AN ANALYSIS OF STOCK SPLITS IN THE ISTANBUL STOCK EXCHANGE

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ABSTRACT

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The primary purpose of this study is to test the validity of the trading range hypothesis as a basis for stock split decisions of Turkish companies. In the first part, the liquidity effects of stock splits on Turkish stocks are examined. Second, the optimal trading ranges for different-sized firms and firms with different investor bases are determined. Finally, the main empirical question of the study is analyzed by testing whether or not Turkish firms whose share prices rise above their optimal trading ranges are more likely to split their stock compared to firms whose share prices are at or below their optimal trading ranges.

The empirical findings about the level of liquidity indicate that there is a slight decline in liquidity in the post-split periods. Analysis of the relationship

between firm characteristics and share prices shows that firm size has a positive effect on share prices. The effect of investor base on share prices could not be identified. Finally, the estimation of the logit model utilized in the study to determine the probability of firms to split does not reveal any statistically significant result.

Keywords: Stock Splits, Liquidity, Trading Range Hypothesis.

ÖZ

İSTANBUL MENKUL KIYMETLER BORSASINDA
HİSSE BÖLÜNMELERİNİN BİR ANALİZİ

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Bu çalışmanın temel amacı Türk şirketlerinin hisse bölünmesi kararlarında işlem aralığı hipotezinin geçerliliğinin sınanmasıdır. İlk bölümde hisse bölünmelerinin Türk firmalarının hisse senetleri üzerindeki likidite etkileri incelenmiştir. İkinci olarak, farklı büyüklükte ve farklı yatırımcı tabanına sahip Türk firmaları için optimum işlem aralıkları belirlenmiştir. Son olarak, çalışmanın temel ampirik sorusu olan hisse senedi fiyatı, optimum işlem aralığının üzerinde olan Türk firmalarının hisse bölünmesi gerçekleştirmesi olasılığının, fiyatları işlem aralığında ya da daha aşağıda olanlara oranla daha yüksek olup olmadığı test edilerek cevaplandırılmaya çalışılmıştır.

Likidite ile ilgili elde edilen bulgular hisse bölünmesi sonrasına ait dönemde likiditenin az miktarda düştüğünü göstermektedir. Hisse senedi fiyatları ve firma özellikleri arasındaki ilişki incelendiğinde, firma büyüklüğünün fiyatı pozitif etkilediği bulunmuştur. Yatırımcı tabanının fiyatlara etkisi belirlenememiştir. Son olarak, çalışmada firmaların hisse bölünmesi gerçekleştirmesi olasılığını hesaplamak için geliştirilen modelin yetersiz olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Hisse Bölünmesi, Likidite, İşlem Aralığı Hipotezi

To My Parents

Şerafettin and Mukadder YILMAZ

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CHAPTER 1

INTRODUCTION

1.1 Definition of Stock Splits

A stock split is an accounting transaction that increases the number of shares of stock held by existing shareholders in proportion to the number of shares currently owned by these shareholders. A stock split entails a reduction in the par value of the corporation's stock and the simultaneous exchange of a multiple number of new shares for each existing share (Sharpe, Alexander, Bailey (1995)). For example, in a 2-for-1 stock split, every shareholder with one stock is given an additional share. After the split, there will be two shares for every one pre-split share. (So it is called a "2-for-1 split.") Thus, if a company has 10 million shares outstanding before the split, it will have 20 million shares outstanding after a 2-for-1 split.

Sometimes an ordinary split is referred to as a percent. A 2:1 split is a 100% stock split (or a 100% stock dividend). A 50% split would be a 3:2 split (or a 50% stock dividend). Each stockholder will get one more share of stock for every two shares owned.

The price of a stock is also affected by a stock split. One share represents the value of the company's underlying assets plus its growth potential divided by the number of shares outstanding. After a stock split, the only value that changes is the denominator in this equation. After a split, the stock price is reduced since the number of shares that are outstanding is increased. In the example of a 2-for-1 split, the share price will be halved. If the stock price is $50 per share before the split, each share is worth $25 after the split since the company's net assets do not increase and only the number of shares outstanding changes.

Theoretically, from the investors' point of view, a stock split does not represent an economic event that needs to be incorporated into the stock prices. Following a split, the fraction of the company that each share represents is reduced, but each stockholder is given enough shares so that his or her total fraction of ownership in the company owned remains the same. On the day of the split, the value of the stock is also adjusted so that the total capitalization of the company remains the same.

A stock split is usually executed by companies that have seen their share price increase to levels that are either too high or are above the price levels of similar companies in their industry. The primary motive for a stock split is to make shares seem to be more affordable to small investors even though the underlying value of the company has not changed. Another reason a company may want to declare a stock split is to make more shares available in the market and to broaden its stockholder base thereby making the stock more marketable and liquid.

Theoretically, there is no reason to believe that the stock will continue to rise in price after the stock split. However, in practice, an ordinary split often

drives the new share price. Usually, this increase in price is interpreted to be the outcome of an increased public attention in the stock as a result of reduced stock price. Therefore, a company might choose to split its stock when it feels its per-share price has risen beyond what an individual investor is willing to pay. The company may wish to attract individual or small investors to stabilize its price, since institutional investors usually buy and sell more frequently than individuals. Another explanation given for the price increase is that a stock split provides a signal to the market that the company's share price has been increasing and investors assume that this growth will continue in the future.

As an alternative to splitting its stock, a company may also choose to pay dividends in the form of stock. Stock dividends are similar to stock splits in that the proportionate ownership of existing investors remains unchanged. For instance, in a 10% stock dividend, a shareholder receives one new share for every 10 shares he owns. Similar to stock splits, if a company has 1,000,000 shares of common stock outstanding and declares a 10% stock dividend, the company ends up with 1,100,000 shares outstanding following the distribution of the stock dividends.

