	-0.2460	-2.1169*
40	0.0184	0.1310	-0.0951	-1.4546	-0.2779	-2.1175*
60	-0.0429	-0.2868	-0.0940	-1.1077	-0.3453	-3.0743**
80	-0.0391	-0.2245	-0.1298	-1.4084	-0.3864	-3.2715***
100	-0.0617	-0.3229	-0.1567	-1.6620	-0.4302	-3.4118***
115	-0.0329	-0.1451	-0.2123	-2.2603**	-0.4765	-3.4028***
125	-0.0006	-0.0024	-0.1992	-1.7718	-0.4872	-3.2463***

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 1:
- Between days –109 and –100 abnormal returns: Significantly positive

In Portfolio 2:
- Between days –122 and –116 abnormal returns: Significantly negative
- Between days -58 and –28 abnormal returns: Significantly positive
- Between days 21 and 29 abnormal returns: Significantly negative
- On day 46 abnormal return: Significantly negative
- Between days 84 and 88 abnormal returns: Significantly negative
- Between days 106 and 124 abnormal returns: Significantly negative

In Portfolio 3:
- Between days –124 and –100 abnormal returns: Significantly negative
- Between days 25 and 125 abnormal returns: Significantly negative

Table 1.9 t-test Statistics of Cumulative Abnormal Returns, (CAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250
In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios							
	Retailing (N=5)		Manufacturing (N=14)		Finance (N=6)		Service (N=4)	
Days	CAR	t-Stat	CAR	t-Stat	CAR	t-Stat	CAR	t-Stat
-125	-0.0063	-1.4792	-0.0059	-1.5994	0.0012	0.2767	-0.0074	-0.5427
-115	-0.0149	-0.9802	-0.0162	-0.9004	-0.0163	-0.9770	-0.0016	-0.0801
-100	-0.0436	-1.6420	0.0175	0.4835	-0.0194	-0.5623	0.0349	0.7158
-80	-0.0464	-1.2759	0.0469	1.1115	0.0261	0.3386	0.0333	0.4851
-60	0.0276	0.8083	0.1105	2.2181**	0.0209	0.2421	0.0391	0.4103
-40	-0.0089	-0.1605	0.1488	2.3856**	0.0211	0.1676	0.0661	0.5594
-30	-0.0379	-0.6924	0.1251	2.0802*	0.0170	0.1271	0.0716	0.6582
-20	-0.0554	-0.6602	0.0902	1.3117	0.0500	0.3825	0.0636	0.5391
-10	-0.0749	-0.7308	0.0634	0.8552	0.0917	0.6344	0.0115	0.0862
-5	-0.0615	-0.5471	0.0310	0.3898	0.0825	0.4700	0.0202	0.1426
-4	-0.0561	-0.4887	0.0354	0.4403	0.1043	0.5832	0.0208	0.1506
-3	-0.0486	-0.3989	0.0245	0.3032	0.0874	0.5309	0.0196	0.1373
-2	-0.0539	-0.4475	0.0298	0.3722	0.0910	0.5681	0.0136	0.0904
-1	-0.0620	-0.5002	0.0448	0.5525	0.0980	0.6005	0.0005	0.0032
0	-0.0699	-0.5705	0.0401	0.5080	0.0924	0.5648	-0.0093	-0.0591
1	-0.0701	-0.5674	0.0356	0.4671	0.0937	0.5699	-0.0218	-0.1448
2	-0.0932	-0.7011	0.0333	0.4425	0.1107	0.6301	-0.0007	-0.0048
3	-0.0998	-0.7170	0.0325	0.4462	0.0887	0.5087	0.0217	0.1508
4	-0.0935	-0.6932	0.0344	0.4608	0.0810	0.4576	0.0329	0.2435
5	-0.0883	-0.6642	0.0353	0.4700	0.0640	0.3648	0.0155	0.1102
10	-0.1111	-0.8179	0.0184	0.2470	0.0406	0.2267	0.0047	0.0359
20	-0.1535	-0.9148	-0.0193	-0.2589	-0.0078	-0.0414	-0.0305	-0.2046
30	-0.1423	-0.7818	-0.0824	-1.0979	-0.0617	-0.3217	-0.0202	-0.1213
40	-0.2604	-0.9339	-0.1303	-1.3483	-0.0681	-0.3309	-0.0520	-0.3171
60	-0.2298	-0.9318	-0.1504	-1.5573	-0.1068	-0.6430	-0.1193	-0.5995
80	-0.2132	-0.9036	-0.1702	-1.4922	-0.1270	-0.8726	-0.1333	-0.6639
100	-0.2794	-1.0433	-0.2405	-1.8757*	-0.0919	-0.6829	-0.2225	-0.9586
115	-0.2843	-1.0559	-0.2688	-1.7786*	-0.1207	-0.8353	-0.1824	-0.8035
125	-0.3806	-1.0459	-0.2848	-1.7524	-0.0826	-0.6425	-0.1340	-0.4786

***, **, * indicate significance at 1, 5, 10 percent levels respectively.
Notes:
In portfolio of retailing sector:
Between days –113 and –110 and on days –93 and -92 abnormal returns: Significantly negative
In portfolio of manufacturing sector:
Between days –69 and –28 abnormal returns: Significantly positive
Between days 43 and 53 abnormal returns: Significantly negative
Between days 99 and 123 abnormal returns: Significantly negative

Table 1.10 t-test Statistics of Buy and Hold Abnormal Returns, (BHAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios							
	Retailing (N=5)		Manufacturing (N=14)		Finance (N=6)		Service (N=6)	
Days	BHAR	t-Stat	BHAR	t-Stat	BHAR	t-Stat	BHAR	t-Stat
-125	-0.0063	-1.4792	-0.0059	-1.5994	0.0012	0.2767	-0.0074	-0.5427
-115	-0.0172	-1.1267	-0.0172	-0.9585	-0.0171	-0.9911	-0.0032	-0.1486
-100	-0.0508	-1.7365	0.0179	0.4715	-0.0242	-0.6456	0.0313	0.5712
-80	-0.0626	-1.3826	0.0508	1.0416	0.0236	0.2437	0.0214	0.2556
-60	0.0143	0.3861	0.1291	1.8325*	0.0033	0.0296	0.0191	0.1573
-40	-0.0357	-0.4743	0.1881	1.9616*	-0.0140	-0.0852	0.0348	0.2179
-30	-0.0722	-0.9500	0.1485	1.6756	-0.0235	-0.1363	0.0381	0.2629
-20	-0.1017	-0.9306	0.1105	1.0339	-0.0056	-0.0340	0.0146	0.0899
-10	-0.1160	-0.8509	0.0761	0.6651	0.0464	0.2434	-0.0716	-0.3778
-5	-0.0995	-0.6871	0.0295	0.2527	0.0194	0.0925	-0.0586	-0.3039
-4	-0.0920	-0.6238	0.0353	0.2994	0.0464	0.2204	-0.0593	-0.3156
-3	-0.0825	-0.5291	0.0226	0.1909	0.0245	0.1249	-0.0609	-0.3131
-2	-0.0893	-0.5731	0.0281	0.2368	0.0272	0.1416	-0.0712	-0.3439
-1	-0.0979	-0.6161	0.0467	0.3792	0.0376	0.1913	-0.0896	-0.4238
0	-0.1087	-0.6956	0.0383	0.3202	0.0278	0.1426	-0.1019	-0.4790
1	-0.1106	-0.7096	0.0286	0.2490	0.0293	0.1486	-0.1142	-0.5677
2	-0.1353	-0.8356	0.0235	0.2118	0.0491	0.2394	-0.0858	-0.4706
3	-0.1405	-0.8432	0.0203	0.1935	0.0181	0.0899	-0.0551	-0.2899
4	-0.1365	-0.8346	0.0241	0.2198	0.0062	0.0300	-0.0406	-0.2225
5	-0.1304	-0.8051	0.0265	0.2378	-0.0159	-0.0784	-0.0638	-0.3421
10	-0.1536	-0.9416	0.0067	0.0621	-0.0469	-0.2214	-0.0739	-0.4195
20	-0.1839	-0.9949	-0.0363	-0.3574	-0.0987	-0.4436	-0.1025	-0.5236
30	-0.1618	-0.8080	-0.1075	-1.1271	-0.1586	-0.6787	-0.0941	-0.4337
40	-0.2302	-0.9384	-0.1339	-1.3161	-0.1478	-0.6104	-0.1328	-0.6660
60	-0.2254	-0.9478	-0.1685	-1.5714	-0.2143	-0.9907	-0.2320	-0.9950
80	-0.2074	-0.8583	-0.1937	-1.4242	-0.2577	-1.2216	-0.2729	-1.0713
100	-0.2544	-0.9866	-0.2538	-1.7624	-0.2297	-1.1161	-0.3618	-1.3042
115	-0.2748	-1.0804	-0.2768	-1.5299	-0.2806	-1.2402	-0.3527	-1.1969
125	-0.3109	-1.1008	-0.2802	-1.4054	-0.2551	-1.1912	-0.2885	-0.7859

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In portfolio of retailing sector:

Between days –113 and –110 and on days –93 and -92 abnormal returns: Significantly negative

In portfolio of manufacturing sector:

Between days –67 and –53 abnormal returns: Significantly positive

Between days –47 and –34 abnormal returns: Significantly positive

Between days 43 and 58 abnormal returns: Significantly negative

Between days 108 and 109 abnormal returns: Significantly negative

Table 1.11 Rank test statistics of Cumulative Abnormal Returns, (CAR) for the Market Value and All Stocks Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium and Portfolio 3: Large

		Market Value Portfolios		
	All Stocks	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	CAR	CAR	CAR	CAR
-125	0.2903	-0.0464	1.2903	-0.0965
-115	0.0782	-0.3560	1.6530	-0.5160
-100	-0.0452	0.0556	0.6783	-1.0846
-80	0.4238	0.1168	0.8077	0.5342
-60	1.1432	0.7602	0.3344	2.2439**
-40	1.5962	1.1903	1.6121	1.5200
-30	1.4483	0.7657	1.6511	2.0368*
-20	1.0430	1.0327	0.9563	0.3988
-10	1.1367	0.8844	0.6069	1.5763
-5	0.8472	1.0661	-0.0924	0.6543
-4	0.9468	1.0438	0.0247	0.9962
-3	0.8846	1.1180	-0.0172	0.5825
-2	0.9467	1.1254	-0.0411	0.8440
-1	1.1109	1.3164	0.0253	0.9210
0	1.0476	1.2682	0.5119	0.2583
1	0.9142	1.1792	0.4478	-0.0080
2	0.9388	1.0920	0.5409	0.2337
3	0.9239	0.9660	0.2435	0.8318
4	1.0515	1.0475	0.3176	1.0468
5	0.9100	1.0049	0.2231	0.6900
10	0.3813	0.5673	-0.2560	0.2529
20	0.2018	0.0389	0.2717	0.4246
30	-0.3952	-0.2577	-1.2730	0.4826
40	-0.3995	-1.0253	-0.3821	1.5966
60	-1.1913	-1.1384	-1.5177	-0.1008
80	-1.3484	-1.2329	-0.7790	-1.3201
100	-1.3417	-1.8633*	-0.5881	0.2567
115	-1.6983*	-1.9597*	-1.2623	-0.2114
125	-1.3052	-1.6872	-2.1271*	1.6363

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes: In portfolio of all stocks:

On day 45 day abnormal return : Significantly negative

Between 112 and 121 days abnormal returns : Significantly negative

In Portfolio 1:

On some days between 97 and 122 abnormal returns: Significantly negative

In Portfolio 2:

Between –38 and –33 days abnormal returns: Significantly positive

On days 45 and 46 abnormal returns: Significantly negative

On most of the days between 118 and 125 days abnormal returns: Significantly negative

In Portfolio 3:

On many days between –61 and –29 days abnormal returns: Significantly positive

Only on 40 and 124 days abnormal returns: Significantly positive at 10 percent

Table 1.12 Rank test statistics of Buy and Hold Abnormal Returns, (BHAR) for the Market Value and All Stocks Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium and Portfolio 3: Large

			Market Value Portfolios					
	All Stocks (N=34)		Portfolio 1 (N=11)		Portfolio 2 (N=11)		Portfolio 3 (N=12)	
Days	**BHAR**	**t-Stat**	**BHAR**	**t-Stat**	**BHAR**	**t-Stat**	**BHAR**	**t-Stat**
-125	-0.0042	-1.8053*	-0.0046	-0.8681	-0.0030	-0.7272	-0.0050	-1.7003
-115	-0.0150	-1.6753*	-0.0347	-1.9024*	0.0033	0.1867	-0.0138	-1.5099
-100	-0.0030	-0.1521	0.0159	0.3592	0.0090	0.2386	-0.0312	-1.8721*
-80	0.0081	0.2747	0.0409	0.6423	-0.0146	-0.2466	-0.0012	-0.0395
-60	0.0468	1.2011	0.1439	1.6724	-0.0349	-0.5012	0.0328	0.8946
-40	0.0636	1.1959	0.1967	1.5774	-0.0459	-0.5024	0.0419	1.0526
-30	0.0435	0.8669	0.1446	1.2264	-0.0677	-0.7615	0.0528	1.4424
-20	0.0231	0.4067	0.1740	1.2984	-0.1293	-1.4665	0.0246	0.5188
-10	0.0039	0.0624	0.1489	1.0251	-0.1748	-1.8274*	0.0347	0.6392
-5	-0.0161	-0.2554	0.1553	1.0400	-0.2030	-2.1074*	-0.0020	-0.0426
-4	-0.0083	-0.1298	0.1604	1.0572	-0.1940	-2.0129*	0.0073	0.1490
-3	-0.0167	-0.2630	0.1466	0.9523	-0.1969	-2.0578*	-0.0013	-0.0288
-2	-0.0141	-0.2209	0.1481	0.9479	-0.1936	-2.1152*	0.0016	0.0319
-1	-0.0073	-0.1103	0.1683	1.0387	-0.1890	-2.0385*	-0.0017	-0.0311
0	-0.0156	-0.2403	0.0110	0.0978	-0.0391	-0.2384	-0.0185	-0.3519
1	-0.0193	-0.2974	0.0011	0.0100	-0.0342	-0.1955	-0.0257	-0.4941
2	-0.0162	-0.2532	-0.0025	-0.0219	-0.0295	-0.1766	-0.0176	-0.3528
3	-0.0183	-0.2939	-0.0155	-0.1348	-0.0387	-0.2377	-0.0039	-0.0884
4	-0.0157	-0.2482	-0.0144	-0.1253	-0.0332	-0.1988	-0.0024	-0.0525
5	-0.0219	-0.3426	-0.0166	-0.1502	-0.0387	-0.2230	-0.0129	-0.2810
10	-0.0423	-0.6702	-0.0564	-0.5072	-0.0605	-0.3536	-0.0142	-0.3669
20	-0.0670	-1.0507	-0.1071	-0.9892	-0.0671	-0.4026	-0.0300	-0.8238
30	-0.1009	-1.5560	-0.1800	-1.6471	-0.1107	-0.6741	-0.0195	-0.4151
40	-0.1229	-1.7678*	-0.2761	-2.2211*	-0.1115	-0.6734	0.0071	0.1654
60	-0.1662	-2.3664**	-0.3183	-2.7866**	-0.1560	-0.9154	-0.0360	-0.6220
80	-0.1910	-2.4428**	-0.3826	-3.1181**	-0.1377	-0.7256	-0.0643	-0.9400
100	-0.2225	-2.6454***	-0.4664	-3.5683***	-0.1835	-0.9093	-0.0347	-0.5721
115	-0.2475	-2.5765***	-0.5189	-3.6844***	-0.1640	-0.6745	-0.0752	-1.3274
125	-0.2366	-2.2536**	-0.5370	-3.2526***	-0.1754	-0.6855	-0.0174	-0.2670

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes: In portfolio of all stocks:
- Between days –125 and –115 abnormal returns : Significantly negative
- Between days 24 and 125 abnormal returns : Significantly negative

In Portfolio 1:
- On some days between –124 and –115 abnormal returns: Significantly negative
- Between days -67 and -52 abnormal returns : Significantly positive
- Between days 34 and 125 abnormal returns : Significantly negative

In Portfolio 2:
- Between days –10 and –1 abnormal returns: Significantly negative
- Between days 39 and 125 abnormal returns: Significantly negative

In Portfolio 3:
- Between days –104 and –100 abnormal returns: Significantly negative
- Between days -46 and 45 abnormal returns: Significantly positive
- Between days 112 and 113 abnormal returns: Significantly negative

Table 1.13 Rank test statistics of Cumulative Abnormal Returns, (CAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, R_{iFt} is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1: Low , Portfolio 2: Moderate and Portfolio 3: High