There are two basic differences between a stock split and a stock dividend. The first difference is the magnitude of change in the number of shares outstanding. The post-split number of shares is usually larger by an amount of 25% or more compared to the pre-split number of shares in a stock split. On the other hand, a stock dividend is usually associated in an increase of less than 10%. The second difference between a stock split and a stock dividend is the accounting treatment. In case of a stock split, all the old shares are destroyed and new shares are issued with a new par value. For instance, in a two-for-one stock split, the

number of outstanding shares is doubled and par value is halved. In case of a stock dividend, a bookkeeping entry is made transferring "retained earnings" to common stock. For instance, if a firm with 1,000,000 shares outstanding with a pre-split price of $10 declares a 10% stock dividend, the accountant would show 100,000 new shares outstanding and transfer 100,000($10)= $1,000,000 from "retained earnings" account to "common stock". Thus the level of retained earnings puts a limit on the size of the stock dividend for a given firm.

Another version of a stock split is the "reverse" split. This is the opposite of an ordinary split. When a company engages in a reverse stock split, it exchanges one share of stock for a predetermined number of shares of stock. A reverse split does not increase the market capitalization of the company. This procedure is typically used by companies with low share prices who would like to increase their share prices to either gain more respectability in the market or to prevent the company from being de-listed from the stock exchange.[1] Alternatively, a company may want to conduct a massive reverse split to eliminate small investors from its shareholder base. For instance, in a reverse 5-for-1 split, 10 million outstanding shares at 50 cents each would be changed to only 2 million shares outstanding at $2.50 each. Both before and after the reverse split, the company is only worth $50 million.

Just like the case of ordinary splits, following a reverse split, there is no theoretical reason to expect a change in the stock price beyond the adjustment for the split itself. Empirically, it has been shown that after most reverse splits, the

[1] Many stock exchanges will de-list stocks if they fall below a certain price per share.

stock price declines. The reasons for such a decline are posited to be the opposite of the reasons for the price increases following ordinary splits.

1.2 The Stock Split Procedure in Turkey

In Turkey, there is no exact match for the concept of stock splits as executed in the US and other developed financial markets. Alternatively, Turkish corporations use two types of stock distributions: bonus issues and stock dividends. In case of bonus issues, new shares are issued by using "internal funds", especially the revaluation fund[2]. In Turkey, capital increases through bonus issues are regulated by the Turkish Commercial Law and the Turkish Capital Markets Law. By definition, there are no newly created funds as a result of a bonus issue. According to regulations, a firm may increase its capital through a bonus issue by adding either one of the five different sources of internally generated capital to its equity and by issuing new stocks to represent this increase in the equity base. These sources are the extraordinary reserves, past years' net income, the revaluation fund, the cost increase fund, and the gains obtained from the sale of real estate and participation certificates.

The firms who want to increase their capital through a bonus issue have to go through several steps in order to complete the split procedure. First, the board of directors of the company passes the decision. If there are preferred shareholders in the company, the decision needs to be approved by the board of preferred

[2] Revaluation fund is an equity account which enables firms to adjust their fixed assets for inflation by increasing the value of plant assets by a constant ratio announced by the Ministry of Finance. Corporations are allowed to transfer the revaluation fund to paid-in-capital through bonus issues. The accounting treatment of such a transaction is similar to the stock dividend concept in the US while the split factor is usually quite high.

shareholders as well. Second, the company applies to the Capital Markets Board for the approval of the bonus issue decision. Once the Capital Markets Board approves the decision, it is executed in the market. Following the execution, the changes that take place in the company's equity account are registered with the Commercial Registry Office.

In 1995, ISE corporations were allowed to distribute stock dividends which are dividends in the form of stocks. Stock dividends are distributed out of retained earnings and distributable profit. When the percentage of stock dividends in paid-in-capital is considered, it should be noted that Turkish stock dividend percentages are larger (ranging from 2% to 600%) compared to the stock dividends in the US. This difference is attributable to the regulatory differences between Turkey and the US where corporations are prescribed to make share distributions of less than 25% through stock dividends rather than stock splits.

Aydoğan and Muradoğlu (1998) suggest that the motivation behind the bonus issues and stock dividends for Turkish corporations is to increase the book value of their paid-in-capital which enables them to keep consistent debt-to-paid-in capital ratios. This way, these firms avoid exceeding the debt issuance limit which is up to 600% of the paid-in-capital.

Although the accounting treatments of bonus issues and stock dividends as exercised in Turkey differ from a stock split in which there is no change in capital, what this study analyses is their split effect. Thus, for the sake of simplicity and to be consistent with the literature, both bonus issues and stock dividends in the Turkish market will be referred to as "stock splits" throughout this study.

1.3 Main Hypotheses about Stock Splits

The definition of a stock split indicates that a shareholder would expect no tangible benefits from a stock split. However, many studies empirically showed that the split decision has significant effects on firm value and returns to shareholders increase with the announcement and execution of splits. The empirical findings can be grouped under four main headings. These are signaling, trading range, optimal tick size, and tax-option hypotheses.

The supporters of signaling hypothesis mainly argue that there is informational asymmetry between managers and shareholders. They claim that a split would reduce this information asymmetry by conveying information about firm's prospects.

A second group of researchers argue that companies split their shares to position the share's price into an optimum trading range. This optimum trading range is expected to attract a greater number of investors (especially small individual investors) and to improve the trading liquidity.

Alternatively, the optimal tick size hypothesis states that the rationale for a split decision is to influence the relative tick size when there is an institutionally-mandated constant absolute minimum tick size. A stock split results in a lower share price and a higher relative tick size. A higher tick size is expected to lead to greater liquidity and higher transaction costs for investors. Therefore, a split is a tool to reach the optimal tick size by providing a balance between higher transaction costs and the benefit of enhanced liquidity.

The tax option hypothesis is based on the empirical findings that indicate increased post-split volatility. The supporters of this hypothesis argue that investors have more opportunities to time their purchase and sale of the stock due to increased return variance on the day of and following the execution of splits.

1.4 Objectives and Outline of the Study

In this study, the common-stock split decisions are examined for Turkish firms whose shares are traded on the Istanbul Stock Exchange during the period from 1992 to 2002. Specifically, the study aims to find out the validity of the trading range hypothesis as a basis for split decisions of Turkish companies. The "trading range hypothesis" states that there is an optimum trading price range for each stock and that through stock splits managers aim to attract new money and shareholders by bringing the stock prices into this optimum and presumably preferred range. The specific empirical question answered in this study is whether or not those firms whose share prices rise above their optimal trading ranges are more likely to split their stock compared to firms whose share prices are at or below their optimal trading range.