	Book-to-Market Value Portfolios		
	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	CAR	CAR	CAR
-125	-1.7469	0.2900	0.8355
-115	-0.9295	-0.2038	0.6177
-100	0.3838	0.1825	-0.3652
-80	1.3404	-0.0086	0.3664
-60	1.4595	1.3061	0.5050
-40	1.4187	2.5155**	0.2944
-30	1.3669	2.0114*	0.4797
-20	0.0323	0.9926	1.0469
-10	-0.6981	0.7941	1.6256
-5	-0.6234	0.6948	1.1539
-4	-0.4640	0.7941	1.2003
-3	-0.5238	0.8359	1.0676
-2	-0.0007	0.7575	1.0856
-1	0.5024	1.0527	0.9707
0	-0.1657	0.8150	1.2738
1	-0.7893	0.7706	1.2937
2	-0.3587	0.4597	1.4829
3	-0.0315	0.5747	1.2410
4	0.4490	0.7810	1.1357
5	0.2655	0.7680	0.9393
10	-0.1394	0.2299	0.5606
20	1.2623	-0.3317	0.2644
30	0.1445	-0.1567	-0.6387
40	0.8484	-0.4911	-0.5764
60	-0.8471	-0.3239	-1.6495
80	-0.1138	-0.6951	-1.8465*
100	-0.1915	-1.1557	-1.4055
115	0.0627	-1.4595	-1.8786*
125	0.7097	-1.0763	-1.6930

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 1:
- Between –69 and –57 abnormal returns: Significantly positive
- Between 45 and 56 days abnormal returns : Significantly negative

In Portfolio 2:
- Between –50 and –28 days abnormal returns: Significantly positive

In Portfolio 3:
- Between 76 and 80 days abnormal returns: Significantly negative
- Between 112 and 122 days abnormal returns: Significantly negative

Table 1.14 Rank test statistics of Buy and Hold Abnormal Returns, (BHAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1: Low , Portfolio 2: Moderate and Portfolio 3: High

	Book-to-Market Value Portfolios		
	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	BHAR	BHAR	BHAR
-125	-0.5325	0.5556	1.0070
-115	0.1339	0.1915	0.8460
-100	0.9213	0.5837	0.1045
-80	1.2816	0.3753	0.5158
-60	1.4786	1.2672	0.5190
-40	1.2976	2.3312 **	0.3250
-30	1.4960	1.8252 *	0.4490
-20	0.3632	0.9315	0.9175
-10	-0.2173	0.7400	1.3420
-5	-0.4628	0.5911	1.0393
-4	-0.2207	0.6809	1.1217
-3	-0.2812	0.7093	1.0199
-2	0.1775	0.5485	0.9445
-1	0.3782	0.7613	0.8726
0	0.0062	0.6076	1.0667
1	-0.4304	0.5580	1.0003
2	-0.5199	0.3405	1.1642
3	-0.1900	0.3499	1.0146
4	0.1343	0.4729	0.8609
5	0.0687	0.4870	0.7176
10	-0.0815	-0.0166	0.4018
20	0.8739	-0.4776	0.2584
30	0.2200	-0.3783	-0.4627
40	0.4527	-0.5580	-0.4535
60	-1.0597	-0.3948	-1.3681
80	-0.8653	-0.7570	-1.7816
100	-0.7941	-1.1933	-1.5755
115	-1.0646	-1.5607	-2.1130 *
125	-0.0064	-1.3131	-1.9810 *

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 1:
- On –83 day abnormal return: Significantly positive
- Between -68 and -65 days abnormal returns : Significantly positive
- Between 45 and 51 days, between 55 and 57 days and on day 113 abnormal returns: Significantly negative

In Portfolio 2:
- Except for few days between –49 and –28 days abnormal returns: Significantly positive

In Portfolio 3:
- Between 76 and 79 days abnormal returns: Significantly negative
- Between 109 and 125 days abnormal returns: Significantly negative

Table 1.15 Rank test statistics of Cumulative Abnormal Returns, (CAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios			
	Retailing (N=5)	Manufacturing (N=14)	Finance (N=6)	Service (N=4)
Days	CAR	CAR	CAR	CAR
-125	0.7032	0.1872	0.0205	-0.4824
-115	-0.1780	0.0185	-0.1078	0.2371
-100	-0.1335	0.2194	-0.6773	-0.0245
-80	-0.4629	0.6849	0.4669	-0.1799
-60	1.6290	1.2442	0.7235	0.4906
-40	1.5667	1.7398	0.5798	1.3083
-30	0.3828	1.4935	0.4413	1.5944
-20	-0.0979	1.0325	1.3700	1.3573
-10	0.2938	1.0037	2.1705*	0.3271
-5	1.0326	0.5987	1.6061	0.7032
-4	1.1839	0.6325	2.1089*	0.6541
-3	2.2343*	0.4526	1.8421	0.6623
-2	1.8249	0.5379	1.7138	0.6950
-1	1.8605	0.7710	1.8934	0.5397
0	1.5934	0.6201	1.8319	0.3761
1	1.6824	0.5236	2.0576*	0.0736
2	1.1127	0.4650	2.1500*	0.2617
3	1.0326	0.4895	1.4624	0.7850
4	1.1127	0.6106	1.2007	1.0875
5	1.3353	0.5708	0.9544	0.7277
10	0.4718	0.3583	0.5337	0.4742
20	0.1958	-0.0978	0.3233	-0.2453
30	0.4362	-0.7187	-0.7081	0.4415
40	-0.8635	-0.5839	-0.3335	-0.3189
60	-0.4718	-0.9984	-1.5137	-0.7931
80	-0.1780	-1.0038	-1.7138	-0.6705
100	-1.0237	-1.5573	-0.4823	-2.0033
115	-1.6468	-1.3780	-1.6625	-1.3083
125	-1.4243	-1.3937	-1.2572	0.0572

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In portfolio of retailing sector:
- On day –3 abnormal return: Significantly positive
- Between 118 and 122 days abnormal returns: Significantly negative

In portfolio of manufacturing sector:
- On day -41 abnormal return: Significantly positive

In portfolio of finance sector:
- On some days between –13 and 2 days abnormal returns: Significantly positive
- Between 74 and 79 days and on day 114 abnormal returns: Significantly negative

Table 1.16 Rank test statistics of Buy and Hold Abnormal Returns, (BHAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios			
	Retailing (N=5)	Manufacturing (N=14)	Finance (N=6)	Service (N=4)
Days	BHAR	BHAR	BHAR	BHAR
-125	1.1113	0.3871	0.4267	0.0434
-115	0.2925	0.3350	0.3811	0.6323
-100	0.3509	0.5178	0.0456	0.4649
-80	-0.1504	0.7958	0.7333	0.3533
-60	1.5124	1.1953	0.7747	0.5083
-40	1.4873	1.5855	0.6463	1.0166
-30	0.3008	1.3188	0.5220	1.6303
-20	-0.0669	0.9726	1.1351	1.2150
-10	0.3175	0.9689	1.7151	0.2108
-5	1.1531	0.4679	1.2801	0.4091
-4	1.2701	0.5533	1.6529	0.3595
-3	2.2059	0.3756	1.5038	0.3409
-2	1.8884	0.4142	1.2552	0.3161
-1	1.8466	0.5769	1.4209	0.2232
0	1.5207	0.4818	1.3837	0.1798
1	1.5458	0.4249	1.4955	-0.0682
2	0.9108	0.3496	1.5825	-0.0124
3	0.7938	0.3378	1.0730	0.4463
4	0.8105	0.3863	0.8203	0.7005
5	1.1030	0.3796	0.6421	0.3099
10	0.2507	0.1730	0.3231	0.3347
20	0.0669	-0.2591	0.2693	0.0558
30	0.3509	-0.7468	-0.4723	0.2480
40	-0.8189	-0.6745	-0.1409	-0.2232
60	-0.5849	-0.9992	-1.2055	-0.7191
80	0.0501	-1.1117	-1.7814	-1.0352
100	-1.0110	-1.4981	-1.1102	-2.0022
115	-1.9719	-1.4971	-2.1211 *	-1.4381
125	-1.9385	-1.5965	-1.7192	-0.1612

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In portfolio of retailing sector:
- On most of the days between 112 and 123 abnormal returns: Significantly negative

In portfolio of finance sector:
- On 77 and 78 days abnormal return: Significantly negative
- Between 112 and 115 days, and day 119 abnormal returns: Significantly negative

In portfolio of service sector:
- On day 111 abnormal return: Significantly negative

Table 1.17 Wilcoxon test statistics of Cumulative Abnormal Returns, (CAR) for the Market Value and All Stocks Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium and Portfolio 3: Large

		Market Value Portfolios		
	All Stocks	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	CAR	CAR	CAR	CAR
-125	-0.0247	22	28	26
-115	-0.0256	14*	32	26
-100	0.0057	47	37	28
-80	0.0092	41	24	49
-60	0.0189	50	23	55
-40	0.0224	51	25	57
-30	0.0194	47	23	65
-20	0.0121	52	18	49
-10	0.0095	48	17	56
-5	0.0048	49	16	52
-4	0.0080	49	18	55
-3	0.0072	51	18	52
-2	0.0069	50	18	53
-1	0.0080	52	17	52
0	0.0042	45	16	48
1	-0.0031	45	12	44
2	-0.0019	45	13	44
3	-0.0007	46	15	47
4	-0.0025	44	16	46
5	-0.0042	44	15	46
10	-0.0098	41	12	42
20	-0.0045	30	27	46
30	-0.0095	30	22	50
40	-0.0107	18	22	56
60	-0.0227	18	20	49
80	-0.0259	15	24	36
100	-0.0300	9**	23	46
115	-0.0326	10**	27	40
125	-0.0305	13*	19	48

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 1:

Between -124 and -115 days abnormal returns : Significantly negative

On day 79 and between 89 and 125 days abnormal returns: Significantly negative

In Portfolio 2:

Between –17 and –15 days abnormal returns: Significantly negative

On days 6, 13 and 14 abnormal returns: Significantly negative

Table 1.18 Wilcoxon test statistics of Buy and Hold Abnormal Returns, (BHAR) for the Market Value and All Stocks Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250
In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Small , Portfolio 2: Medium and Portfolio 3: Large

		Market Value Portfolios		
	All Stocks	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	BHAR	BHAR	BHAR	BHAR
-125	-0.0229	22	27	28
-115	-0.0300	11 **	33	23
-100	-0.0004	40	37	26
-80	0.0045	40	24	48
-60	0.0127	47	20	53
-40	0.0130	49	24	48
-30	0.0133	42	23	60
-20	0.0022	51	17	44
-10	0.0010	48	15	47
-5	-0.0066	48	13 *	42
-4	-0.0022	49	14 *	43
-3	-0.0039	48	16	41
-2	-0.0039	48	15	45
-1	-0.0019	50	15	43
0	-0.0039	43	16	41
1	-0.0077	42	23	38
2	-0.0077	43	23	40
3	-0.0054	42	23	45
4	-0.0045	43	23	46
5	-0.0080	40	23	43
10	-0.0130	35	21	42
20	-0.0165	27	25	37
30	-0.0215	25	22	38
40	-0.0241	16	21	46
60	-0.0405	13 *	16	31
80	-0.0411	10 **	19	29
100	-0.0437	6 **	20	33
115	-0.0493	5 ***	20	24
125	-0.0422	13 *	15	39

***, **, * indicate significance at 1, 5, 10 percent levels respectively.
Notes:
In Portfolio 1:
Between -124 and -115 days abnormal returns : Significantly positive
On many days between 49 and 66 abnormal returns: Significantly negative
Between 73 and 125 days abnormal returns: Significantly negative
In Portfolio 2:
On –24, -23 and -14 days abnormal returns: Significantly negative
Between -8 and-4 days abnormal returns: Significantly negative
In Portfolio 3:
Between 112 and 114 days abnormal returns: Significantly negative

Table 1.19 Wilcoxon Test Statistics of Cumulative Abnormal Returns, (CAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250
In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated**.** Portfolio1: Low , Portfolio 2: Moderate and Portfolio 3: High

	Book-to-Market Value Portfolios		
	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	CAR	CAR	CAR
-125	24	26	29
-115	44	18	6***
-100	57	31	23
-80	49	29	39
-60	50	50	26
-40	45	57	27
-30	44	53	31
-20	38	41	39
-10	34	40	43
-5	36	38	39
-4	37	39	42
-3	38	40	42
-2	39	38	40
-1	38	42	39
0	36	38	41
1	20	40	40
2	20	39	41
3	21	38	42
4	20	39	42
5	20	38	40
10	11**	36	40
20	45	23	28
30	42	30	22
40	43	30	18
60	36	33	8**
80	37	29	6***
100	36	21	11**
115	37	18	10**
125	37	19	9**

***, **, * indicate significance at 1, 5, 10 percent levels respectively.
Notes:
In Portfolio 1:
Between 6 and 18 days abnormal returns : Significantly positive
In Portfolio 3:
Between -124 and -101 days abnormal returns: Significantly negative
Between 35 and 125 days abnormal returns: Significantly negative

Table 1.20 Wilcoxon Test Statistics of Buy and Hold Abnormal Returns, (BHAR) for the Book-to-Market Value Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated. Portfolio1:Low , Portfolio 2: Moderate and Portfolio 3: High

	Book to Market Value Portfolios		
	Portfolio 1 (N=11)	Portfolio 2 (N=11)	Portfolio 3 (N=12)
Days	BHAR	BHAR	BHAR
-125	23	26	31
-115	43	16	3***
-100	52	30	21
-80	47	30	35
-60	47	46	23
-40	39	54	22
-30	43	50	25
-20	35	39	34
-10	32	36	40
-5	32	35	34
-4	34	35	37
-3	34	32	38
-2	35	32	34
-1	34	37	32
0	34	34	35
1	32	33	34
2	32	30	33
3	33	31	33
4	33	32	32
5	33	32	30
10	35	27	28
20	40	18	23
30	40	22	14**
40	41	23	13**
60	30	23	5***
80	33	22	2***
100	32	16	4***
115	30	12*	5***
125	33	19	7***

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In Portfolio 2:

On –122, 21 and 22 days abnormal returns : Significantly negative

Between 106 and 115 and on 121 and 122 days abnormal returns: Significantly negative

In Portfolio 3:

Between -124 and -101 days abnormal returns: Significantly negative

Between 25 and 125 days abnormal returns: Significantly negative

Table 1.21 Wilcoxon Test Statistics of Cumulative Abnormal Returns, (CAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios			
	Retailing (N=5)	Manufacturing (N=14)	Finance (N=6)	Service (N=4)
Days	CAR	CAR	CAR	CAR
-125	1*	32	14	3
-115	5	38	5	5
-100	0*	61	8	7
-80	5	73	12	4
-60	10	76	13	4
-40	9	82	12	6
-30	7	77	11	7
-20	7	67	14	7
-10	8	66	15	6
-5	9	61	14	5
-4	10	61	17	5
-3	10	58	17	5
-2	9	59	15	5
-1	10	61	15	5
0	9	58	14	5
1	9	53	12	6
2	9	54	12	6
3	9	55	13	6
4	8	53	14	6
5	8	52	13	6
10	7	51	14	6
20	5	46	10	6
30	8	34	8	7
40	6	35	8	7
60	7	34	6	5
80	8	31	5	5
100	5	24*	9	3
115	4	29	6	4
125	4	25*	5	6

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In portfolio of retailing sector:

On some of the days between -125 and -90 abnormal returns: Significantly negative

In portfolio of manufacturing sector:

Between 43 and 52 days abnormal returns: Significantly negative

On many days between 100 and 125 abnormal returns: Significantly negative

In portfolio of service sector:

On day -122 abnormal return: Significantly negative

Table 1.22 Wilcoxon Test Statistics of Buy and Hold Abnormal Returns, (BHAR) for the Industry Portfolios

In the calculation of the abnormal returns the following model is used: $R_{it} = \alpha_i + \beta_{iF} R_{iFt} + \beta_{iG} R_{iGt} + \varepsilon_{it}$ in the pre-listing period t=-250,…,-126 , and in post-listing period t=+126,…,+250

In the model, Rit is the logarithmic return of close-to-close prices of the stock i on day t, RiFt is logarithmic return of the Datastream's French stock market index, and R_{iGt} is the logarithmic return of the Datastream's German market index on day after the effects of French stock index are eliminated.

	Industry Portfolios			
	Retailing (N=5)	Manufacturing (N=14)	Finance (N=6)	Service (N=4)
Days	BHAR	BHAR	BHAR	BHAR
-125	2	31	16	3
-115	4	36	5	5
-100	0*	61	9	5
-80	5	70	12	4
-60	8	73	13	4
-40	9	76	12	5
-30	6	74	11	7
-20	5	64	14	6
-10	6	59	14	5
-5	7	53	13	5
-4	8	55	14	5
-3	8	52	15	5
-2	9	56	13	5
-1	9	56	13	5
0	9	54	13	5
1	9	54	14	5
2	8	53	13	5
3	7	56	12	5
4	7	54	12	5
5	8	54	10	5
10	6	50	10	6
20	5	35	10	5
30	7	23*	7	7
40	5	22*	8	6
60	5	22*	4	4
80	7	22*	2*	4
100	5	19**	4	2
115	4	19**	4	3
125	4	20**	4	5

***, **, * indicate significance at 1, 5, 10 percent levels respectively.

Notes:

In portfolio of retailing sector:
- On most of the days between -113 and -90 abnormal returns: Significantly negative

In portfolio of manufacturing sector:
- On day -121 abnormal return: Significantly negative
- On almost all of the days between 23 and 125 abnormal returns: Significantly negative

In portfolio of finance sector:
- Between 73 and 80 abnormal returns: Significantly negative

In portfolio of service sector:
- On day -122 abnormal return: Significantly negative

Table 1.23 Summary of the Results of the Parametric and Non-Parametric Tests of Abnormal Returns

	t-TEST				THE CORRADO'S RANK TEST				THE WILCOXON SIGNED RANK TEST			
	CAR		BHAR		CAR		BHAR		CAR		BHAR	
Portfolios	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
All Stocks	+	-	0	-	0	-	0	-	0	0	0	0
Market Value Portfolios												
MV1 (Small)	+	-	+	-	0	-	0	-	0	-	0	-
MV2 (Medium)	0	0	- (few days before)	-	+	-	0	-	- (few days before)	-	- (few days before)	-
MV3 (Large)	+	-	+	-	+	0	+	0	0	0	0	-
Book-to-Market Value Portfolios												
BMV1 (Lowest)	+	0	+	0	+	-	+	-	0	-	0	0
BMV2 (Moderate)	+	0	+	-	+	0	+	0	0	0	0	-
BMV3 (High)	0	-	0	-	0	-	0	-	0	-	0	-
Industry Portfolios												
Retailing	0	0	0	0	+	-	0	-	0	-	0	-
Manufacturing	+	-	+	-	0	0	0	0	0	-	0	-
Finance	0	0	0	0	+	-	0	-	0	0	0	-
Service	0	0	0	0	0	0	0	0	0	0	0	0

+: Significantly positive abnormal returns

-: Significantly negative abnormal returns

0: Insignificant abnormal returns

In the pre-listing period consistent and significant abnormal returns are presented for the period 60 days before the cross-listing. To identify consistent behavior significant abnormal returns are observed at least during 5 days.

Table 2.1 Descriptive Statistics for Average Volume in Whole, Pre- and Post-Listing Periods

Average volume of the portfolio refers to average of stocks' daily number of shares traded identified in thousands

Portfolios	Whole Period (-250,…,0,…250 days)				Pre-Listing Period (-250,…,-1 days)				Post-Listing Period (0,…250 days)				∆Avg. Volume
	Avg. Volume	Stand.Dev.	Skewness	Kurtosis	Avg. Volume	Stand.Dev.	Skewness	Kurtosis	Avg. Volume	Stand.Dev.	Skewness	Kurtosis	t-Statistic
All Stocks	1074.84	648.93	9.38	146.42	1040.40	790.93	10.15	134.95	1109.43	463.82	1.70	3.77	1.155
Market Value Portfolios													
MV1 (Small)	111.97	73.70	4.90	45.89	112.15	59.46	1.37	1.88	111.79	85.78	5.81	50.03	-0.039
MV2 (Medium)	2215.71	1914.25	9.99	158.85	2154.29	2334.43	10.73	145.29	2277.39	1370.80	1.92	4.70	0.686
MV3 (Large)	916.87	346.72	2.84	16.04	872.14	387.57	3.49	19.45	961.77	294.17	1.71	7.18	2.891***
Book-to-Market Value Portfolios													
BMV1 (Lowest)	2373.67	1913.41	9.94	157.87	2315.15	2230.22	10.72	145.17	2432.43	1375.86	1.87	4.37	0.651
BMV2 (Moderate)	605.34	316.99	3.90	28.26	579.92	361.36	4.30	29.95	630.87	263.38	2.80	16.07	1.799*
BMV3 (Highest)	308.84	164.57	7.60	102.47	283.50	183.08	10.12	136.12	334.28	139.42	2.60	12.25	3.467***
Industry Portfolios													
Retailing	484.44	203.19	1.88	5.61	490.45	216.34	2.04	6.17	482.41	189.43	1.62	4.32	-0.472
Manufacturing	369.57	227.06	6.12	55.30	352.53	280.00	5.78	44.20	386.68	155.64	5.26	49.41	1.668
Finance	558.70	262.24	3.03	19.87	520.82	213.49	1.73	3.88	596.73	299.04	3.30	21.13	3.236***
Service	394.21	170.90	1.65	5.10	367.99	175.80	1.48	2.43	420.54	161.95	2.11	9.31	3.531***

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 2.2 Descriptive Statistics for Average Turnover in the Whole, Pre- and Post-Listing Periods

Average turnover the portfolio refers to average of stocks' daily number of shares traded identified in thousands divided by number of shares outstanding

	Whole Period (-250,…,0,…250 days)				Pre- Listing Period (-250,…,-1 days)				Post- Listing Period (0,…250 days)				∆Avg. Turnover
Portfolios	Avg. Turnover	Stand.Dev.	Skewness	Kurtosis	Avg. Turnover	Stand.Dev.	Skewness	Kurtosis	Avg. Turnover	Stand.Dev.	Skewness	Kurtosis	t-Statistic
All Stocks	0.0260	0.020	10.005	160.445	0.0262	0.025	10.805	146.755	0.0257	0.015	1.638	3.592	-0.232
Market Value Portfolios													
MV1 (Small)	0.0026	0.002	7.690	85.964	0.0028	0.003	6.830	59.377	0.0024	0.001	2.078	7.959	-2.173**
MV2 (Medium)	0.0665	0.061	9.867	156.511	0.0671	0.075	10.751	145.611	0.0658	0.045	1.768	4.174	-0.167
MV3 (Large)	0.0103	0.003	1.036	1.199	0.0101	0.003	1.151	1.289	0.0105	0.003	0.944	1.244	1.680
Book to Market Value Portfolios													
BMV1 (Lowest)	0.0711	0.062	9.776	154.478	0.0716	0.074	10.750	145.596	0.0706	0.045	1.728	4.042	-0.105
BMV2 (Moderate)	0.0056	0.002	1.445	3.568	0.0057	0.002	1.369	1.950	0.0055	0.002	1.541	5.156	-1.118
BMV3 (Highest)	0.0029	0.002	8.077	90.877	0.0030	0.002	7.224	62.810	0.0028	0.001	1.560	4.315	-0.969
Industry Portfolios													
Retailing	0.0064	0.003	1.912	5.454	0.0066	0.003	1.987	5.814	0.0061	0.002	1.764	4.486	-2.060**
Manufacturing	0.0038	0.001	2.206	9.819	0.0042	0.002	2.179	8.063	0.0035	0.001	0.776	1.185	-5.530***
Finance	0.0062	0.004	6.092	56.633	0.0064	0.005	6.364	52.449	0.0060	0.003	3.211	20.675	-1.285
Service	0.0071	0.003	1.742	4.756	0.0064	0.003	2.373	7.938	0.0079	0.003	1.407	3.611	5.213***

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 2.3 Average Close-to-Close, Open-to-Close, and Close-to-Open Volatilities in the Pre- and Post-Listing Periods

	Pre- Listing Period Volatility (-250,…,-1 days)			Post- Listing Period Volatility (0,…,250 days)			t-Statistics for the Change in Volatilities After the Cross-Listing		
Portfolios	Close- to-Close Vol.	Open- to-Close Vol.	Close- to-Open Vol.	Close- to-Close Vol.	Open- to-Close Vol.	Close- to-Open Vol.	Close- to-Close Vol.	Open- to-Close Vol.	Close- to-Open Vol.
All Stocks	96.111	75.156	38.480	174.600	142.607	56.574	7.816***	9.327***	2.861***
Market Value Portfolios									
MV1 (Small)	98.280	78.030	40.193	106.464	91.989	40.556	0.756	1.915*	-0.080
MV2 (Medium)	76.390	62.301	29.706	129.876	101.785	42.646	4.188***	4.129***	2.614***
MV3 (Large)	111.877	82.865	44.871	277.157	226.367	83.655	10.060***	11.465***	4.982***
Book-to-Market Value Portfolios									
BMV1 (Lowest)	101.292	77.709	39.914	223.633	185.732	69.913	6.922***	7.818***	3.340***
BMV2 (Moderate)	89.996	69.503	37.657	127.573	107.622	42.774	4.740***	5.873***	0.699
BMV3 (Highest)	137.105	78.321	56.948	172.022	135.075	56.842	1.119	5.691***	-0.046
Industry Portfolios									
Retailing	100.285	72.421	46.597	151.513	125.155	49.779	3.868***	4.766***	0.227
Manufacturing	132.056	100.076	52.157	204.541	168.761	67.658	5.034***	6.437***	1.574
Finance	66.034	50.814	23.446	113.269	90.390	40.198	5.704***	6.208***	3.475***
Service	99.574	79.330	35.220	343.273	278.425	100.670	6.856***	7.133***	5.685***

Note: ***, **, * indicate significance at 1, 5, 10 percent levels respectively.
N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 2.4 Roll's Estimated Spread for Whole, Pre- and Post- Listing Periods

Roll 's Estimated Spread=200[(-Cov(R_t, R_{t-1}))$^{0.5}$], R_t: Return of the stock on day t

	Roll's Estimated Spread (%)		
Portfolios	Whole Period (-250,…,250 days)	Pre-Listing Period (-250,…-1 days)	Post Listing Period (0,…,250 days)
All Stocks	1.3846	1.2329	1.6524
Market Value Portfolios			
MV1 (Small)	1.4695	1.4394	1.8744
MV2 (Medium)	1.1870	1.2117	1.2969
MV3 (Large)	1.4880	1.0630	1.7748
Book to Market Value Portfolios			
BMV1 (Lowest)	1.3319	1.1682	1.4528
BMV2 (Moderate)	1.3711	1.2208	1.7623
BMV3 (Highest)	1.3155	1.2280	1.4251
Industry Portfolios			
Retailing	1.3350	1.1170	1.5270
Manufacturing	1.1365	1.2426	1.7930
Finance	1.5268	1.4760	1.8131
Service	1.5929	1.1029	2.0814

Note: N(i): Number of stocks in portfolio i. N(All Stocks)=34, N(MV1)= N(MV2)= N(BMV1)= NB(MV1)=11, N(MV3)= N(BMV3)=12, N(Retailing) =5 , N(Manufacturing)=14, N=(Finance)=6 and N(Service)=4.

Table 2.5 Changes in Price Volatility and Liquidity for All of the Stocks With Close-to-Close Price Data and Volume

The following model is estimated $(\Delta P_t)^2 = \gamma_0 + \gamma_1 D_t + \delta_0(\Delta P_{t-1})^2 + \delta_1(\Delta P_{t-1})^2 D_t + \lambda_0 V_t + \lambda_1 V_t D_t + \eta_t$ t=-250,…,0,…250 days
where, P_t: Closing price of the stock on day t., V_t: Trading volume on day t, D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity.

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Accor	2.353	0.051	0.259	-0.327	0.036	0.036	0.090
	(0.290)	(0.000)	(3.140)***	(-3.500)***	(2.430)**	(1.510)	
Air France	12.853	-12.145	0.006	-0.210	0.669	-0.657	0.068
	(3.600)***	(-3.310)***	(0.110)	(-2.270)**	(1.220)	(-1.200)	
Altran	-53.058	65.460	0.091	-0.113	1.900	1.140	0.199
	(-2.450)**	(1.610)	(1.190)	(-1.010)	(3.340)***	(1.110)	
Bnp	-1.449	-7.437	0.083	-0.107	0.113	0.149	0.151
	(-0.050)	(-0.160)	(1.140)	(-1.120)	(2.550)**	(2.110)**	
Bull	0.908	0.908	0.069	0.283	0.017	-0.015	0.065
	(1.140)	(0.910)	(3.730)***	(3.070)***	(2.600)***	(-2.120)**	
Canal +	0.007	-0.004	0.067	0.027	0.000	0.000	0.153
	(1.480)	(-0.420)	(1.270)	(0.320)	(0.950)	(2.190)**	
Cap Gemini	89.012	-69.204	0.104	0.066	0.900	2.238	0.187
	(1.540)	(-0.210)	(1.230)	(0.420)	(2.110)**	(1.340)	
Carrefour	-18.196	-16.210	0.090	-0.129	0.042	0.024	0.250
	(-1.690)*	(-0.490)	(0.530)	(-0.660)	(3.550)***	(0.780)	
Casino Guichard	13.375	31.220	0.231	-0.143	0.048	0.314	0.156
	(3.130)***	(1.070)	(2.360)**	(-1.250)	(3.000)***	(1.610)	
Ccf	-10.568	93.637	0.110	-0.026	0.430	-0.111	0.095
	(-0.260)	(1.920)*	(1.800)*	(-0.260)	(2.250)**	(-0.500)	
Christian Dior	6.043	1.773	-0.047	0.051	0.038	0.013	0.105
	(1.410)	(0.340)	(-0.980)	(0.650)	(1.950)**	(0.510)	
Club Medirranee	35.732	21.664	0.008	-0.100	1.173	1.776	0.194
	(3.100)***	(1.010)	(0.120)	(-0.990)	(4.290)***	(2.930)***	
Cpr Paris	-2.028	-6.029	0.145	-0.184	3.590	0.044	0.146
	(-0.080)	(-0.210)	(3.200)***	(-2.130)**	(1.890)*	(0.020)	
Credit Lyonn.	-110.378	143.519	-0.109	0.191	4.684	-2.932	0.575
	(-2.860)***	(3.500)***	(-2.950)***	(2.380)**	(3.970)***	(-2.050)**	
Danone	55.950	-295.534	-0.010	0.059	0.142	0.756	0.230
	(2.320)**	(-2.440)**	(-0.190)	(0.770)	(4.030)***	(2.950)***	
Dmc	5.620	-2.779	0.087	0.191	0.403	-0.367	0.195
	(2.250)**	(-1.030)	(1.370)	(2.090)**	(2.960)***	(-2.650)***	
Euro Disney	-0.032	0.037	-0.077	0.266	0.000	0.000	0.239
	(-1.960)*	(2.140)**	(-0.730)	(1.780)*	(3.350)***	(-1.540)	
France Telecom	22.146	108.945	0.177	-0.196	0.006	0.016	0.086
	(2.780)***	(3.030)***	(7.510)***	(-2.700)***	(1.180)	(0.780)	
Gaz & Eaux	20.810	1.490	0.002	0.102	-0.011	0.438	0.036
	(4.000)***	(0.190)	(0.070)	(1.320)	(-0.760)	(2.760)***	

Table 2.5 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Labinal	313.840	-69.558	0.000	0.377	14.358	-9.645	0.103
	(4.880)***	(-0.740)	(-0.010)	(2.940)***	(2.590)***	(-1.510)	
Lafarge	31.444	119.127	0.082	-0.135	0.205	0.061	0.069
	(1.820)*	(2.440)**	(1.590)	(-2.100)**	(3.650)***	(0.420)	
Lvmh	4.947	0.274	-0.078	0.186	0.019	0.002	0.104
	(0.910)	(0.030)	(-1.500)	(1.370)	(3.990)***	(0.300)	
Michelin	-44.302	40.925	-0.114	0.046	0.164	-0.122	0.435
	(-1.720)*	(1.510)	(-1.880)*	(0.500)	(3.040)***	(-2.090)**	
Moulinex	3.803	-2.661	0.155	-0.121	0.015	0.000	0.083
	(2.990)***	(-1.750)*	(2.490)**	(-1.580)	(2.170)**	(0.050)	
Peugeot	-63.295	-87.376	0.046	0.212	2.661	0.354	0.138
	(-0.500)	(-0.310)	(0.770)	(2.950)***	(3.040)***	(0.200)	
Renault	38.854	-20.415	0.015	0.093	0.000	0.072	0.127
	(5.870)***	(-1.350)	(0.480)	(1.320)	(-0.150)	(3.800)***	
Saint Gobain	84.486	373.584	0.326	-0.269	0.274	0.082	0.085
	(1.820)*	(3.600)***	(2.190)**	(-1.680)*	(1.710)*	(0.260)	
Scor	8.812	26.740	-0.028	0.070	0.264	0.105	0.092
	(1.500)	(2.000)**	(-0.430)	(0.870)	(5.630)***	(0.860)	
Seb	90.207	-146.454	-0.015	0.022	9.552	3.351	0.142
	(1.270)	(-1.030)	(-0.270)	(0.310)	(2.270)**	(0.420)	
Sge	21.375	18.997	0.052	0.100	0.264	-0.215	0.049
	(3.220)***	(1.650)	(0.770)	(0.830)	(2.840)***	(-1.970)**	
Societe Generale	1.915	-3.239	0.195	-0.152	0.012	0.016	0.153
	(0.250)	(-0.180)	(2.230)**	(-1.440)	(2.800)***	(1.570)	
Sommer	16.469	5.036	0.141	0.078	0.173	-0.048	0.052
	(3.460)***	(0.640)	(1.650)	(0.700)	(1.550)	(-0.380)	
Suez Lyon.	56.437	218.788	0.311	-0.445	0.287	0.005	0.115
	(2.050)**	(2.120)**	(2.780)***	(-3.780)***	(4.600)***	(0.030)	
Thomson	5.788	29.279	-0.019	0.018	0.037	0.042	0.129
	(1.730)*	(2.650)***	(-0.400)	(0.240)	(2.900)***	(1.210)	
Median	6.043	0.908	0.067	0.027	0.173	0.016	

***, **, and * indicate significance at 1, 5, and 10 percent levels respectively

Table 2.6 Changes in Price Volatility and Liquidity for All of the Stocks With Open-to-Close Price Data and Volume