First, the study starts with a test concerning the liquidity effects of stock splits for Turkish common stocks. The main assumption of the trading range hypothesis is that it is improved liquidity that characterizes a price range as optimum. Thus, before the trading range hypothesis can be tested, it is important to investigate whether or not stock splits enhance the liquidity of Turkish common stocks that undergo a stock split. In order to examine the liquidity effects of the

split decision on Turkish stocks, the widely accepted methodology of Copeland (1979) is utilized in this study and the volume of trading is taken as a measure of pre- and post-split liquidity. The results of this test provide a background for forming the a priori expectations regarding the validity of the optimal trading range hypothesis in the Turkish stock market.

In the next step, the study identifies the optimal trading price range for Turkish firms whose stocks are traded on the Istanbul Stock Exchange during the period from 1992 to 2002. For this purpose, the analytical framework of Dyl and Elliott (2000) is modified for the specific characteristics of the Turkish stock market. Originally, the optimal trading range concept is based on Merton's (1987) model of capital market equilibrium with incomplete information. According to Merton, the optimal trading range is a function of a firm's size and its ownership characteristics. He argues that firms whose owners are primarily small investors are more concerned with the trading range issue in order to expand their investor base further by keeping their prices low. In addition Merton expects large/well-known and widely-held firms to care little about an optimal trading range since these firms already have a large investor base. By modeling the share price as a function of firm size and investor base, this study makes it possible to determine whether this argument holds for Turkish firms. Also, by identifying an optimal price range for each stock, the results of this stage of the study provide the reference point that is needed to test whether the trading range hypothesis holds.

In the last stage, the study determines whether or not Turkish firms whose share prices rise above their optimal trading range are more likely to split their stock compared to firms whose share prices are at or below their optimal trading

range. The trading range hypothesis posits that stocks whose prices are within their optimal range would be less likely to split. In order to test this hypothesis, the probability of a firm executing a stock split is calculated. This likelihood is determined within Dyl and Elliott's (2000) logit framework where the probability density function is modified to reflect the characteristics of the Turkish stock market. The idea in this stage of the study is to compare the actual share price of a company against the theoretical optimal trading range that is calculated in the previous stage of the study. Based on whether or not the actual price is above the optimal range or not and by also taking into account other firm-specific characteristics, the probability of a firm executing a stock split is calculated.

The next section of the study presents the current literature on the motivation for and results of stock splits. Chapter 3 briefly explains in detail the methodology utilized in this study. In Chapter 4, the analysis sample is described and analyses and results are presented. Finally, Chapter 5 concludes with a summary of the main findings and discusses the limitations of the study.

CHAPTER 2

LITERATURE REVIEW

Stock splits are generally stated to be a puzzling phenomenon for researchers where theory and practice contradict. On one hand, theoretically, a stock split means no more than a cosmetic accounting change and it simply increases the number of shares outstanding without any change in shareholders' proportional ownership of shares. Thus, shareholders are expected to receive no tangible benefits from a stock split while there are some costs associated with it such as administrative costs for issuing companies and increased transaction costs for investors. On the other hand, empirically, many studies have detected real effects on returns for investors associated with the announcement and execution of stock splits and put forward different arguments to explain this unexpected result. The most common explanations for these unexpected effects are provided by the signaling hypothesis and the trading range hypothesis which are not mutually exclusive. Two additional theories are the optimal tick size and the tax-timing hypotheses. The signaling explanation was first put forward by Fama, Fisher,

Jensen and Roll in their 1969 study and it has later found support in studies by Brennan, Copeland (1988), McNichols and Dravid (1990), Brennan and Hughes (1991) and many others. The results of these studies show that stock splits are followed by unexpected increases in earnings from the stock. This finding is explained by the informational asymmetry which exists between managers and investors. The main idea is that managers split their stock to signal good information about the future prospects of their company and splits reduce the informational asymmetry between them and the investors. A common finding about splits is that abnormal equity appreciation precedes stock splits. In most of the studies, the information that the firm will maintain its' new level of performance is argued to be the signal conveyed by the announcement of a stock split.

The seminal article of Fama, Fisher, Jensen, and Roll is one of the earliest attempts to investigate whether any specific type of return behavior is associated with the process of splitting. They examine the information content of splits and analyze how common stock prices adjust to this information. They specifically attempt to determine whether any abnormal return is observed around stock splits and to what extend these (if any) abnormal returns are caused by stock splits. They use a sample of 940 stock splits from the NYSE that were executed over the 1927-1959 period. Their findings indicate that a period of unusually high returns precede stock splits. Fama, Fisher, Jensen, and Roll state that these high returns begin long before any information concerning a stock split reaches the market. Thus, they suggest that the pre-split high returns are likely to be caused by large increases in expected earnings and dividends. They conclude that splits tend to occur during

general boom periods and the splitting companies are those which perform "unusually" well compared to general market behavior. However, they also observe that the highest average monthly rates of return are observed in the few months preceding the split. This finding leads them to suggest that a proposed split may provide information to investors to reduce the uncertainty about the level of returns. Analysis of past split data shows that a large fraction of splits are followed by dividend increases. Simultaneous dividend changes and split announcements are also frequently observed. Thus, announcement or anticipation of a split is interpreted as the improved probability of an increase in future dividends. Therefore, a split is a signal to the market that managers are confident that their future earnings will be sufficient to maintain dividend payments at a higher level. Furthermore, Fama, Fisher, Jensen, and Roll identify substantial differences in the post-split return behavior for the cases where the dividend increase materializes and the cases where it does not. On one hand, for the group where the dividend increase actually takes place, the cumulative average residuals (which represent the average deviation of returns on splitting stocks from that of the market) drift slightly upward. They interpret this as evidence for their hypothesis because only a slight additional price adjustment is necessary when the dividend increase takes place since the price already reflects the anticipation of a future dividend increase. On the other hand, the stock splits associated with decreased dividends are found to perform poorly in the 12 months following the splits and the poorest performance is detected in the few months immediately after the split. This is the time when the anticipated dividend increase should have been observed. Moreover, for these stocks, cumulative average residuals fall back to the level

observed five months prior to the split. They argue that it is highly probable that the reliable information concerning the split had not yet reached the market five months before the split. They state that "by the time it has become clear that the anticipated dividend increase is not forthcoming, the apparent effects of the split seem to have been completely wiped away, and the stock returns have reverted to their normal relationship with market returns." They also find that on average the market adjusts quickly and dividend forecasts for split securities are fully reflected in the price of the security by the end of the split month. This rapid adjustment to new information provided by splits is stated to be evidence for the assumption of "efficient markets." To summarize, Fama, Fisher, Jensen and Roll argue that the high pre-split returns in the months immediately preceding a split reflect market's anticipation of substantial increases in dividends since such increases are usually observed in the past. They conclude that when the information effects of dividend changes are taken into account, the apparent price effects of the split disappears.