The following model is estimated $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t-1})^2+\delta_1(\Delta P_{t-1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\eta_t$ t=-250,…,0,…250 days
where, ΔP_t: Price change from open to close of the bourse for a stock on day t, V_t: Trading volume on day t, D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Accor	14.571	-11.822	0.181	-0.129	0.015	0.039	0.082
	(2.600)***	(-0.750)	(3.120)***	(-1.330)	(1.560)	(1.870)*	
Altran	0.143	39.179	-0.007	0.057	0.528	1.213	0.125
	(0.010)	(1.430)	(-0.100)	(0.670)	(1.830)*	(1.850)*	
Bnp	19.764	-72.934	-0.002	-0.001	0.065	0.195	0.160
	(0.950)	(-1.500)	(-0.030)	(-0.020)	(2.120)**	(2.690)***	
Bull	0.976	0.611	0.015	0.128	0.011	-0.008	0.101
	(1.480)	(0.800)	(0.140)	(0.920)	(3.080)***	(-2.110)**	
Canal +	0.007	0.007	0.106	-0.045	0.000	0.000	0.100
	(3.190)***	(1.190)	(1.680)*	(-0.510)	(0.960)	(1.780)*	
Cap Gemini	73.389	93.401	0.054	0.198	0.644	1.128	0.191
	(1.570)	(0.360)	(0.780)	(1.510)	(1.940)*	(1.040)	
Carrefour	0.290	-9.690	0.076	-0.075	0.021	0.017	0.176
	(0.050)	(-0.900)	(1.430)	(-0.840)	(3.540)***	(1.590)	
Casino Guichard	15.199	39.784	-0.007	-0.015	0.049	0.180	0.112
	(4.360)***	(1.710)*	(-0.110)	(-0.180)	(3.000)***	(1.130)	
Ccf	25.813	34.650	-0.053	0.108	0.278	-0.023	0.080
	(1.060)	(1.030)	(-1.560)	(1.330)	(2.560)**	(-0.170)	
Christian Dior	5.438	4.437	0.077	-0.145	0.022	0.017	0.090
	(2.550)**	(1.360)	(0.830)	(-1.460)	(2.130)**	(1.120)	
Club Medirranee	47.629	30.673	0.078	-0.138	0.814	0.633	0.078
	(3.580)***	(1.440)	(1.240)	(-1.700)	(3.520)***	(0.930)	
Cpr Paris	8.671	-16.388	0.252	-0.306	1.902	1.237	0.191
	(0.680)	(-0.850)	(2.480)**	(-2.450)**	(2.390)**	(0.960)	
Credit Lyonn.	24.176	6.040	-0.006	0.040	0.325	0.906	0.079
	(3.080)***	(0.490)	(-0.100)	(0.420)	(1.470)	(1.520)	
Danone	57.191	-141.097	0.100	-0.136	0.058	0.481	0.131
	(3.430)***	(-1.980)**	(1.260)	(-1.500)	(2.310)**	(2.900)***	
Dmc	4.877	-3.586	-0.012	0.364	0.293	-0.245	0.177
	(2.840)***	(-1.850)*	(-0.280)	(2.750)***	(3.560)***	(-2.760)***	
Euro Disney	-0.024	0.032	0.134	-0.149	0.000	0.000	0.197
	(-1.890)*	(2.020)**	(1.080)	(-1.140)	(3.280)***	(-0.570)	
France Telecom	21.843	99.037	0.120	-0.046	0.001	0.011	0.111
	(4.780)***	(3.450)***	(1.730)*	(-0.510)	(0.930)	(0.730)	
Gaz & Eaux	15.598	5.228	0.019	0.051	0.000	0.254	0.033
	(5.130)***	(0.930)	(0.440)	(0.790)	(-0.020)	(2.180)**	

Table 2.6 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Labinal	304.325	-19.141	-0.048	0.421	7.866	-7.358	0.095
	(5.310)***	(-0.200)	(-1.020)	(4.020)***	(2.020)**	(-1.500)	
Lafarge	41.891	72.287	0.015	-0.081	0.130	0.123	0.071
	(2.650)***	(1.910)*	(0.320)	(-1.250)	(3.060)***	(1.070)	
Lvmh	13.601	-10.764	-0.049	0.083	0.007	0.013	0.076
	(3.030)***	(-1.230)	(-0.900)	(1.100)	(1.990)**	(1.740)*	
Michelin	11.696	-1.895	0.098	-0.047	0.029	-0.017	0.071
	(1.540)	(-0.240)	(1.160)	(-0.430)	(1.860)*	(-1.030)	
Moulinex	3.158	-2.698	0.071	0.152	0.013	0.001	0.097
	(3.300)***	(-2.070)**	(1.280)	(1.600)	(1.870)*	(0.170)	
Peugeot	109.985	-148.991	0.131	0.070	1.010	1.018	0.084
	(1.750)*	(-0.700)	(1.890)*	(0.970)	(2.620)***	(0.770)	
Renault	35.082	-12.539	0.030	0.136	-0.001	0.045	0.087
	(5.230)***	(-0.910)	(0.720)	(2.020)**	(-2.490)**	(2.900)***	
Saint Gobain	170.620	139.397	-0.016	0.176	-0.008	0.307	0.111
	(8.660)***	(1.810)*	(-0.380)	(2.060)**	(-0.220)	(1.540)	
Scor	15.766	14.752	0.100	0.198	0.109	0.112	0.115
	(2.440)**	(1.150)	(1.980)**	(1.520)	(2.570)**	(0.970)	
Seb	138.429	-72.377	-0.012	0.110	4.495	0.833	0.067
	(2.870)***	(-1.250)	(-0.300)	(1.190)	(1.910)*	(0.270)	
Sge	30.393	-1.409	0.073	0.079	0.099	-0.050	0.026
	(3.920)***	(-0.130)	(1.560)	(0.790)	(0.930)	(-0.420)	
Societe Generale	8.371	4.930	0.202	-0.285	0.005	0.011	0.094
	(1.110)	(0.400)	(2.300)**	(-2.820)***	(1.690)*	(1.880)*	
Sommer	12.387	6.970	0.057	0.190	0.160	-0.083	0.060
	(2.750)***	(0.980)	(1.130)	(2.130)**	(1.960)*	(-0.840)	
Suez Lyon.	93.361	115.649	0.171	-0.330	0.157	0.190	0.063
	(3.540)***	(1.400)	(2.980)***	(-3.760)***	(5.270)***	(1.350)	
Thomson	12.389	28.263	0.032	-0.025	0.005	0.021	0.077
	(4.610)***	(2.660)***	(0.640)	(-0.360)	(1.000)	(0.760)	
Median	5.915	0.591	0.068	0.025	0.169	0.020	

Note: ***, **, and * indicate significance at 1, 5, and 10 percent levels respectively
Since opening price data for Air France is not enough to make analysis, in the table Air France is not included.

Table 2.7 Market Adjusted Changes in Price Volatility and Liquidity for All of the Stocks With Close-to-Close Price and Volume

The following model is estimated $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\phi(\Delta I_t)^2+\eta_t$ t=-250,…,0,…250 days where, P_t: Closing price of the stock on day t., V_t= Trading Volume on day t, D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise, and I_t: Closing price of the market index on day t. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity.

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	ϕ	Adj. R^2
Accor	-0.610	-5.979	0.229	-0.330	0.028	0.034	0.001	0.16
	(-0.090)	(-0.480)	(2.750)***	(-3.640)***	(2.450)**	(1.660)*	(3.450)***	
Air France	12.840	-12.140	0.006	-0.210	0.668	-0.657	0.000	0.07
	(3.520)***	(-3.300)***	(0.110)	(-2.270)**	(1.220)	(-1.200)	(0.030)	
Altran	-60.089	45.298	0.093	-0.109	1.628	1.093	0.002	0.24
	(-2.670)***	(1.040)	(1.290)	(-1.030)	(2.740)***	(1.070)	(1.440)	
Bnp	-6.032	-45.657	-0.021	-0.048	0.083	0.140	0.004	0.32
	(-0.250)	(-1.130)	(-0.270)	(-0.540)	(2.250)**	(2.240)**	(5.950)***	
Bull	0.624	0.603	0.068	0.289	0.017	-0.015	0.000	0.07
	(0.810)	(0.590)	(3.620)***	(3.090)***	(2.610)***	(-2.140)**	(2.380)**	
Canal +	0.006	-0.006	0.070	0.029	0.000	0.000	0.000	0.15
	(1.270)	(-0.600)	(1.310)	(0.340)	(0.930)	(2.230)**	(1.410)	
Cap Gemini	-44.855	-206.130	0.039	0.092	0.730	2.225	0.017	0.28
	(-0.720)	(-0.610)	(0.390)	(0.500)	(1.900)*	(1.370)	(4.130)***	
Carrefour	-21.741	-29.724	0.051	-0.107	0.039	0.025	0.001	0.33
	(-1.870)*	(-0.910)	(0.360)	(-0.640)	(3.100)***	(0.820)	(3.490)***	
Casino Guichard	3.144	15.181	0.089	0.005	0.058	0.308	0.001	0.19
	(0.560)	(0.500)	(1.310)	(0.050)	(3.940)***	(1.620)	(2.310)**	
Ccf	-32.713	62.215	0.119	-0.055	0.383	-0.092	0.003	0.18
	(-0.850)	(1.360)	(1.950)*	(-0.550)	(2.170)**	(-0.440)	(4.820)***	
Christian Dior	4.356	-1.659	-0.042	0.046	0.036	0.016	0.000	0.14
	(1.060)	(-0.320)	(-0.880)	(0.580)	(1.870)*	(0.650)	(3.600)***	
Club Medirranee	28.860	10.635	-0.004	-0.084	1.182	1.810	0.001	0.20
	(2.450)**	(0.480)	(-0.060)	(-0.830)	(4.340)***	(2.940)***	(3.270)***	
Cpr Paris	-10.153	-8.064	0.144	-0.209	3.520	0.094	0.000	0.15
	(-0.400)	(-0.280)	(3.200)***	(-2.570)**	(1.820)*	(0.040)	(1.390)	
Credit Lyonn.	-118.741	134.575	-0.109	0.159	4.663	-2.869	0.001	0.59
	(-3.060)***	(3.220)***	(-3.010)***	(1.890)*	(3.920)***	(-2.010)**	(2.610)***	
Danone	42.422	-306.730	-0.006	0.047	0.123	0.740	0.002	0.25
	(1.940)*	(-2.480)**	(-0.130)	(0.640)	(3.930)***	(2.800)***	(2.420)**	
Dmc	5.134	-3.187	0.086	0.190	0.404	-0.371	0.000	0.20
	(2.070)**	(-1.180)	(1.360)	(2.080)**	(2.970)***	(-2.680)***	(1.420)	
Euro Disney	-0.036	0.032	-0.081	0.269	0.000	0.000	0.000	0.25
	(-2.140)**	(1.900)*	(-0.790)	(1.810)*	(3.380)***	(-1.510)	(2.940)***	
France Telecom	-2.848	92.292	0.202	-0.216	0.001	0.008	0.003	0.25
	(-0.350)	(2.730)***	(7.070)***	(-3.230)***	(0.300)	(0.390)	(4.690)***	

Table 2.7 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	ϕ	Adj. R^2
Gaz & Eaux	16.709	-3.609	-0.004	0.116	-0.009	0.448	0.000	0.06
	(3.670)***	(-0.430)	(-0.150)	(1.530)	(-0.700)	(2.720)***	(2.790)***	
Labinal	265.220	-145.576	-0.026	0.378	14.096	-8.773	0.006	0.14
	(4.200)***	(-1.490)	(-0.370)	(2.950)***	(2.430)**	(-1.330)	(3.170)***	
Lafarge	23.747	75.140	0.046	-0.119	0.164	0.120	0.002	0.13
	(1.520)	(1.690)*	(1.080)	(-2.000)**	(3.310)***	(0.870)	(3.990)***	
Lvmh	3.892	-8.343	-0.079	0.169	0.016	0.004	0.000	0.16
	(0.770)	(-1.040)	(-1.850)*	(1.320)	(3.580)***	(0.640)	(4.490)***	
Michelin	-45.578	38.006	-0.113	0.038	0.165	-0.121	0.000	0.44
	(-1.770)*	(1.400)	(-1.880)*	(0.420)	(3.050)***	(-2.090)**	(1.410)	
Moulinex	3.120	-4.059	0.115	-0.109	0.014	0.001	0.000	0.13
	(2.690)***	(-2.170)**	(2.640)***	(-1.850)*	(2.020)**	(0.080)	(2.090)**	
Peugeot	-191.875	-255.059	0.026	0.232	2.491	0.268	0.016	0.26
	(-1.430)	(-0.840)	(0.480)	(3.460)***	(3.040)***	(0.170)	(2.490)**	
Renault	19.026	-42.428	0.018	0.060	0.000	0.076	0.002	0.31
	(2.900)***	(-3.190)***	(0.600)	(0.900)	(0.050)	(4.340)***	(5.930)***	
Saint Gobain	16.434	141.460	0.169	-0.125	0.185	0.205	0.013	0.33
	(0.450)	(1.730)*	(1.960)*	(-1.250)	(1.590)	(0.750)	(5.820)***	
Scor	0.964	16.620	-0.024	0.058	0.262	0.130	0.001	0.13
	(0.170)	(1.260)	(-0.370)	(0.750)	(5.700)***	(1.060)	(4.240)***	
Seb	95.772	-137.908	-0.015	0.023	9.587	3.278	-0.001	0.14
	(1.360)	(-0.980)	(-0.250)	(0.320)	(2.270)**	(0.410)	(-1.130)	
Sge	20.116	16.834	0.047	0.106	0.266	-0.216	0.000	0.05
	(3.160)***	(1.370)	(0.680)	(0.860)	(2.850)***	(-1.980)**	(0.790)	
Societe Generale	-3.401	-11.478	0.119	-0.039	0.010	0.012	0.001	0.28
	(-0.500)	(-0.730)	(1.090)	(-0.310)	(2.630)***	(1.390)	(4.320)***	
Sommer	8.771	-2.172	0.106	0.078	0.188	-0.067	0.001	0.18
	(1.680)*	(-0.320)	(1.440)	(0.860)	(1.610)	(-0.510)	(3.800)***	
Suez Lyon.	-10.668	104.687	0.273	-0.365	0.281	0.014	0.007	0.29
	(-0.500)	(1.120)	(2.800)***	(-3.510)***	(5.420)***	(0.070)	(5.250)***	
Thomson	2.353	26.972	-0.022	-0.019	0.036	0.043	0.000	0.16
	(0.650)	(2.480)**	(-0.420)	(-0.240)	(2.760)***	(1.250)	(2.940)***	
Median	1.659	-1.915	0.042	0.026	0.164	0.020	0.001	

***, **, and * indicate significance at 1, 5, and 10 percent levels respectively

Table 2.8 Changes in Price Volatility and Liquidity for All of the Stocks With Close-to- Close Price Data and Turnover

The following model is estimated $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t-1})^2+\delta_1(\Delta P_{t-1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\eta_t$ t=-250,…,0,…250 days

where, P_t: Closing price of the stock on day t., V_t: Turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity.

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Accor	**2.494**	**-0.460**	**0.259**	**-0.328**	**1.272**[q]	**1.329**[q]	**0.090**
	(0.300)	**(-0.030)**	**(3.140)*****	**(-3.510)*****	**(2.420)****	**(1.550)**	
Air France	**12.848**	**-12.115**	**0.006**	**-0.207**	**130.877**	**-128.558**	**0.067**
	(3.600)***	**(-3.300)*****	**(0.110)**	**(-2.240)****	**(1.220)**	**(-1.200)**	
Altran	**12.297**	**0.106**	**0.178**	**-0.200**	**2.009**	**27.818**	**0.161**
	(0.590)	**(0.000)**	**(2.920)*****	**(-1.980)****	**(1.520)**	**(3.280)*****	
Bnp	**-0.834**	**-8.332**	**0.084**	**-0.108**	**23.901**	**33.401**	**0.150**
	(-0.030)	**(-0.180)**	**(1.150)**	**(-1.130)**	**(2.540)****	**(2.180)****	
Bull	**1.031**	**0.785**	**0.070**	**0.283**	**2.631**	**-2.330**	**0.063**
	(1.300)	**(0.790)**	**(3.830)*****	**(3.070)*****	**(2.570)****	**(-2.080)****	
Canal +	**0.007**	**0.002**	**0.067**	**0.035**	**0.000**	**0.000**	**0.134**
	(1.480)	**(0.230)**	**(1.270)**	**(0.410)**	**(0.950)**	**(1.910)***	
Cap Gemini	**98.098**	**-96.919**	**0.114**	**0.052**	**52.973**	**169.835**	**0.189**
	(1.670)*	**(-0.290)**	**(1.380)**	**(0.330)**	**(1.960)***	**(1.460)**	
Carrefour	**-18.202**	**-10.618**	**0.090**	**-0.134**	**1.625**	**0.920**	**0.252**
	(-1.700)	**(-0.350)**	**(0.530)**	**(-0.680)**	**(3.550)*****	**(0.790)**	
Casino Guichard	**13.691**	**29.608**	**0.232**	**-0.144**	**3.003**	**24.349**	**0.157**
	(3.240)***	**(1.010)**	**(2.370)****	**(-1.260)**	**(3.040)*****	**(1.670)***	
Ccf	**-9.501**	**92.974**	**0.111**	**-0.027**	**30.668**	**-7.534**	**0.094**
	(-0.240)	**(1.920)***	**(1.800)***	**(-0.270)**	**(2.260)****	**(-0.470)**	
Christian Dior	**-7.983**	**3.754**	**-0.065**	**-0.224**	**5.685**	**-0.548**	**0.072**
	(-0.470)	**(0.180)**	**(-1.180)**	**(-1.310)**	**(1.250)**	**(-0.090)**	
Club Medirranee	**37.599**	**19.648**	**0.014**	**-0.106**	**15.970**	**28.251**	**0.192**
	(3.240)***	**(0.920)**	**(0.200)**	**(-1.050)**	**(4.120)*****	**(3.140)*****	
Cpr Paris	**0.036**	**-8.093**	**0.148**	**-0.187**	**39.850**	**2.381**	**0.144**
	(0.000)	**(-0.300)**	**(3.320)*****	**(-2.170)****	**(1.880)***	**(0.100)**	
Credit Lyonn.	**-103.446**	**139.153**	**-0.114**	**0.201**	**57.499**	**-32.726**	**0.586**
	(-3.030)***	**(3.730)*****	**(-3.080)*****	**(2.450)****	**(4.330)*****	**(-1.710)***	
Danone	**56.023**	**-296.405**	**-0.010**	**0.059**	**10.350**	**55.974**	**0.230**
	(2.330)**	**(-2.440)****	**(-0.190)**	**(0.760)**	**(4.040)*****	**(2.960)*****	
Dmc	**5.620**	**-2.779**	**0.088**	**0.190**	**3.069**	**-2.791**	**0.194**
	(2.300)**	**(-1.050)**	**(1.370)**	**(2.080)****	**(3.050)*****	**(-2.720)*****	
Euro Disney	**-0.032**	**0.037**	**-0.077**	**0.266**	**0.101**	**-0.049**	**0.239**
	(-1.960)**	**(2.130)****	**(-0.730)**	**(1.780)***	**(3.350)*****	**(-1.540)**	
France Telecom	**22.146**	**109.837**	**0.177**	**-0.196**	**5.858**	**15.601**	**0.085**
	(2.780)***	**(3.090)*****	**(7.510)*****	**(-2.690)*****	**(1.180)**	**(0.780)**	
Gaz & Eaux	**20.821**	**1.522**	**0.002**	**0.102**	**-0.037**	**13.846**	**0.036**
	(4.000)***	**(0.200)**	**(0.070)**	**(1.320)**	**(-0.850)**	**(2.710)*****	

Table 2.8 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Labinal	313.841	-69.461	0.000	0.376	58.984 q	-39.385 q	0.103
	(4.880)***	(-0.740)	(-0.010)	(2.930)***	(2.590)***	(-1.510)	
Lafarge	36.863	113.115	0.087	-0.140	18.092	9.427	0.068
	(2.140)**	(2.310)**	(1.680)*	(-2.170)**	(3.540)***	(0.630)	
Lvmh	4.952	0.345	-0.078	0.186	1.620	0.209	0.103
	(0.910)	(0.040)	(-1.500)	(1.380)	(3.990)***	(0.330)	
Michelin	-44.371	40.994	-0.112	0.045	22.510	-16.763	0.432
	(-1.700)*	(1.500)	(-1.860)**	(0.480)	(3.010)***	(-2.090)**	
Moulinex	3.804	-2.663	0.155	-0.122	0.510	0.014	0.083
	(2.990)***	(-1.750)*	(2.490)**	(-1.580)	(2.170)**	(0.050)	
Peugeot	-63.291	-87.447	0.046	0.212	133.367	17.754	0.138
	(-0.500)	(-0.310)	(0.770)	(2.950)***	(3.040)***	(0.200)	
Renault	38.854	-20.415	0.015	0.093	-0.053	17.158	0.127
	(5.870)***	(-1.350)	(0.480)	(1.320)	(-0.150)	(3.800)***	
Saint Gobain	84.877	373.131	0.326	-0.270	24.120	8.028	0.085
	(1.850)*	(3.600)***	(2.190)**	(-1.680)*	(1.730)*	(0.280)	
Scor	12.922	23.897	-0.011	0.055	7.328	5.105	0.082
	(2.080)**	(1.770)*	(-0.160)	(0.680)	(4.860)***	(1.220)	
Seb	90.410	-146.657	-0.015	0.022	146.968	51.935	0.142
	(1.270)	(-1.030)	(-0.270)	(0.310)	(2.270)**	(0.420)	
Sge	21.133	11.041	0.051	0.088	10.883	-5.828	0.069
	(3.180)***	(0.870)	(0.760)	(0.700)	(2.900)***	(-1.070)	
Societe Generale	3.051	-4.537	0.198	-0.155	1.096	1.823	0.152
	(0.410)	(-0.250)	(2.260)**	(-1.470)	(2.760)***	(1.730)*	
Sommer	16.470	5.031	0.141	0.078	3.720	-1.017	0.052
	(3.460)***	(0.640)	(1.650)	(0.700)	(1.550)	(-0.380)	
Suez Lyon.	36.440	234.936	0.308	-0.443	43.607	1.336	0.119
	(1.320)	(2.240)**	(2.740)***	(-3.730)***	(4.680)***	(0.040)	
Thomson	6.302	28.807	-0.013	0.012	4.265	8.960	0.128
	(1.870)*	(2.600)***	(-0.270)***	(0.160)	(2.740)***	(1.590)	
Median	9.300	0.225	0.068	0.017	6.593	1.579	

Note: ***, **, and * indicate significance at 1, 5, and 10 percent levels respectively
q: Coefficients of λ_0 and λ_1 are multiplied by 10^{-3}.

Table 2.9 Changes in Price Volatility and Liquidity for All of the Stocks With Open-to-Close Price Data and Turnover

The following model is estimated $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\eta_t$ t=-250,…,0,…250 days
where, ΔP_t: Price change from open to close of the bourse for a stock on day t., V_t: Turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Accor	14.773	-12.330	0.181	-0.130	0.538 q	1.425 q	0.083
	(2.650)***	(-0.780)	(3.130)***	(-1.340)	(1.550)	(1.910)*	
Altran	28.782	10.540	0.040	0.011	-0.124	17.206	0.120
	(3.680)***	(0.400)	(0.770)	(0.150)	(-0.660)	(2.980)***	
Bnp	20.207	-73.585	-0.001	-0.002	13.752	43.030	0.160
	(0.970)	(-1.520)	(-0.020)	(-0.030)	(2.110)**	(2.740)***	
Bull	1.029	0.558	0.017	0.126	1.695	-1.319	0.099
	(1.580)	(0.730)	(0.160)	(0.910)	(3.050)***	(-2.050)**	
Canal +	0.007	0.013	0.106	-0.037	0.000	0.000	0.084
	(3.190)***	(2.330)**	(1.680)*	(-0.430)	(0.960)	(1.270)	
Cap Gemini	80.090	73.449	0.060	0.190	38.102	88.337	0.192
	(1.680)*	(0.280)	(0.870)	(1.450)	(1.810)*	(1.170)	
Carrefour	0.286	-6.079	0.076	-0.085	0.815	0.642	0.176
	(0.050)	(-0.580)	(1.430)	(-0.960)	(3.540)***	(1.590)	
Casino Guichard	15.528	38.613	-0.006	-0.017	3.061	14.266	0.113
	(4.490)***	(1.640)	(-0.090)	(-0.200)	(2.960)***	(1.200)	
Ccf	26.705	34.006	-0.052	0.108	19.757	-1.270	0.080
	(1.100)	(1.010)	(-1.540)	(1.330)	(2.540)**	(-0.130)	
Christian Dior	5.920	6.656	0.206	-0.375	0.799	0.376	0.037
	(1.640)	(0.800)	(2.340)**	(-3.190)***	(2.120)**	(0.220)	
Club Medirranee	49.279	28.998	0.083	-0.143	10.926	10.740	0.076
	(3.730)***	(1.360)	(1.290)	(-1.740)*	(3.420)***	(1.060)	
Cpr Paris	9.762	-17.479	0.255	-0.309	21.082	15.399	0.199
	(0.770)	(-0.910)	(2.510)**	(-2.470)**	(2.350)**	(1.040)	
Credit Lyonn.	24.959	6.555	-0.006	0.042	3.872	13.992	0.075
	(3.260)***	(0.500)	(-0.100)	(0.440)	(1.430)	(1.380)	
Danone	57.234	-141.697	0.100	-0.136	4.198	35.599	0.131
	(3.430)***	(-1.990)**	(1.260)	(-1.500)	(2.310)**	(2.910)***	
Dmc	4.894	-3.602	-0.012	0.363	2.225	-1.848	0.175
	(2.900)***	(-1.880)**	(-0.260)	(2.740)***	(3.680)***	(-2.810)***	
Euro Disney	-0.024	0.032	0.134	-0.149	0.070	-0.017	0.197
	(-1.890)*	(2.020)**	(1.080)	(-1.140)	(3.280)***	(-0.570)	
France Telecom	21.843	99.781	0.120	-0.046	1.205	11.181	0.110
	(4.780)***	(3.520)***	(1.730)*	(-0.510)	(0.930)	(0.710)	
Gaz & Eaux	15.618	5.238	0.019	0.051	-0.004	8.204	0.033
	(5.140)***	(0.930)	(0.450)	(0.790)	(-0.140)	(2.190)**	

Table 2.9 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Labinal	304.326	-16.506	-0.048	0.421	32.313 q	-30.909 q	0.095
	(5.310)***	(-0.170)	(-1.020)	(4.020)***	(2.020)**	(-1.530)	
Lafarge	46.010	68.085	0.019	-0.085	11.243	14.765	0.070
	(2.860)***	(1.790)*	(0.400)	(-1.300)	(2.780)***	(1.260)	
Lvmh	13.600	-10.642	-0.049	0.083	0.570	1.159	0.075
	(3.030)***	(-1.220)	(-0.900)	(1.110)	(1.990)**	(1.740)*	
Michelin	11.644	-1.842	0.098	-0.047	3.958	-2.332	0.071
	(1.540)	(-0.230)	(1.160)	(-0.440)	(1.870)*	(-1.050)	
Moulinex	3.159	-2.701	0.071	0.152	0.438	0.052	0.098
	(3.300)***	(-2.070)**	(1.280)	(1.590)	(1.870)**	(0.170)	
Peugeot	109.991	-149.046	0.131	0.070	50.604	51.044	0.084
	(1.750)*	(-0.700)	(1.890)*	(0.970)	(2.620)***	(0.770)	
Renault	35.082	-12.539	0.030	0.136	-0.281	10.803	0.087
	(5.230)***	(-0.910)	(0.720)	(2.020)**	(-2.490)**	(2.900)***	
Saint Gobain	170.858	139.263	-0.016	0.177	-0.798	27.693	0.111
	(8.650)***	(1.810)*	(-0.380)	(2.060)**	(-0.240)	(1.540)	
Scor	17.354	14.035	0.104	0.195	3.102	4.338	0.112
	(2.730)***	(1.100)	(2.090)**	(1.510)	(2.350)**	(1.090)	
Seb	138.558	-72.506	-0.012	0.110	69.138	12.993	0.067
	(2.870)***	(-1.250)	(-0.300)	(1.190)	(1.910)*	(0.270)	
Sge	30.146	-10.310	0.073	0.054	4.156	1.208	0.055
	(3.850)***	(-0.810)	(1.560)	(0.500)	(0.950)	(0.210)	
Societe Generale	9.128	4.085	0.204	-0.287	0.479	1.166	0.094
	(1.200)	(0.330)	(2.310)**	(-2.830)***	(1.580)	(2.060)**	
Sommer	12.388	6.965	0.057	0.190	3.442	-1.790	0.060
	(2.750)***	(0.980)	(1.130)	(2.130)**	(1.960)*	(-0.840)	
Suez Lyon.	85.200	118.787	0.171	-0.332	22.824	30.612	0.064
	(3.380)***	(1.430)	(2.950)***	(-3.760)***	(5.150)***	(1.420)	
Thomson	12.567	27.969	0.033	-0.026	0.582	3.949	0.077
	(4.650)***	(2.630)***	(0.660)	(-0.370)	(0.890)	(0.850)	
Median	17.354	0.558	0.060	0.011	3.061	4.338	

Note: ***, **, and * indicate significance at 1, 5, and 10 percent levels respectively

q: Coefficients of λ_0 and λ_1 are multiplied by 10^{-3}. Since opening price data for Air France is not enough to make analysis, in the table Air France is not included.

Table 2.10 Market Adjusted Changes in Price Volatility and Liquidity for All of the Stocks With Close-to-Close Price Data and Turnover

The following model is estimated $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\phi(\Delta I_t)^2+\eta_t$ t=-250,…,0,…250 days where, P_t: Closing price of the stock on day t., V_t= Turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise, and I_t: Closing price of the market index on day t. γ_t refers to Base-level volatility and $1/\lambda_t$ represents liquidity

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	ϕ	Adj. R^2
Accor	-0.465	-6.330	0.230	-0.331	0.980 q	1.251 q	0.001	0.16
	(-0.070)	(-0.500)	(2.750)***	(-3.640)***	(2.450)**	(1.700)*	(3.440)***	
Air France	12.826	-12.108	0.006	-0.208	130.799	-128.482	0.000	0.07
	(3.520)***	(-3.290)***	(0.110)	(-2.240)**	(1.220)	(-1.200)	(0.050)	
Altran	-4.050	-13.326	0.167	-0.181	1.589	24.804	0.002	0.02
	(-0.170)	(-0.310)	(2.820)***	(-1.920)*	(1.050)	(3.020)***	(1.610)	
Bnp	-5.438	-46.482	-0.020	-0.048	17.560	31.161	0.004	0.32
	(-0.220)	(-1.150)	(-0.260)	(-0.550)	(2.240)**	(2.310)**	(5.950)***	
Bull	0.745	0.480	0.068	0.288	2.639	-2.341	0.000	0.06
	(0.960)	(0.470)	(3.720)***	(3.090)***	(2.590)**	(-2.090)**	(2.390)**	
Canal +	0.006	0.001	0.070	0.037	0.000	0.000	0.000	0.14
	(1.290)	(0.080)	(1.310)	(0.430)	(0.930)	(1.930)*	(1.260)	
Cap Gemini	-36.753	-229.207	0.047	0.080	42.794	166.537	0.017	0.28
	(-0.590)	(-0.670)	(0.480)	(0.440)	(1.760)*	(1.470)	(4.130)***	
Carrefour	-21.654	-22.963	0.051	-0.111	1.522	0.934	0.001	0.32
	(-1.870)*	(-0.750)	(0.360)	(-0.660)	(3.110)***	(0.800)	(3.360)***	
Casino Guichard	3.544	13.753	0.090	0.003	3.626	23.938	0.001	0.19
	(0.640)	(0.450)	(1.330)	(0.030)	(3.980)***	(1.690)*	(2.300)**	
Ccf	-31.822	61.546	0.120	-0.056	27.345	-6.199	0.003	0.18
	(-0.840)	(1.360)	(1.950)**	(-0.560)	(2.180)**	(-0.420)	(4.820)***	
Christian Dior	-9.934	3.929	-0.063	-0.289	5.926	-0.964	0.000	0.05
	(-0.570)	(0.190)	(-1.160)	(-2.030)*	(1.300)	(-0.150)	(1.370)	
Club Medirran.	30.770	8.651	0.002	-0.090	16.083	28.778	0.001	0.20
	(2.600)***	(0.390)	(0.030)	(-0.880)	(4.160)***	(3.150)***	(3.250)***	
Cpr Paris	-8.288	-10.040	0.146	-0.212	39.107	2.885	0.000	0.15
	(-0.340)	(-0.360)	(3.320)***	(-2.620)***	(1.820)*	(0.120)	(1.400)	
Credit Lyonn.	-112.011	130.681	-0.113	0.169	57.283	-32.176	0.001	0.60
	(-3.260)***	(3.450)***	(-3.150)***	(1.960)*	(4.280)***	(-1.690)*	(2.500)**	
Danone	42.606	-307.112	-0.006	0.046	8.996	54.678	0.002	0.25
	(1.950)*	(-2.480)**	(-0.130)	(0.640)	(3.930)***	(2.800)***	(2.400)**	
Dmc	5.136	-3.187	0.087	0.190	3.077	-2.820	0.000	0.20
	(2.120)**	(-1.200)	(1.360)	(2.070)**	(3.060)***	(-2.750)***	(1.410)	
Euro Disney	-0.036	0.032	-0.081	0.269	0.101	-0.047	0.000	0.25
	(-2.140)**	(1.900)*	(-0.790)	(1.810)*	(3.380)***	(-1.510)	(2.940)***	
France Telecom	-2.872	93.248	0.202	-0.216	1.466	7.375	0.003	0.25
	(-0.350)	(2.810)***	(7.060)***	(-3.230)***	(0.300)	(0.370)	(4.700)***	

Table 2.10 (Continued)