In a later study, Grinblatt, Masulis and Titman (1984) suggest that at least part of the price effects can be attributable to non-dividend-related factors. Grinblatt, Masulis and Titman examine if any valuation effects are associated with stock split and stock dividend announcements. They use a sample of 1762 announcements and 1740 ex-date events for proposed splits and stock dividends from NYSE and AMEX during the 1967 - 1976 period. They find significant positive announcement returns for the entire sample, for a sub-sample consisting of "pure" splits that have no other announcements in the three-day period around the announcement day and for another sub-sample where no cash dividends were declared in the previous three years. Contrary to Fama, Fisher, Jensen, and Roll,

this study finds evidence that the positive announcement effect is not restricted to firms that have experienced or will experience improvements in dividends. This finding indicates that the announcement effect is not completely tied to cash dividend increases and some of the informational content of splits and stock dividends is not dividend related. Grinblatt, Masulis and Titman suggest that stock dividend and stock split announcements are interpreted as different types of announcements by the market.

The role of dividends as a signal is further examined by Desai and Jain (1997). They examine whether any signal is conveyed by dividend increase announcements that are made simultaneously with stock split announcements. In order to isolate the effect of the dividend signal, Desai and Jain form sub-samples for dividend paying stocks (3907 announcements) and non-dividend paying stocks (1689 announcements) over the period from 1976 to 1991. They report a positive correlation between the percentage change in dividends that occurs at the time of the stock split announcement and the 1 year abnormal returns, as well as long run abnormal returns. This finding is consistent with the dividend signaling argument. One-year abnormal returns of 3.6%, 5.62% and 11.00% are found for sub-samples of firms that increase dividends by less than or equal to 10%, between 10% and 25%, and more than 25%,respectively. Moreover, 3-year post-announcement abnormal returns of 48.07% are reported for firms initiating dividends accompanied by stock splits. Thus, Desai and Jain conclude that a stock split with a simultaneous increase or initiation in dividends is a stronger signal than a pure split and so, the part of the signal conveyed by stock split announcements belongs to an increase in dividends.

Nayak and Prabhala (2001) go one step further and attempt to decompose the relative importance of the dividend and non-dividend components in explaining split announcement effects. They also try to provide an explanation for the finding of Grinblatt, Masulis, and Titman (1984) that split announcement effects are higher for non-dividend paying firms. Nayak and Prabhala suggest two possible explanations for this phenomenon, which are not mutually exclusive. First, they argue that the systematic differences between dividend paying and non-dividend paying firms may cause non-dividend paying firms to be unlikely to announce a split. Thus, the market response will be higher for split announcements of non-dividend paying firms since it is more surprising to market. They refer this idea as "differential expectations hypothesis." Alternatively they argue that "splits and dividends are partial informational substitutes for each other" since dividends are also used to convey messages by the management. Thus, splits executed by dividend paying firms should be less informative announcements and a less intense stock price response is expected compared to that expected for a non-dividend paying firm. They provide empirical evidence that a combination of differential expectations and information substitute hypothesis can explain the differences in split announcement effects between dividend paying and non-dividend paying firms. They also examine "what part of split announcement effects are due to increased likelihood of dividend increases and what part is due to other non-dividend factors such as increased "attention" to the stock or a more "optimal" price for the stock" for dividend paying firms. Results obtained by using traditional event study techniques for their sample of dividend paying firms reported on the CRSP tapes which announced stock splits indicate that about 46

percent of the stock announcement effects cannot be attributed to the dividend component. However, the coverage and the relative importance of non-dividend factors are left unexplained.

Approximately two decades after the study of Fama, Fisher, Jensen and Roll, Brennan and Copeland (1988) develop a transaction cost model where trading costs depend on stock prices. In such a model, a stock split serves as a costly signal of managers' private information since it is stated to be costly to trade in low-price shares. The inverse relationship between stock trading costs and stock prices are supported by empirical evidence obtained from average stock commission quoted by 98 discount brokers in early 1982. The transaction cost function is exogenous to the signaling model. According to the signaling model developed in the study, a stock split that does not replace each old share with an integral number of new shares will cause some investors who previously owned round lots to end up with odd lots which are more expensive to sell. More importantly, stock splits also have long run effects on the cost of trading and the study finds evidence that trading costs and stock prices are inversely related. Announcement date mean adjusted returns from a sample of 967 splitting firms are used to estimate the model. The major conclusion of the study is that stock splits are able to signal managerial information about the prospects of the firm precisely because of the influence of the stock price on the cost of trading. More clearly, since the cost of trading depends on the stock price, the announced number of shares for the split acts as a costly signal of its value and the higher the new number of shares announced, the higher the value of manager's private information conveyed by the split.

Later, Brennan and Hughes (1991) claim that the transaction cost model of Brennan and Copeland which attempt to explain how a stock split announcement can serve as a credible signal is incomplete since no rational justification for the dependence of brokerage commission rates on stock prices is provided. They point out the role of security analysts' earnings forecasts as a motivator of stock splits. It is argued that managers with favorable private information use brokers who make earning forecasts about individual firms as "information producers" and brokers are compensated in the form of brokerage commissions obtained from investors. Brennan and Hughes use a model in which brokerage commission rates depend on share prices and this dependence provides an incentive for brokers to produce research reports on firms with low share prices. The argument in this model, combined with the idea that investors prefer to trade in stocks that they know about, is expected to motivate managers to try to attract the attention of security analysts when they have private "good news" to signal. In Brennan and Hughes's model, managers achieve this attention by announcing a stock split and thereby reducing the share price and increasing the trading commission revenue for brokerage houses. A sample of firms listed on the I/B/E/S database during the 1976 – 1987 period is used to test the predictions of the model. The positive abnormal returns observed around the split announcements are explained by the signaling hypothesis which argues that the market responds positively to the information conveyed by the split. Brennan and Hughes conclude that there is an inverse relationship between the number of analysts and share prices and that the change in the number of analysts following a firm is positively related to the magnitude of stock splits (and positively related to the size of the company).