Stocks	γ_0	γ_1	δ_0	δ_1	λ_0	λ_1	ϕ	Adj. R^2
Gaz & Eaux	16.724	-3.574	-0.004	0.116	-0.032 [q]	14.215 [q]	0.000	0.06
	(3.680)***	(-0.430)	(-0.150)	(1.530)	(-0.800)	(2.670)***	(2.790)***	
Labinal	265.252	-144.450	-0.026	0.378	57.909	-36.041	0.006	0.14
	(4.200)***	(-1.490)	(-0.370)	(2.950)***	(2.430)**	(-1.340)	(3.170)***	
Lafarge	29.064	69.140	0.049	-0.123	14.146	15.161	0.002	0.13
	(1.860)**	(1.550)	(1.170)	(-2.070)**	(3.140)***	(1.080)	(3.990)***	
Lvmh	3.895	-8.308	-0.079	0.169	1.405	0.410	0.000	0.16
	(0.770)	(-1.040)	(-1.850)*	(1.330)	(3.580)***	(0.670)	(4.490)***	
Michelin	-45.648	38.076	-0.112	0.037	22.544	-16.701	0.000	0.43
	(-1.760)**	(1.390)	(-1.860)*	(0.410)	(3.020)***	(-2.090)**	(1.410)	
Moulinex	3.120	-4.060	0.115	-0.109	0.488	0.023	0.000	0.13
	(2.690)***	(-2.170)**	(2.640)***	(-1.850)**	(2.020)***	(0.080)	(2.090)**	
Peugeot	-191.869	-255.107	0.026	0.232	124.806	13.458	0.016	0.26
	(-1.430)	(-0.840)	(0.480)	(3.460)***	(3.040)***	(0.170)	(2.490)**	
Renault	19.026	-42.429	0.018	0.060	0.014	18.261	0.002	0.31
	(2.900)***	(-3.190)***	(0.600)	(0.900)	(0.050)	(4.340)***	(5.930)***	
Saint Gobain	16.815	140.855	0.169	-0.125	16.276	18.926	0.013	0.33
	(0.460)	(1.730)*	(1.960)*	(-1.250)	(1.600)	(0.770)	(5.820)***	
Scor	4.871	13.576	-0.007	0.043	7.298	6.020	0.001	0.12
	(0.820)	(1.020)	(-0.100)	(0.550)	(4.920)***	(1.440)	(4.250)***	
Seb	95.975	-138.111	-0.014	0.023	147.514	50.803	-0.001	0.14
	(1.370)	(-0.980)	(-0.250)	(0.320)	(2.270)**	(0.410)	(-1.130)	
Sge	19.833	8.728	0.045	0.093	10.936	-5.885	0.000	0.07
	(3.120)***	(0.650)	(0.660)	(0.730)	(2.900)***	(-1.070)	(0.830)	
Societe Generale	-2.275	-12.743	0.122	-0.042	0.915	1.312	0.001	0.28
	(-0.330)	(-0.810)	(1.110)	(-0.330)	(2.560)**	(1.570)	(4.330)***	
Sommer	8.773	-2.174	0.106	0.078	4.046	-1.443	0.001	0.18
	(1.680)*	(-0.320)	(1.440)	(0.860)	(1.610)	(-0.510)	(3.800)***	
Suez Lyon.	-29.080	118.258	0.270	-0.364	42.260	3.456	0.007	0.29
	(-1.370)	(1.240)	(2.760)***	(-3.480)***	(5.430)***	(0.120)	(5.260)***	
Thomson	2.839	26.548	-0.017	-0.025	4.097	9.122	0.000	0.16
	(0.790)	(2.440)**	(-0.300)	(-0.310)	(2.600)***	(1.620)	(2.940)***	
Median	1.792	-2.680	0.046	0.013	6.612	2.098	0.001	

Note: ***, **, and * indicate significance at 1, 5, and 10 percent levels respectively
q: Coefficients of λ_0 and λ_1 are multiplied by 10^{-3}.

Table 2.11 Changes in Overnight and Trading Hour Price Volatilities and Liquidity for All of the Stocks With Open-to-Close Price Data and Volume

$$(\Delta P_t)^2 = \alpha_0 (\Delta NP_{t-1})^2 + \alpha_1 (\Delta NP_{t-1})^2 D_t + \delta_0 (\Delta P_{t-1})^2 + \delta_1 (\Delta P_{t-1})^2 D_t + \lambda_0 V_t + \lambda_1 V_t D_t + \eta_t$$

Where $(\Delta P_t)^2$:Trading hour volatility of the stock on day t in the French Franc. $(PC_t-PO_t)^2$, $(\Delta NP_t)^2$:Overnight volatility of the stock on day t in the French Franc. $(PO_t-PC_{t-1})^2$, $(\Delta P_{t-1})^2$:Trading hour volatility of the stock on day t-1 in the French Franc. $(PC_{t-1}-PO_{t-1})^2$, α_0: Overnight volatility in the pre-listing period, α_1: Change in the overnight volatility after cross-listing. V_t= Trading Volume, D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise, and $1/\lambda_t$ represents liquidity

Stocks	α_0	α_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
Accor	0.219	-0.159	-0.052	1.099	0.033	0.010	0.103
	(3.070)***	(-1.640)	(-0.760)	(1.930)*	(4.310)***	(0.790)	
Altran	-0.084	0.087	0.451	0.002	0.404	1.828	0.140
	(-0.960)	(0.870)	(1.820)*	(0.010)	(3.790)***	(4.310)***	
Bnp	0.019	-0.078	-0.066	0.901	0.079	0.070	0.304
	(0.320)	(-0.980)	(-1.540)	(3.050)***	(4.480)***	(2.180)**	
Bull	-0.016	0.042	-0.011	0.318	0.016	-0.010	0.001
	(-0.140)	(0.260)	(-0.580)	(1.700)*	(6.060)***	(-2.800)***	
Canal +	0.078	-0.002	0.590	-0.882	0.000	0.000	0.104
	(0.940)	(-0.020)	(4.280)***	(-5.210)***	(3.480)***	(4.680)***	
Cap Gemini	0.053	0.217	0.107	-0.117	0.914	1.602	0.183
	(0.720)	(1.680)*	(0.860)	(-0.570)	(3.790)***	(2.910)***	
Carrefour	0.003	-0.025	0.252	0.817	0.018	0.005	0.301
	(0.030)	(-0.230)	(12.030)***	(4.340)***	(6.650)***	(1.070)	
Casino Guichard	0.086	-0.177	0.059	-0.187	0.081	0.543	0.000
	(1.400)	(-1.940)*	(1.210)	(-2.080)**	(4.810)***	(5.920)***	
Ccf	-0.060	0.122	0.337	-0.213	0.339	0.051	0.085
	(-1.750)*	(1.510)	(4.350)***	(-1.840)*	(5.900)***	(0.540)	
Christian Dior	-0.052	-0.016	0.346	0.042	0.041	0.016	0.058
	(-0.550)	(-0.150)	(3.310)***	(0.190)	(5.580)***	(1.320)	
Club Medirranee	0.150	-0.226	0.197	0.266	1.170	1.375	0.002
	(2.740)***	(-2.510)**	(1.860)*	(1.650)*	(6.090)***	(2.300)**	
Cpr Paris	0.207	-0.240	0.989	-0.811	1.378	1.129	0.265
	(1.720)*	(-1.880)*	(2.880)***	(-2.080)**	(2.740)***	(1.360)	
Credit Lyonn.	-0.071	0.118	-0.132	0.151	1.113	1.369	0.039
	(-0.950)	(1.060)	(-6.040)***	(1.820)*	(6.300)***	(2.600)***	
Danone	0.160	-0.205	0.113	-0.185	0.109	0.331	0.120
	(1.940)*	(-2.260)**	(1.380)	(-1.010)	(5.500)***	(5.010)***	
Dmc	-0.014	0.337	0.132	0.305	0.432	-0.356	0.156
	(-0.290)	(2.600)***	(1.550)	(1.410)	(5.780)***	(-4.350)***	
Euro Disney	0.127	-0.251	-0.150	0.490	0.000	0.000	0.189
	(0.800)	(-1.450)	(-0.400)	(1.230)	(4.050)***	(0.320)	

Table 2.11 (Continued)

Stocks	α_0	α_1	δ_0	δ_1	λ_0	λ_1	Adj. R^2
France Telecom	0.244	-0.210	0.074	0.382	0.004	0.068	0.000
	(3.270)***	(-2.090)**	(1.110)	(1.770)*	(2.150)**	(6.240)***	
Gaz & Eaux	0.107	0.022	0.423	-0.233	0.019	0.547	0.029
	(1.850)*	(0.280)	(2.340)**	(-1.120)	(1.300)	(4.850)***	
Labinal	-0.031	0.396	0.149	0.450	28.796	-20.189	0.046
	(-0.540)	(3.360)***	(11.900)***	(1.790)*	(5.100)***	(-3.400)***	
Lafarge	0.014	-0.102	0.016	0.318	0.221	0.285	0.062
	(0.260)	(-1.440)	(0.200)	(1.930)*	(7.210)***	(4.290)***	
Lvmh	-0.015	-0.021	-0.050	0.745	0.014	0.005	0.086
	(-0.260)	(-0.300)	(-0.790)	(2.910)***	(6.530)***	(1.430)	
Michelin	0.149	-0.065	-0.210	0.556	0.056	-0.035	0.078
	(2.050)**	(-0.650)	(-2.680)***	(2.890)***	(7.200)***	(-3.800)***	
Moulinex	0.085	0.109	0.012	0.597	0.027	-0.013	0.063
	(1.190)	(1.020)	(0.690)	(2.670)***	(5.260)***	(-2.000)**	
Peugeot	0.145	0.055	0.278	-0.554	1.158	1.219	0.090
	(2.050)**	(0.750)	(1.900)*	(-2.840)***	(4.390)***	(2.360)**	
Renault	0.150	-0.045	0.702	0.168	0.003	0.052	0.100
	(2.420)**	(-0.540)	(2.930)***	(0.450)	(0.810)	(5.140)***	
Saint Gobain	0.133	0.084	0.052	0.238	0.346	0.678	0.005
	(2.020)**	(0.850)	(2.300)**	(2.270)**	(3.490)***	(2.880)***	
Scor	0.087	0.070	0.656	0.183	0.153	0.197	0.265
	(2.020)**	(0.980)	(2.780)***	(0.580)	(3.860)***	(2.440)***	
Seb	-0.036	0.168	0.431	-0.183	8.980	-2.151	0.067
	(-0.720)	(1.690)*	(2.080)**	(-0.820)	(5.970)***	(-0.950)	
Sge	0.139	0.024	0.031	-0.122	0.396	-0.191	0.000
	(2.300)**	(0.200)	(0.200)	(-0.690)	(4.650)***	(-1.840)*	
Societe Generale	0.259	-0.345	-0.046	0.163	0.009	0.012	0.087
	(3.180)***	(-3.600)***	(-0.980)	(1.200)	(4.230)***	(3.230)***	
Sommer	0.060	0.175	0.177	0.281	0.355	-0.153	0.071
	(0.960)	(2.050)**	(3.070)***	(2.500)***	(4.320)***	(-1.780)*	
Suez Lyon.	0.112	-0.199	0.483	-0.301	0.183	0.543	0.117
	(1.310)	(-1.950)*	(3.640)***	(-0.830)	(6.170)***	(5.520)***	
Thomson	0.090	0.012	0.253	-0.080	0.024	0.091	0.033
	(1.570)	(0.160)	(1.720)*	(-0.450)	(4.680)***	(4.350)***	
Median	0.086	-0.002	0.132	0.168	0.109	0.052	

Note: ***, **, and * indicate significance at 1, 5, and 10 percent levels respectively

Table 2.12 Changes in Volatility and Liquidity After the Cross-Listing for the Market Value, Book-to-Market Value and Industry Portfolios

Close-to-Close Volatility: The following model is estimated for each stock $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\eta_t$ t=-250,…,0,…250 days
where, P_t: Closing price of the stock on day t., V_t: Trading volume or turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise.
Open-to-Close Volatility: The following model is estimated for each stock $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\eta_t$ t=-250,…,0,…250 days
where, ΔP_t: Price change from open to close of the bourse for a stock on day t., V_t: Trading volume or turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise.
Market Adjusted Close-to-Close Volatility: The following model is estimated for each stock $(\Delta P_t)^2=\gamma_0+\gamma_1 D_t+\delta_0(\Delta P_{t=1})^2+\delta_1(\Delta P_{t=1})^2 D_t+\lambda_0 V_t+\lambda_1 V_t D_t+\phi(\Delta I_t)^2+\eta_t$ t=-250,…,0,…250 days
where, P_t: Closing price of the stock on day t., V_t= Trading volume or turnover on day t (=Trading Volume/Number of Shares Outstanding), D_t: A dummy variable which is equal to 1 if t≥0, and 0 otherwise, and I_t: Closing price of the market index on day t

Changes in volatility, γ_1, and liquidity of the portfolios, λ_1, refers to the median value of the changes in volatility and liquidity of the stocks included in the portfolios.

	Changes in Volatility and Liquidity with Volume Data						**Changes in Volatility and Liquidity with Turnover Data**						
	Close-to-Close Volatility		***Open-to-Close Volatility***		***Market Adj. Close-to-Close Volatility***		***Close-to-Close Volatility***		***Open-to-Close Volatility***		***Market Adj. Close-to-Close Volatility***		
Portfolios	γ_1	λ_1	γ_1	λ_1	γ_1	λ_1	γ_1	λ_1	γ_1	λ_1	γ_1	λ_1	**Number of Stocks**
Market Value Portfolios													
MV1 (Small)	**5.6200**	**-0.0001**	**0.0322**	**0.0015**	**-3.1869**	**-0.0001**	**0.0371**	**-0.4856 p**	**0.0322**	**0.5197 p**	**-3.1867**	**-0.4710 p**	**11**
MV2 (Medium)	**26.7403**	**0.0126**	**9.5949**	**0.0188**	**16.6202**	**0.0158**	**11.0412**	**0.0003**	**8.5981**	**25.7862**	**8.7281**	**0.0003**	**11**
MV3 (Large)	**0.0509**	**0.0611**	**-2.3800**	**0.0840**	**-7.1612**	**0.0020**	**43.3504**	**141.2958**	**-0.9973**	**127.2345**	**-7.3186**	**112.6771**	**12**
Book-to-Market Value Portfolios													
BMV1 (Small)	**1.7725**	**0.0239**	**-1.4090**	**0.0168**	**-0.0059**	**0.0251**	**0.1055**	**9.2029**	**-1.8418**	**12.0831**	**0.0007**	**9.3411**	**11**
BMV2 (Medium)	**5.0357**	**0.0052**	**5.4850**	**0.0681**	**0.6028**	**0.0078**	**5.0311**	**13.3597**	**6.5548**	**107.4046**	**0.4799**	**13.1178**	**11**
BMV3 (Large)	**-1.3709**	**0.0578**	**0.0322**	**0.1125**	**-3.3979**	**0.0848**	**-1.3711**	**65.6655**	**0.0322**	**82.0385**	**-3.3805**	**75.7114**	**12**
Industry Portfolios													
Retailing	**-0.0042**	**0.0022**	**-3.5858**	**0.0131**	**-3.1869**	**0.0045**	**0.0021**	**2.0874**	**-3.6024**	**11.5947**	**-3.1867**	**4.1016**	**5**
Manufacturing	**3.4041**	**0.0288**	**2.5242**	**0.0188**	**-0.5280**	**0.0296**	**2.2696**	**84.9388**	**3.6073**	**73.7621**	**-0.8469**	**82.4860**	**14**
Finance	**-0.8744**	**0.1272**	**9.9901**	**0.1536**	**-7.5436**	**0.1348**	**-1.5076**	**94.7565**	**9.6369**	**62.7114**	**-8.1588**	**101.1741**	**6**
Service	**10.8573**	**0.1752**	**15.3528**	**0.1096**	**5.3335**	**0.1711**	**9.8427**	**128.3895**	**14.5152**	**60.8286**	**4.3413**	**125.9433**	**4**

p: **Coefficients of λ_1 are multiplied by 10^{-2}.**

Table 3.1 Summary Information about the French Stocks Cross-Listed on the Frankfurt Stock Exchange

P_{iFt}: Price of the stock i on day t on the Frankfurt Stock Exchange (in log)
P_{iPt}: Price of the stock i on day t on the Paris Bourse (in log)
Corr(P_{iPt}, P_{iFt}): Correlation between price of stock i on the Paris Bourse and price of the same stock on the Frankfurt Stock Exchange
Number of Observations: Remaining number of observations for a stock after the price series on the Paris Bourse and on the Frankfurt Stock Exchange are matched.