In a related study, Huang, Liano and Pan (2002) examine the relationship between the information content of stock splits and the firm's future profitability. The level of future earnings, changes in future earnings, and future abnormal earnings after splits are used as indicators of future profitability. Huang, Liano and Pan test the signaling hypothesis on a sample of splits with a low split factor in order to isolate out the trading range effects. They argue that the trading range hypothesis is not a plausible explanation for small split factors since small split factors do not reduce the share price enough to a certain range. Analyses in the study are based on a sample of 635 splits for NYSE, AMEX, and NASDAQ firms over the 1982-1997 period where the split factor is less than or equal to 0.5. In their model, Huang, Liano and Pan include the market value of the firm as a control variable since they argue that larger firms may prefer trading at higher share prices. No significant positive relationship between the split factor and the three measures of future profitability is detected. Moreover, a negative relationship between stock splits and future profitability is detected in subsequent years after the announcement regardless of the measure of future profitability and after controlling for current profitability, market's expectations about future earnings, and past dividend changes. The exceptional positive relationship between earnings changes and splits for year 1 turns out to be negative for years 2 and 3. The highest earnings growth is at the announcement year compared to any of three post-split years. Huang, Liano, and Pan suggest that this finding can be explained by the over-optimism of managers of the splitting firms or may indicate that managers may have incentives other than signaling information, such as drawing attention to the company shares or to enlarge the company's ownership base. In addition, no

evidence of abnormal stock returns over the three years subsequent to split announcement is observed. They conclude that "stock splits are not useful signals of a firms' future earnings prospects."

In a recent study, Kadiyala and Vetsuypens (2002) use the changes in short interest positions as indicators of the signaling value of stock splits. They conduct an event study based on a sample of 296 NYSE firms that make split announcements during the 1990 -1994 period. They argue that if a stock split conveys favorable inside information, it should be associated with a decline in short interest since short interest positions are viewed as indicators of negative sentiment in the market. The change in short interest is also stated to be a useful tool for distinguishing between liquidity and signaling effects of stock splits since, if the event is liquidity enhancing, one should expect short interest to increase following a split. Findings of the study indicate that there are significant short position increases when liquidity improves after the split. However, the study provides only weak evidence for the signaling effect of splits. On average, short interest does not decline, indicating that signaling effects do not characterize the overall sample. Post-split performance of firms with reductions in short interest after the split reveal similar results with those not showing post-split reductions in short interest. A somewhat better operating performance is detected in pre-split years in favor of firms for which a split causes a reduction in short interest. However, there is no evidence that firms with good post-split performance convey favorable signal at the time of the split. Thus, the authors conclude that splits appear not to signal management's optimism about future prospects, but rather they reveal the managers' confidence that their firms' exceptional pre-split

performance is permanent. This conclusion is consistent with the earlier argument that "splits may act as a confirmation of improved past performance rather than a signal of improved future performance."[3]

The second major explanation for the positive returns around split announcements is the trading range hypothesis which argues that stock splits bring share prices to a lower and more preferred trading range.

The study by Baker and Gallagher (1980) suggests that the trading range hypothesis is popular among practitioners. Baker and Gallagher investigate the incentives that lead managers to splitting their stocks. They use a mail questionnaire including a series of 18 closed-end statements and one open-ended question. Their survey includes two groups of chief financial officers. The first group consists of the CFOs of 100 companies that performed a stock split during 1978, and the second group includes the CFOs of 100 randomly selected firms that performed neither stock dividends nor splits between 1974 and 1978. The results are interesting since both the stock split and the non-stock split groups agree that stock splits keep a firm's stock price in an optimal price range and splits increase the number of shareholders of the firm. Managers from both groups also believe that stock splits make it easier for small investors to purchase round lots. Stock splits are seen by these two groups as a device to make stocks more attractive to investors by increasing the number of shares outstanding. Baker and Gallagher conclude that stock splits are perceived by managers as a useful device to bring the

[3] Fama, Fisher, Jensen and Roll (1969) suggest that the managers actually signal their confidence that future earnings will be sufficient to maintain dividend payments at a higher level. Asquith, Healy, and Palepu (1989) find significant earnings increases during the four years before the split. Benartzi, Michaely, and Thaler (1997) also find evidence that dividend changes convey information that the concurrent earnings change is permanent.

price into an optimal trading range. A lower price is seen as a means of increasing marketability and the ownership base. Thus, stock split decisions are argued to be more targeted at the small investors rather than institutional investors.

Additional empirical support for the trading range hypothesis comes from Lakoniskok and Lev (1987) who show that restoring stock prices to a "normal range", rather than signaling information, is the motivation behind splits. Lakoniskok and Lev compare the operational performance and other characteristics of companies that have split their stock and distributed dividends with those of a control group of non-distributing but otherwise similar firms. They aim to investigate why firms split their stock or distribute stock dividends and why the market reacts favorably to these distributions. The study use a sample of 1015 stock split and 1257 stock dividend events from the CRSP database during the 1963-1982 period. Analysis of data indicates that splitting firms are characterized by higher growth of earnings and market volatilities prior to the split and the firms distributing stock dividends tend to be smaller firms. These systematic differences between splitting firms and firms that distribute stock dividends indicate that stock dividends are not just small stock splits contrary to the widely held belief. Growth in earnings and cash dividends is analyzed to test the signaling hypothesis. Only weak evidence is obtained to support signaling in the form of somewhat higher growth in earnings and cash dividends compared to the control group. The authors indicate that the data more strongly support the price reaction motive for splits meaning that splits are intended to adjust stock prices to normal levels but no such intention is valid for stock dividends. For stock splits, it is found that the market-wide average price and the industry-wide average price are the objectives in

choosing the size of the split. More specifically, a one percent deviation of the stock price from the market-wide average price is associated with a 0.225 percent increase in the size of the split.