Stocks	Number of Observations	Corr(P_{iPt},P_{iFt})	Industry
Accor	625	0.967	Hotel
Air France	511	0.959	Air Lines
Altran	465	0.996	Electronic Equipment
Bnp	656	0.995	Bank
Bouygues	412	0.996	Construction
Bull	616	0.994	Computer
Canal +	554	0.999	Broadcasting
Cap Gemini	627	0.997	Computer Service
Carrefour	653	0.998	Food Retailer
Club Mediterranee	576	0.996	Hotel
Danone	653	0.997	Food Processor
Euro Disney	650	0.996	Leisure Facilities
Elf	651	0.991	Oil Integrated
France Telecom	651	0.999	Telecommunication
L'oreal	653	0.998	Personal Products
Lvmh	652	0.999	Diversified Industry
Moulinex	551	0.994	Household Appliances
Pechiney	436	0.967	Packaging
Peugeot	645	0.999	Automobiles
Remy Cointreau	479	0.990	Distillers
Renault	618	0.992	Automobiles
Saint Gobain	657	0.984	Building Materials
Sanofi	643	0.994	Pharmaceuticals
Schneider	536	0.983	Electrical Equipment
Suez Lyonn.	648	0.989	Diversified Industry
Total	647	0.999	Oil Integrated
Usinor	539	0.967	Steel

Table 3.2 Descriptive Statistics for the Stock Returns on the Paris Bourse

Stocks	Whole Period				1999			
	Avg. Return	Standard Dev.	Skewness	Kurtosis	Avg. Return	Standard Dev.	Skewness	Kurtosis
Accor	0.00028	0.023	0.293	0.588	0.00099	0.021	0.546	0.760
Air France	0.00034	0.024	0.381	1.687	0.00121	0.023	1.579	4.621
Altran	0.00197	0.042	0.458	2.443	0.00921	0.040	1.022	3.571
Bnp	0.00045	0.020	0.337	2.254	0.00079	0.023	0.521	1.975
Bouygues	0.00193	0.037	0.325	1.435	0.01194	0.037	0.843	1.261
Bull	-0.00198	0.041	0.814	3.798	0.00099	0.038	0.657	5.446
Canal +	0.00214	0.042	0.514	3.351	0.00498	0.038	0.655	2.092
Cap Gemini	-0.00100	0.040	-0.432	3.358	0.00233	0.035	-0.206	2.738
Carrefour	0.00025	0.023	0.050	2.629	0.00210	0.022	0.559	3.725
Club Mediterranee	-0.00019	0.029	-0.396	8.217	0.00215	0.023	1.816	8.840
Danone	0.00023	0.021	0.031	2.187	-0.00029	0.019	-0.045	2.915
Euro Disney	0.00000	0.024	0.761	3.640	-0.00051	0.022	0.275	2.032
Elf	0.00094	0.027	0.123	7.081	0.00164	0.028	1.115	7.395
France Telecom	-0.00057	0.034	0.632	2.949	0.00233	0.026	0.178	0.218
L'oreal	0.00028	0.023	0.032	0.561	0.00069	0.022	0.102	1.440
Lvmh	0.00089	0.023	0.134	2.045	0.00403	0.021	0.410	3.262
Moulinex	-0.00253	0.034	0.571	4.300	-0.00136	0.026	0.437	2.517
Pechiney	0.00125	0.031	1.043	8.458	0.00511	0.031	2.926	21.494
Peugeot	0.00134	0.020	0.067	1.307	0.00204	0.020	0.095	1.016
Remy Cointreau	0.00150	0.032	1.010	6.527	0.00226	0.035	1.670	9.735
Renault	0.00033	0.027	0.114	0.836	0.00054	0.029	0.118	1.021
Saint Gobain	0.00048	0.023	0.094	1.305	0.00150	0.023	0.357	0.675
Sanofi	0.00095	0.026	0.072	0.405	0.00038	0.029	0.157	0.490
Schneider	0.00028	0.027	0.010	1.298	0.00149	0.026	0.350	1.305
Suez Lyonn.	0.00004	0.018	0.434	2.691	-0.00057	0.016	0.111	0.399
Total	0.00092	0.021	-0.008	0.037	0.00167	0.022	-0.049	-0.133
Usinor	0.00062	0.028	-0.310	2.510	0.00413	0.031	-0.127	1.915

Table 3.2 (Continued)

Stocks	2000 Avg. Return	2000 Standard Dev.	2000 Skewness	2000 Kurtosis	2001 Avg. Return	2001 Standard Dev.	2001 Skewness	2001 Kurtosis
Accor	-0.00027	0.026	0.187	0.226	0.00000	0.022	0.222	0.953
Air France	0.00126	0.023	0.282	0.683	-0.00183	0.026	-0.204	0.860
Altran	0.00093	0.044	0.326	2.433	-0.00207	0.038	0.244	1.049
Bnp	0.00008	0.019	0.011	2.021	0.00049	0.016	0.137	0.714
Bouygues	-0.00168	0.042	0.051	0.378	-0.00149	0.029	0.380	3.287
Bull	-0.00200	0.046	0.861	3.522	-0.00643	0.039	0.931	2.212
Canal +	0.00120	0.051	0.431	2.143	-0.00026	0.020	-0.108	0.065
Cap Gemini	-0.00153	0.041	0.184	0.301	-0.00519	0.043	-1.425	7.495
Carrefour	-0.00124	0.026	-0.201	1.488	-0.00032	0.017	0.065	0.674
Club Mediterranee	-0.00102	0.031	-0.117	4.123	-0.00206	0.031	-2.025	12.695
Danone	0.00126	0.025	0.070	1.593	-0.00063	0.018	-0.247	0.792
Euro Disney	-0.00204	0.024	0.258	2.450	0.00424	0.028	1.579	4.659
Elf	0.00061	0.030	-0.718	5.801	0.00076	0.018	0.110	0.007
France Telecom	-0.00142	0.040	0.921	3.472	-0.00399	0.034	0.278	-0.037
L'oreal	0.00054	0.025	-0.014	0.135	-0.00084	0.021	-0.010	-0.097
Lvmh	-0.00093	0.024	-0.080	2.186	-0.00129	0.025	0.289	0.667
Moulinex	-0.00313	0.041	0.967	3.295	-0.00351	0.035	-0.274	4.712
Pechiney	-0.00240	0.036	0.462	2.497	0.00093	0.026	-0.272	0.730
Peugeot	0.00029	0.021	0.029	1.678	0.00189	0.018	0.158	0.903
Remy Cointreau	0.00356	0.033	0.863	4.956	-0.00187	0.028	0.028	2.242
Renault	0.00067	0.029	0.205	0.348	-0.00053	0.022	-0.279	0.789
Saint Gobain	-0.00043	0.023	0.211	1.118	0.00033	0.023	-0.582	2.898
Sanofi	0.00214	0.025	-0.033	0.129	-0.00016	0.023	0.057	0.311
Schneider	0.00022	0.030	0.078	0.369	-0.00132	0.025	-0.695	3.261
Suez Lyonn.	0.00080	0.019	1.128	4.771	-0.00023	0.019	-0.417	0.827
Total	0.00071	0.022	0.051	0.047	0.00004	0.016	-0.211	-0.365
Usinor	-0.00124	0.028	-0.483	2.494	-0.00038	0.026	-0.498	3.582

Table 3.3 Descriptive Statistics for the Returns of the French Stocks Cross-Listed on the Frankfurt Stock Exchange

	Whole Period				1999			
Stocks	Avg. Return	Standard Dev.	Skewness	Kurtosis	Avg. Return	Standard Dev.	Skewness	Kurtosis
Accor	0.00026	0.021	-0.058	1.054	0.00082	0.019	0.761	1.956
Air France	-0.00048	0.029	-2.816	34.845	-0.00211	0.035	-5.798	56.103
Altran	0.00222	0.041	0.080	2.500	0.01020	0.045	0.783	2.637
Bnp	0.00053	0.021	-0.134	4.025	0.00100	0.025	-0.179	4.526
Bouygues	0.00205	0.039	0.225	6.533	0.01225	0.039	0.500	1.570
Bull	-0.00199	0.049	0.543	3.050	0.00120	0.038	0.591	3.011
Canal +	0.00205	0.042	0.531	4.265	0.00460	0.038	1.608	6.098
Cap Gemini	-0.00096	0.039	-0.440	3.625	0.00227	0.032	-0.271	2.371
Carrefour	0.00022	0.022	-0.090	2.550	0.00194	0.021	0.396	3.339
Club Mediterranee	-0.00022	0.028	-0.156	8.898	0.00212	0.021	2.262	11.264
Danone	0.00022	0.020	0.324	3.383	-0.00033	0.019	0.814	7.358
Euro Disney	-0.00011	0.025	0.082	5.906	-0.00059	0.021	0.425	1.782
Elf	0.00090	0.029	0.075	4.347	0.00138	0.028	0.928	4.480
France Telecom	-0.00054	0.033	0.503	2.004	0.00228	0.025	-0.009	0.641
L'oreal	0.00029	0.020	0.095	0.402	0.00062	0.018	0.362	0.584
Lvmh	0.00096	0.024	0.229	1.159	0.00410	0.022	0.706	3.103
Moulinex	-0.00262	0.037	0.026	3.191	-0.00137	0.027	0.589	4.606
Pechiney	0.00161	0.034	0.300	6.405	0.00577	0.032	-0.430	7.106
Peugeot	0.00135	0.020	-0.056	1.199	0.00204	0.021	-0.075	1.213
Remy Cointreau	0.00177	0.035	0.246	5.679	0.00294	0.035	0.813	9.938
Renault	0.00038	0.027	-0.099	1.453	0.00061	0.029	-0.217	1.764
Saint Gobain	0.00053	0.023	-0.027	2.171	0.00155	0.024	0.005	2.804
Sanofi	0.00096	0.023	0.021	1.754	0.00029	0.022	-0.161	4.915
Schneider	0.00033	0.027	0.186	4.817	0.00166	0.026	0.446	3.124
Suez Lyonn.	0.00009	0.018	0.514	2.194	-0.00045	0.017	0.173	0.542
Total	0.00092	0.020	0.115	0.171	0.00163	0.022	-0.053	-0.107
Usinor	0.00067	0.030	0.026	4.822	0.00431	0.035	0.355	5.624

Table 3.3 (Continued)

Stocks	2000				2001			
	Avg. Return	Standard Dev.	Skewness	Kurtosis	Avg. Return	Standard Dev.	Skewness	Kurtosis
Accor	-0.00024	0.022	-0.497	0.733	0.00013	0.022	-0.098	0.442
Air France	0.00127	0.026	0.049	1.783	-0.00156	0.026	0.291	1.173
Altran	0.00077	0.041	-0.237	2.361	-0.00183	0.039	-0.367	1.866
Bnp	0.00007	0.020	-0.169	1.723	0.00052	0.016	0.167	1.165
Bouygues	-0.00144	0.047	0.150	7.208	-0.00166	0.028	0.054	0.965
Bull	-0.00238	0.055	0.797	3.081	-0.00616	0.053	0.108	1.589
Canal +	0.00126	0.050	0.124	2.600	-0.00023	0.026	0.516	0.531
Cap Gemini	-0.00151	0.040	0.227	1.299	-0.00498	0.045	-1.160	5.479
Carrefour	-0.00117	0.026	-0.289	1.786	-0.00033	0.018	-0.144	0.790
Club Mediterranee	-0.00092	0.032	0.062	5.928	-0.00229	0.029	-1.563	10.435
Danone	0.00128	0.022	0.120	1.771	-0.00063	0.018	-0.129	0.753
Euro Disney	-0.00239	0.027	-0.297	8.811	0.00448	0.025	0.573	1.730
Elf	0.00026	0.028	-1.129	8.496	0.00132	0.034	0.374	0.412
France Telecom	-0.00126	0.039	0.782	2.129	-0.00407	0.033	0.248	0.136
L'oreal	0.00066	0.023	-0.108	0.009	-0.00090	0.020	0.234	0.859
Lvmh	-0.00076	0.026	-0.023	0.485	-0.00138	0.025	0.384	0.281
Moulinex	-0.00314	0.046	0.343	1.825	-0.00381	0.039	-0.950	2.788
Pechiney	-0.00221	0.041	0.883	6.404	0.00116	0.027	-0.143	0.745
Peugeot	0.00035	0.021	-0.053	1.425	0.00188	0.019	-0.011	0.687
Remy Cointreau	0.00368	0.038	-0.066	4.129	-0.00177	0.029	0.094	2.700
Renault	0.00071	0.027	0.066	0.802	-0.00047	0.022	-0.219	1.075
Saint Gobain	-0.00033	0.024	0.210	1.177	0.00025	0.021	-0.723	3.275
Sanofi	0.00218	0.025	0.099	0.384	-0.00005	0.022	-0.008	0.764
Schneider	0.00017	0.027	0.980	5.921	-0.00128	0.027	-1.144	5.372
Suez Lyonn.	0.00086	0.019	1.030	3.659	-0.00033	0.018	-0.151	0.436
Total	0.00078	0.021	0.301	0.225	0.00000	0.016	-0.131	-0.261
Usinor	-0.00131	0.027	-0.446	5.022	-0.00025	0.029	-0.257	0.930

Table 3.4 The Augmented Dickey-Fuller (ADF) and the Phillips-Perron Unit Root Tests

Price= Log of the daily closing stock prices, and ΔPrice=The change of log price level.
Stationarity of the price series is tested by the following two models.
a) The ADF Unit Root Test :

$$\Delta P_t = \beta_0 P_{t-1} + \sum_{i=1}^{n} \beta_i \Delta P_{t-i} + \varepsilon_t$$

b) The Phillips-Perron Unit Root Test:

$$\Delta P_t = \beta_0 P_{t-1} + \varepsilon_t$$

The numbers on the table refer to β_0 coefficients.

		Augmented Dickey-Fuller Unit Root Test		Phillips-Perron Unit Root Test	
Stocks		Paris Bourse	Frankfurt Stock Exchange	Paris Bourse	Frankfurt Stock Exchange
Accor	Price	0.321	0.218	0.391	0.348
	ΔPrice	-7.780***	-19.690***	-28.536***	-27.199***
Air France	Price	0.257	-0.505	0.271	-0.461
	ΔPrice	-24.067***	-25.671***	-24.034***	-25.460***
Altran	Price	1.003	0.961	0.979	1.032
	ΔPrice	-13.643***	-8.075***	-21.230***	-21.026***
Bnp	Price	0.944	0.996	0.874	1.018
	ΔPrice	-9.967***	-9.178***	-27.273***	-28.979***
Bouygues	Price	0.686	0.791	0.792	0.844
	ΔPrice	-10.229***	-10.372***	-18.530***	-19.414***
Bull	Price	-0.980	-1.042	-1.148	-1.109
	ΔPrice	-6.887***	-12.483***	-22.819***	-26.561***
Canal +	Price	0.845	0.986	0.954	0.979
	ΔPrice	-16.869***	-6.381***	-19.419***	-21.321***
Cap Gemini	Price	-0.731	-0.675	-0.752	-0.722
	ΔPrice	-18.662***	-15.806***	-23.634***	-24.331***
Carrefour	Price	0.195	0.192	0.284	0.244
	ΔPrice	-12.792***	-26.260***	-25.153***	-26.636***
Club Mediterranee	Price	-0.138	-0.151	-0.203	-0.231
	ΔPrice	-8.918***	-7.720***	-25.488***	-24.107***
Danone	Price	0.670	0.615	0.391	0.391
	ΔPrice	-9.302***	-9.362***	-29.571***	-30.037***
Euro Disney	Price	-0.203	-0.333	-0.151	-0.299
	ΔPrice	-8.716***	-8.449***	-26.827***	-27.561***
Elf	Price	0.886	0.946	0.989	0.846
	ΔPrice	-11.559***	-11.550***	-24.635***	-27.780***
France Telecom	Price	-0.527	-0.492	-0.489	-0.470
	ΔPrice	-9.311***	-9.024***	-23.200***	-23.147***
L'oreal	Price	0.577	0.677	0.487	0.534
	ΔPrice	-9.490***	-12.840***	-30.032***	-28.183***
Lvmh	Price	0.851	0.793	1.137	1.175
	ΔPrice	-12.426***	-9.474***	-24.810***	-26.068***
Moulinex	Price	-1.282	-1.821*	-1.855*	-2.160**
	ΔPrice	-6.484***	-8.842***	-24.283***	-24.208***
Pechiney	Price	0.748	0.890	0.792	1.108
	ΔPrice	-21.407***	-20.773***	-21.417***	-21.107***

Table 3.4 (Continued)

Stocks		Augmented Dickey-Fuller Unit Root Test		Phillips-Perron Unit Root Test	
		Paris Bourse	Frankfurt Stock Exchange	Paris Bourse	Frankfurt Stock Exchange
Peugeot	Price	2.002 **	2.106 **	2.196 **	-2.541 **
	∆Price	-14.891 ***	-10.273 ***	-25.510 ***	-28.104 ***
Remy Cointreau	Price	1.283	1.005	1.130	1.166
	∆Price	-7.927 ***	-21.804 ***	-21.094 ***	-21.950 ***
Renault	Price	0.316	0.242	0.353	0.418
	∆Price	-13.178 ***	-7.770 ***	-24.884 ***	-26.359 ***
Saint Gobain	Price	0.792	0.813	0.574	0.621
	∆Price	-9.417 ***	-9.515 ***	-26.497 ***	-26.411 ***
Sanofi	Price	1.275	0.989	1.300	1.412
	∆Price	-11.349 ***	-19.970 ***	-29.457 ***	-27.543 ***
Schneider	Price	0.340	0.422	0.299	0.355
	∆Price	-12.404 ***	-8.394 ***	-25.459 ***	-25.096 ***
Suez Lyonn.	Price	0.172	0.027	0.038	0.119
	∆Price	-10.735 ***	-27.287 ***	-25.304 ***	-27.953 ***
Total	Price	1.128	1.231	1.468	1.432
	∆Price	-16.479 ***	-17.206 ***	-28.047 ***	-26.909 ***
Usinor	Price	0.292	0.414	0.466	0.559
	∆Price	-17.093 ***	-23.218 ***	-21.313 ***	-23.869 ***

Note: *, **, and *** refer to significance levels at 10, 5, and 1 percent.