Recently, Dyl and Elliot (2000) provide further evidence for a preferred trading range for firms in the US market. Dyl and Elliott claim that the substantial variation in common stock prices observed in the US market is the result of different price range preferences of the firms. They show that Merton's (1987) model of capital equilibrium with incomplete information can explain 45 percent of the variation among firms' share prices for cross-sectional US data. They find that larger, well-known firms have higher share prices. On the other hand, lower share prices are observed for firms owned by small investors. Stock splits are seen as a way to manage the stock prices in such an environment where the optimal design of a security is achieved by managing the share price. Dyl and Elliott use a sample of 1426 firms reported on the CRSP database over a 21-year period from 1976 to 1996 with a share price of at least $1.25 as of the end of January 1976 (ten times the tick size of the period is chosen in order to eliminate "penny" stocks). They find that the less widely held firms have greater incentives to split their stocks compared to more widely held firms. Moreover, the firms splitting their stock are found to experience an increase in the number of shareholders compared to non-splitting ones. For instance, an average of 50 percent increase in shareholders is observed for firms that have at least a 2 for 1 split while an average of 0.5 percent decrease is detected for the non-splitting firms. However, Dyl and Elliott cannot explain the mechanism by which a split can increase the investor base. Another finding consistent with earlier studies is that firms are more likely to

split after a period of price appreciation. They conclude that trading range, share price appreciation and shareholder base are significant predictors of stock splits. The evidence provided by the study shows that trading range considerations are important to firms and stock splits are used to manage stock price levels.

The idea of an optimal trading range for stocks also leads to the assumption that a split would enhance the liquidity of a stock. However, empirical evidence for improved post-split liquidity is mixed due to differences in methods of analysis and measures of liquidity.

Copeland (1979) investigates the liquidity effects of stock splits by using a finite time series model of trading volume which depends on the assumption that trading during the current time period depends on messages arriving during the current and recent calendar intervals. Two measures of liquidity used in the study are the changes in the proportional volume of trading and the changes in transactions costs as a percent of value traded. Tests based on approximately 11 years of weekly volume data for a random sample of 25 NYSE stock splits show that the response of volume to new information takes place in less than two to three weeks. Increase in brokerage fees by at least 7.1 percent and wider bid-ask spreads are evidences of lower liquidity following stock splits. Volume is found to increase less than proportionately after stock splits. Thus, the empirical evidence of decreased liquidity found in this study contradicts with managers' beliefs about post-split increase in liquidity and wider markets presented by Baker and Gallagher (1980). Copeland concludes that the relative liquidity as measured by trading volume, brokerage revenues and bid-ask spreads show a permanent decrease following the split. He also points out that investors' positive reaction to

splits can be explained by the argument that signaling and diversification benefits may exceed the liquidity costs associated with a split.

Muscarella and Vetsuypens (1996) provide further evidence for the role of liquidity in stock splits by investigating the splits of American Depository Receipts (ADR) that are not associated with splits in their home country stock (solo splits). Solo splits are stated to be a useful tool in differentiating between signaling-based versus liquidity-based explanations of stock splits. Muscarella and Vetsuypens argue that the analysis of solo splits helps to isolate the signaling effects of splits and provides unique illustrations of the effect of liquidity. This argument is based on the idea that ADR solo splits cannot be motivated by a desire to convey favorable inside information since the company would likely split in its primary domestic market if the split were intended to signal inside information. Still, ADRs have a target US price level, suggesting a value to having stock prices within an optimal range. Moreover, it is possible that the ADR prices might rise above the optimal US trading range while home stock prices still remain within the optimal home trading range due to differences between nominal median US stock prices and nominal median stock prices in the home country. Thus, any post-split improvement in value for an ADR solo split would be attributable to liquidity effects. Muscarella and Vetsuypens use a sample of 143 splits of foreign stocks and ADRs traded on the NYSE, AMEX and NASDAQ over the period of 1962 to 1993. In this sample, 24% of transactions are ADR solo splits. Results show that ADR solo splits have higher pre-split ADR prices and higher split factors compared to simultaneous home and ADR splits. Moreover, the difference between ADR prices before solo splits and typical median US stock prices is much

higher compared to the difference between typical median US stock prices and pre-split prices for simultaneous splits and home-only splits. Thus, ADR solo splits are more likely to be motivated by liquidity than simultaneous splits. Significant increases in total volume and the number of trades following ADR solo splits provide additional evidence for improved liquidity. Muscarella and Vetsuypens also report significant positive returns between 1% and 2% around solo split announcements both in the ADR market as well as in the stock's home market. They argue that firms that make their stock more accessible to US investors by splitting are rewarded by their home market. These excess returns are interpreted as the markets' response to greater post-split liquidity. Muscarella and Vetsuypens conclude that the findings support the liquidity explanation of stock split announcement effects, meaning that the shares trading at lower prices result in improved liquidity. They also suggest that the positive market reaction to common stock splits documented by prior research could partly be a manifestation of the same liquidity affect that appear to be at work with ADRs.

In another recent study, Dennis and Strickland (1998) argue that the previous studies fail to detect the liquidity gain following stock splits in an appropriate manner because the liquidity for firms before the split is ignored in the analyses. They claim that the liquidity gain for a stock split is conditional on the pre-split liquidity of firms and that institutional investors are the source of much of the market's liquidity. Dennis and Strickland examine the linkage between splits, ownership structure, volume and abnormal returns by using a sample of splits executed by NYSE, AMEX or NASDAQ firms over the 1990 -1993 period. They find that the "changes in liquidity, measured by the volume of trade, are negatively

related to the level of institutional ownership prior to the split." The largest liquidity benefits are observed for the firms with the lowest levels of pre-split institutional ownership. Dennis and Strickland reexamine the prior studies about the effects of splits on ownership structure. The prior hypotheses of round lot considerations and increased bid-ask spreads predict the proportion of institutional ownership of a stock to decrease following a stock split. However, Dennis and Strickland's findings contradict with these prior hypotheses. They find a statistically significant increase in the proportion of institutional ownership following a split, conditional on the pre-split level of institutional ownership. The largest post-split increase in institutional ownership occurs for firms that had low institutional ownership prior to the split. This result can be explained by the fact that institutions follow the market more closely than individual investors and when they see the signal conveyed by the split they make an attempt to increase their ownership in a stock. Institutional investors acquire this new demand from the existing shareholders and a large increase in institutional ownership will be observed only if the existing shareholders are individuals. Dennis and Strickland suggest that the large increase in the trading volume for firms with low pre-split institutional ownership results from the increased institutional ownership following a split. Finally, they observe a negative association between the level of institutional ownership prior to the split and the abnormal returns following a split. They conclude that the increase in liquidity is a function of the ownership structure of the firm. The firms with the lowest levels of pre-split institutional ownership experience the largest increase in liquidity and are rewarded by the market for this

improvement in liquidity. This result also indicates that the liquidity gain is priced in the market.

In a later study, Michayluk and Kofman (2001) criticize the prior studies on liquidity on the grounds that simple statistics is not sufficient to evaluate liquidity changes. They provide a comprehensive picture of the microstructure changes in common stock liquidity following stock splits. A six-year period is examined in order to determine the full impact of stock splits on 31 liquidity measures broadly classified as either "friction measures" or "activity measures". The friction measures category includes variables of bid-ask spread, price and return measures, and the activity measures category includes variables of depth, volume and size measures. These two measures are expected to have opposite directional impacts on liquidity: an increase in a friction measure indicates reduced liquidity whereas an increase in an activity measure indicates an increase in liquidity. Moreover, effects of different sizes of stock splits on liquidity are also examined, based on the idea that different motivations may exist for different sizes of stock splits. Two-for-one and three-for-two split factors are examined since these are the most frequent split ratios and prior research (Elgers and Murray (1985)) has suggested different incentives for each. Another issue Michayluk and Kofman examine is how measures of liquidity differ across different market structures. A total of 1830 NASDAQ, 824 NYSE and 135 AMEX stock splits are included in the sample in order to analyze this issue. The liquidity impact of the 1997 structural change that altered the minimum tick size and order handling rules is also analyzed. The empirical results for adjusted activity measures indicate a decline in liquidity in all three exchanges. However, unadjusted activity measures are found to increase and

unadjusted friction measures are found to decrease indicating higher liquidity after stock splits. The authors interpret this misperception as a probable motivation for stock splits. They also find that there are systematic differences between post-split measures across exchanges and between small (three-for-two) and large (two-for-one) splits. Large stock splits exhibit a more severe liquidity decline than small stock splits, especially on NASDAQ; however, this difference between large and small stock splits is found to diminish over time. In NYSE and AMEX, the liquidity decline is more severe for friction measures but the scale of measures is much higher for AMEX. In NASDAQ, similar effects of friction measures are combined with large reductions in depth measures. In addition, the structural changes that took place in 1997 also had an impact on the liquidity changes following stock splits. Authors suggest that differences in NASDAQ and NYSE are less apparent in 1998 compared to 1996, indicating that increased competition after the structural change forced these two exchanges to become similar. They also state that the change in order handling rules on NASDAQ may have served to reduce the disparity in percentage spreads and depths observed before the structural change.

There are some other empirical studies which argue that signaling and trading range hypothesis are not mutually exclusive and a fusion of the two can be used to explain the stock split behavior. In such a study, McNichols and Dravid (1990) argue that signaling alone is an incomplete explanation for the stock split behavior and provide evidence that the choice of the split factor enables firms to

signal their private information about earnings[4]. They conduct three tests concerning the characteristics of a signaling equilibrium. The tests of the signaling hypothesis are based on the idea of a preferred trading range. They assume that there are different costs associated with different share price ranges and these costs are inversely related to management's private information. The study uses a sample of 3015 stock dividend announcements (with no contemporaneous announcements) during the 1967 -1983 period. The first hypothesis to be tested is whether managers' choice of the split factor reflects their private information about future earnings. The private information about future earnings is approximated by earnings forecasts errors. Pre-split share price and pre-split market value of equity are included in the model of split factor choice since prior research shows that these two variables should be controlled for in such a model. Split factors are found to increase with earning forecast errors after controlling for differences in the pre-split price and firm size. However, McNichols and Dravid also note that the explanatory power of price and market value of equity variables are considerably greater than that of earnings forecast errors. They interpret this result to suggest that either price and market value of equity are more fundamental to the split factor choice than management's private information or forecast errors measure manager's private information with error. The remainder of the study examines the inferences of investors about splits and compares the results with those that would be expected in a signaling equilibrium. The findings indicate that announcement returns and split factor signals are statistically associated suggesting

[4] Later, Desai and Jain (1997) also find evidence consistent with this idea and suggest that the performance analysis should include the split factor. However, Desai and Jain fail to provide a clear relationship between the split factor and the abnormal returns.

that investors' inferences about firm value do correspond to the firms' split factor choices. The third test provides a decomposition of the split factor signal. The first component is correlated with earnings forecast errors and the second component is uncorrelated. Both components are found to be significantly associated with announcement date returns. The observed correlation between earning forecast errors and announcement returns is taken as evidence to suggest that stock dividend announcements are interpreted by investors as signals about future earnings. However, the significant coefficient on the uncorrelated split factor component brings about three probable conclusions: first, other firm characteristics may also be signaled through the split factor choice; second, earnings forecast errors may cause considerable error in measuring management's private information about earnings; and third, the signaling explanation may be incomplete.