Table 3.5 Engle and Granger (1987) Cointegration Test

$$P_{iFt} = a + b P_{iPt} + \varepsilon_t$$

$$\Delta \hat{\varepsilon}_t = \Psi_0 \hat{\varepsilon}_{t-1} + \sum_{i=1}^{k} \Psi_i \Delta \hat{\varepsilon}_{t-i} + \omega_t$$

P_{iFt}: Price of the stock i on day t on Frankfurt Stock Exchange (in log)
P_{iPt}: Price of the stock i on day t on Paris Bourse (in log)

	Cointegration Test
Stocks	**t- Values of Ψ_0**
Accor	**-6.750 *****
Air France	**-18.271 *****
Altran	**-14.965 *****
Bnp	**-6.757 *****
Bouygues	**-14.299 *****
Bull	**-5.903 *****
Canal +	**-3.623 *****
Cap Gemini	**-22.377 *****
Carrefour	**-6.681 *****
Club Mediterranee	**-9.456 *****
Danone	**-4.527 *****
Euro Disney	**-3.340 *****
Elf	**-3.584 *****
France Telecom	**-23.700 *****
L'oreal	**-7.380 *****
Lvmh	**-5.764 *****
Pechiney	**-2.932 *****
Remy Cointreau	**-5.745 *****
Renault	**-8.596 *****
Saint Gobain	**-9.034 *****
Sanofi	**-6.979 *****
Schneider	**-5.141 *****
Suez Lyonn.	**-9.304 *****
Total	**-9.324 *****
Usinor	**-4.071 *****

*, **, and *** refer to significance levels at 10, 5, and 1 percent.

Table 3.6 Error Correction Model for stocks on the Frankfurt Stock Exchange

$$\omega_t = P_{iPt} - P_{iFt}$$

$$\Delta P_{iFt} = \beta_0 \omega_{t-1} + \sum_{j=1}^{m} \beta_i \Delta P_{iPt-j} + \sum_{j=1}^{n} \alpha_i \Delta P_{iFt-j} + u_{1it}$$

P_{iFt}: Price of the stock i on day t on the Frankfurt Stock Exchange (in log)
P_{iPt}: Price of the stock i on day t on the Paris Bourse (in log)
Lag structure is determined by Akaike's final prediction error

Stocks	β_0	β_1	β_2	β_3	β_4	α_1	α_2	α_3	α_4	**Adj.R²**
Accor	**0.431**	**0.049**				**-0.096**				**0.180**
	(9.241)* **	**(0.933)**				**(-2.111)** **				
Air France	**0.647**	**0.023**				**-0.050**				**0.499**
	(9.496)* **	**(0.411)**				**(-1.607)**				
Altran	**0.518**	**0.178**	**0.071**	**0.040**	**0.025**	**-0.105**	**-0.067**	**-0.011**	**-0.001**	**0.358**
	(6.780)* **	**(2.391)** **	**(0.906)**	**(0.636)**	**(0.448)**	**(-1.351)**	**(-0.930)**	**(-0.179)**	**(-0.033)**	
Bnp	**0.847**	**0.092**				**-0.047**				**0.288**
	(8.178)* **	**(1.200)**				**(-0.661)**				
Bouygues	**0.632**	**0.159**	**0.083**	**0.061**		**-0.108**	**-0.069**	**-0.018**		**0.423**
	(6.799)* **	**(2.057)** **	**(1.138)**	**(0.994)**		**(-1.337)**	**(-1.072)**	**(-0.408)**		
Bull	**0.407**	**0.213**	**-0.010**	**-0.036**	**-0.031**	**-0.077**				**0.307**
	(9.888)* **	**(3.388)*** **	**(-0.230)**	**(-0.814)**	**(-0.730)**	**(-2.016)** **				
Canal +	**0.354**	**0.495**	**0.020**	**-0.039**		**-0.268**	**-0.079**	**0.013**	**-0.013**	**0.250**
	(4.421)* **	**(4.234)*** **	**(0.195)**	**(-0.463)**		**(-2.370)*** **	**(-0.840)**	**(0.242)**	**(-0.367)**	
Cap Gemini	**0.634**	**0.265**	**0.079**	**0.008**	**0.011**	**-0.192**	**-0.133**	**-0.055**	**0.031**	**0.215**
	(4.580)* **	**(2.167)** **	**(0.669)**	**(0.077)**	**(0.163)**	**(-1.487)**	**(-1.125)**	**(-0.592)**	**(0.459)**	
Carrefour	**0.494**	**0.222**	**-0.039**	**-0.007**	**-0.035**	**-0.219**				**0.075**
	(3.956)* **	**(2.111)** **	**(-0.978)**	**(-0.210)**	**(-0.759)**	**(-2.154)** **				

Table 3.6 (Continued)

Stocks	β_0	β_1	β_2	β_3	β_4	α_1	α_2	α_3	α_4	Adj.R^2
Club Mediterranee	0.453	0.139				-0.096	-0.045	-0.003	-0.014	0.174
	(4.996)***	(1.674)*				(-1.512)	(-1.189)	(-0.063)	(-0.353)	
Danone	0.364	0.387	0.074	0.002		-0.438	-0.075			0.144
	(2.797)***	(3.064)***	(0.681)	(0.061)		(-3.906)***	(-0.678)			
Euro Disney	0.237	0.291				-0.208	-0.040	-0.009	0.008	0.183
	(5.572)***	(5.788)***				(-2.662)***	(-0.980)	(-0.246)	(0.226)	
Elf	0.278	0.291	0.011	-0.033	-0.028	-0.200				0.185
	(5.922)***	(4.378)***	(0.189)	(-0.889)	(-0.652)	(-3.659)***				
France Telecom	0.656	0.207	-0.109	-0.070	-0.063	-0.087	0.045	-0.003	0.055	0.137
	(3.857)***	(1.288)	(-0.793)	(-0.576)	(-0.728)	(-0.554)	(0.330)	(-0.024)	(0.697)	
L'oreal	0.402	0.198				-0.239				0.077
	(3.652)***	(2.025)**				(-2.431)**				
Lvmh	0.541	0.214				-0.104				0.121
	(4.959)***	(2.073)**				(-1.174)				
Pechiney	0.088	0.326	-0.001	-0.020	-0.007	-0.138				0.107
	(3.642)***	(4.411)***	(-0.022)	(-0.358)	(-0.165)	(-3.232)***				
Remy Cointreau	0.285	0.187				-0.048	-0.039	0.010	-0.035	0.271
	(5.558)***	(2.209)**				(-0.964)	(-0.908)	(0.196)	(-0.830)	
Renault	0.492	0.222	-0.017			-0.164				0.230
	(6.940)***	(3.165)***	(-0.382)			(-2.803)***				
Saint Gobain	0.609	0.149	-0.019	0.015	-0.016	-0.015	-0.007			0.312
	(6.388)***	(1.650)*	(-0.251)	(0.247)	(-0.409)	(-0.224)	(-0.134)			
Sanofi	0.263	0.115				-0.102				0.128
	(4.504)***	(2.465)**				(-2.166)**				

Table 3.6 (Continued)

Stocks	β_0	β_1	β_2	β_3	β_4	α_1	α_2	α_3	α_4	Adj.R^2
Schneider	**0.522**	**0.146**				**-0.082**	**0.005**	**-0.022**		**0.336**
	(6.632)* **	**(2.309)** **				**(-2.103)** **	**(0.113)**	**(-0.615)**		
Suez Lyonn.	**0.523**	**0.282**	**0.135**	**0.091**	**0.044**	**-0.310**	**-0.174**	**-0.097**	**-0.053**	**0.222**
	(5.043)* **	**(2.330)** **	**(1.214)**	**(0.895)**	**(0.634)**	**(-2.422)** **	**(-1.517)**	**(-1.283)**	**(-1.030)**	
Total	**0.625**	**0.140**	**-0.013**	**-0.002**		**-0.125**				**0.122**
	(4.395)* **	**(1.248)**	**(-0.147)**	**(-0.029)**		**(-1.094)**				
Usinor	**0.460**	**0.108**				**-0.036**				**0.336**
	(10.271)* **	**(2.104)** **				**(-0.836)**				

*, **, and *** refer to significance levels at 10, 5, and 1 percent.

Table 3.7 Error Correction Model for stocks on the Paris Bourse

$$\omega_t = P_{iPt} - P_{iFt}$$

$$\Delta P_{iPt} = \theta_0 \omega_{t-1} + \sum_{j=1}^{m} \theta_i \Delta P_{iFt-j} + \sum_{j=1}^{n} \phi_i \Delta P_{iPt-j} + u_{2it}$$

P_{iFt}: Price of the stock i on day t on the Frankfurt Stock Exchange (in log)
P_{iPt}: Price of the stock i on day t on the Paris Bourse (in log)
Lag structure is determined by Akaike's final prediction error

Stocks	θ_0	θ_1	θ_2	θ_3	θ_4	ϕ_1	ϕ_2	ϕ_3	ϕ_4	**Adj.R²**
Accor	**-0.139**	**-0.087**	**-0.053**	**-0.058**	**-0.053**	**0.014**	**-0.006**	**0.004**		**0.012**
	(-1.684) *	**(-0.982)**	**(-0.611)**	**(-0.845)**	**(-1.200)**	**(0.146)**	**(-0.079)**	**(0.055)**		
Air France	**-0.099**	**0.074**	**0.070**	**0.012**	**0.013**	**-0.044**	**-0.044**	**0.026**	**-0.022**	**0.012**
	(-1.294)	**(0.922)**	**(1.100)**	**(0.401)**	**(0.466)**	**(-0.519)**	**(-0.564)**	**(0.456)**	**(-0.456)**	
Altran	**-0.077**	**-0.099**	**-0.058**	**-0.025**	**0.008**	**0.110**	**0.093**			**0.004**
	(-0.921)	**(-1.086)**	**(-0.781)**	**(-0.402)**	**(0.164)**	**(1.520)**	**(1.014)**			
Bnp	**-0.064**	**-0.042**				**0.088**				**0.002**
	(-0.491)	**(-0.448)**				**(0.877)**				
Bouygues	**0.138**	**0.004**	**0.027**	**0.009**		**0.006**	**0.028**	**-0.009**		**0.005**
	(1.660)	**(0.049)**	**(0.396)**	**(0.180)**		**(0.068)**	**(0.328)**	**(-0.134)**		
Bull	**-0.010**	**-0.072**				**0.145**	**-0.107**	**0.045**	**0.027**	**0.025**
	(-0.259)	**(-1.948)** *				**(2.871)** ***	**(-2.079)** **	**(0.868)**	**(0.769)**	
Canal +	**-0.175**	**-0.060**	**-0.055**	**-0.042**	**-0.057**	**0.266**				**0.035**
	(-2.261) **	**(-0.855)**	**(-0.998)**	**(-0.859)**	**(-1.157)**	**(2.995)** ***				
Cap Gemini	**-0.241**	**-0.174**	**-0.179**	**-0.081**	**0.039**	**0.259**	**0.098**	**0.038**	**0.028**	**0.010**
	(-1.402)	**(-1.075)**	**(-1.270)**	**(-0.796)**	**(0.486)**	**(1.664)** *	**(0.691)**	**(0.329)**	**(0.303)**	
Carrefour	**-0.365**	**-0.309**	**-0.209**	**0.010**	**-0.007**	**0.334**	**0.163**	**-0.001**	**0.009**	**0.003**
	(-1.872) *	**(-1.697)** *	**(-1.219)**	**(0.075)**	**(-0.058)**	**(1.831)** *	**(0.919)**	**(-0.009)**	**(0.073)**	

Table 3.7 (Continued)

Stocks	θ_0	θ_1	θ_2	θ_3	θ_4	ϕ_1	ϕ_2	ϕ_3	ϕ_4	Adj.R^2
Club Mediterranee	**-0.154**	**-0.158**	**-0.065**	**-0.037**		**0.085**	**0.113**	**0.090**	**0.003**	**0.001**
	(-1.772) *	**(-2.042)** **	**(-0.810)**	**(-0.519)**		**(0.921)**	**(1.441)**	**(1.400)**	**(0.062)**	
Danone	**-0.274**	**-0.186**	**0.038**			**0.161**	**-0.028**	**-0.028**		**0.008**
	(-1.888) *	**(-1.377)**	**(0.328)**			**(1.115)**	**(-0.232)**	**(-0.608)**		
Euro Disney	**-0.014**	**0.110**	**0.041**	**0.072**		**-0.100**	**-0.050**	**-0.095**	**-0.030**	**0.003**
	(-0.316)	**(1.308)**	**(0.542)**	**(1.209)**		**(-1.455)**	**(-0.704)**	**(-1.422)**	**(-0.731)**	
Elf	**-0.005**	**0.102**	**0.062**	**0.020**	**0.051**	**-0.015**	**-0.121**	**-0.091**	**-0.061**	**0.005**
	(-0.146)	**(1.955)** *	**(0.994)**	**(0.315)**	**(1.076)**	**(-0.194)**	**(-1.638)**	**(-1.290)**	**(-1.093)**	
France Telecom	**-0.194**	**-0.034**	**0.079**	**0.090**	**0.065**	**0.150**	**-0.178**	**-0.136**	**-0.098**	**0.019**
	(-0.992)	**(-0.182)**	**(0.488)**	**(0.636)**	**(0.723)**	**(0.801)**	**(-1.085)**	**(-0.974)**	**(-0.983)**	
L'oreal	**-0.337**	**-0.118**	**-0.061**			**0.093**	**-0.022**			**0.017**
	(-2.365) **	**(-0.901)**	**(-0.654)**			**(0.743)**	**(-0.256)**			
Lvmh	**-0.185**	**-0.004**				**0.088**				**0.008**
	(-1.623)	**(-0.041)**				**(0.862)**				
Pechiney	**0.002**	**0.097**	**0.038**	**-0.047**		**-0.083**	**-0.049**	**-0.011**	**-0.012**	**0.005**
	(0.073)	**(1.716)** *	**(0.787)**	**(-0.840)**		**(-1.520)**	**(-0.846)**	**(-0.197)**	**(-0.307)**	
Remy Cointreau	**0.075**	**0.135**	**0.065**	**-0.033**		**-0.053**	**-0.122**	**-0.100**	**-0.038**	**0.007**
	(2.329) **	**(1.923)** *	**(0.831)**	**(-0.813)**		**(-0.769)**	**(-2.029)** **	**(-1.655)** *	**(-0.764)**	
Renault	**-0.144**	**-0.061**	**-0.031**			**0.126**				**0.001**
	(-1.557)	**(-0.767)**	**(-0.487)**			**(1.231)**				
Saint Gobain	**-0.095**	**0.014**	**0.098**	**0.027**	**-0.027**	**0.002**	**-0.128**	**-0.019**	**-0.004**	**0.006**
	(-0.768)	**(0.103)**	**(0.743)**	**(0.295)**	**(-0.444)**	**(0.015)**	**(-0.947)**	**(-0.183)**	**(-0.059)**	
Sanofi	**-0.111**	**-0.027**	**-0.033**	**-0.035**	**-0.027**	**-0.049**	**-0.046**	**-0.079**	**0.002**	**0.023**

	(-1.874)*	**(-0.396)**	**(-0.557)**	**(-0.542)**	**(-0.465)**	**(-0.707)**	**(-0.682)**	**(-1.205)**	**(0.029)**	

Table 3.7 (Continued)

Stocks	θ_0	θ_1	θ_2	θ_3	θ_4	ϕ_1	ϕ_2	ϕ_3	ϕ_4	**Adj.R^2**
Schneider	**-0.113**	**-0.096**	**-0.020**			**0.084**	**0.002**			**0.001**
	(-1.473)	**(-1.482)**	**(-0.395)**			**(1.120)**	**(0.026)**			
Suez Lyonn.	**-0.117**	**-0.217**	**-0.087**	**-0.027**	**0.055**	**0.215**	**0.022**	**0.075**	**-0.063**	**0.008**
	(-0.773)	**(-1.340)**	**(-0.633)**	**(-0.289)**	**(0.801)**	**(1.313)**	**(0.154)**	**(0.584)**	**(-0.731)**	
Total	**-0.189**	**-0.039**	**-0.049**			**0.004**	**0.022**			**0.001**
	(-1.187)	**(-0.320)**	**(-0.521)**			**(0.032)**	**(0.225)**			
Usinor	**0.047**	**0.015**	**-0.017**	**0.016**	**0.002**	**0.041**	**-0.105**	**-0.033**	**-0.064**	**0.005**
	(0.776)	**(0.184)**	**(-0.292)**	**(0.251)**	**(0.040)**	**(0.595)**	**(-1.477)**	**(-0.510)**	**(-1.091)**	

*, **, and *** refer to significance levels at 10, 5, and 1 percent.

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