In another study, Ikenberry, Rankine and Stice (1996) provide a synthesis of signaling and trading range explanations and they refer to their hypothesis as the "self selection hypothesis." The idea is that "managers use splits to move share prices into a trading range, but condition their decision to split on expectations about the future performance of the firm." The argument that the size of the split factor signals information (Brennan, Copeland (1988); Brennan, Hughes (1991)) led Ikenberry, Rankine and Stice to focus only on the most common split size of two-for-one in order to isolate out the confounding influence of different split factors. Their sample contains 1275 two-for-one stock splits initiated by NYSE and ASE firms during the 1975 -1990 period. They also account for firm size effects by ranking a firm's share price relative to other firms in the same size

decile while plotting pre-split and post-split share prices. They report a five-day significant mean abnormal announcement return of 3.38 percent which indicates that splits convey favorable information. The market reaction is found to be greater for small firms, for low book-to-market firms, and for firms splitting at low share prices. An important finding is that there is under-reaction to split announcements like many other corporate events[5]. The 7.93 percent significant excess return in the first year after the split and the 12.5 percent in three years following the split represent the degree of under-reaction. Ikenberry, Rankine and Stice state that the findings are not a result of momentum effects since the pre-split run-up and post-split excess returns are inversely related. Their results confirm the self-selection hypothesis in that managers' decision to split is conditional on expectations about the future performance of the firm.

In a later study, Conroy and Harris (1999) examine the link between splits and share prices at the firm level. They find evidence in support of the trading range hypothesis and report that managers appear to engineer splits to bring the share price to a stable particular level. The study also attempts to discriminate between the information and liquidity effects of splits. Conroy and Harris claim that the anticipated split factor reflects the liquidity concerns and the average information effects of splits. They examine over 4000 splits by NYSE firms from 1963 to 1996. The main contribution of their approach is that they develop a firm-

[5] Desai and Jain (1997) also find evidence of a positive drift following stock splits and a negative drift following reverse splits, indicating that the market does not incorporate the full effect, and therefore, "underreacts", for both types of announcements during the month of the announcement. The evidence is based on a sample of 5596 stock split and 76 reverse split announcements for the period from 1976 to 1991. They report a 7.11 % abnormal return during the announcement month, followed by a 7.05% 1-year and a 11.87% 3-year average abnormal return after the announcement month. For reverse splits, the announcement month abnormal return of -4.59% and abnormal returns of –10.76% in one year and -33.90% in three years are reported.

specific measure of expectations. The firm specific price levels largely depend on lagged split prices. It is argued that managers of the splitting companies target at bringing the share prices close to the lagged split price (the price level after the prior split) when they engineer splits. Conroy and Harris show that the lagged split price by itself explains 70% of the variation in the price to which a firm splits its stock. They also find that the role of the lagged split price weakens over time and if the last split is within the last five years, 82% of the variability in split prices can be explained by the lagged split price. However, even when the last split price is over 5 years old, the coefficient is still highly significant. Another interesting finding is that a larger-than-anticipated split factor announcement results in significantly higher abnormal returns to shareholders. Moreover, earnings forecasts of analysts are also found to increase with a split factor that is larger-than-anticipated. Thus, Conroy and Harris's findings are also consistent with the signaling hypothesis.

In a recent article, Angel (1997) argues that price levels per share and thus the optimal price ranges differ across countries but the tick size to stock price ratio is comparable. He attempts to explain stock splits based on an "optimal tick size hypothesis." Angel claims that companies may split their stocks in order to bring the share prices to the desired level where the institutionally-mandated minimum absolute tick size is optimal relative to the share price. This explanation originates from the work of Harris (1994). With a constant absolute tick size, a split has the effect of increasing the relative tick size since the stock price decreases following the split. The idea that firms split their stocks to obtain an optimal relative tick size given a single absolute tick size makes sense since the effects of different tick

sizes on liquidity and bid-ask spreads differ. On one hand, a wider relative tick size is expected to provide the benefit of increasing liquidity due to lower bargaining and processing costs and increasing incentives for limit orders. On the other hand, it also increases the minimum quoted bid-ask spread. The hypothesis is tested on 1160 stock splits from NYSE and AMEX over the period from 1984 to 1993. Angel shows that liquidity-providing limit orders are used more frequently for wider tick sizes since wider tick size reduces bargaining and processing costs and provides more incentives for limit orders. Therefore, stock splits are used to increase liquidity by bringing the stock price to a relatively larger tick size. The study also uses Merton's (1987) model to show the tradeoff between the costs of an increased bid-ask spread and the benefits of an expanded pool of investors. Angel concludes that the optimal relative tick size for a particular firm may be the function of its idiosyncratic risk, market size and the fraction of investors who know about the firm. Specifically, firms with higher idiosyncratic risk and a larger fraction of the total market value should have wider relative tick sizes. In addition, the fraction of investors who know about a firm is negatively related to the optimal relative tick size. This makes sense since very well known firms like Apple and IBM are likely to choose higher price levels than firms producing lesser-known products and higher prices result in a lower relative tick size.

Easley, O'Hara and Saar, (2001) conduct a comprehensive study and evaluate trading range, signaling and tick size hypotheses by examining their implications for trading in common stocks. They apply a market microstructure sequential trade model on a sample of 72 NYSE common stocks which executed two-for-one splits in 1995. Rates of informed and uninformed trading, the

probability of information events and the propensity to execute trading strategies using limit orders are estimated as the underlying parameters that define trading activity. Using these parameters enables them to differentiate between the hypothesized effects of particular theories. The empirical findings of the study indicate an increase in uninformed trading following splits and a slight increase in the tendency of uninformed buyers to execute trades using market orders. This new clientele effect is stated to be the evidence for the trading range hypothesis. Easley, O'Hara and Saar cannot find evidence for a significant increase in liquidity and argue that this result is partly caused by the intensified trading activity of informed investors since an increase in informed trading is also observed following splits. While the liquidity finding is inconsistent with the enhanced liquidity explanation of the trading range hypothesis, the trading range idea still holds. Additionally, informational asymmetry argument is not supported either by empirical evidence. No effect of splits is detected on the probability of new information. Probability of new information in the trading model is presented with a probability tree that assigns probabilities to occurrence of good and bad information which may effect trading in the stock. The results show that the information environment of stocks does not change systematically after stock splits. Easley, O'Hara and Saar interpret the increase in the intensity of limit order trading as evidence consistent with the optimal tick size hypothesis. However, they suggest that the increase in limit order trading is not sufficient to compensate the uninformed traders for the increase in the bid-ask spread and the more intense usage of market buy orders by uninformed traders. The market orders executed at wider bid-ask spreads after the split results in higher overall trading costs for the

uninformed population. Moreover, Easley, O'Hara and Saar find evidence consistent with an increase in limit order cancellations following splits. This finding also contradicts with the idea presented by the tick size hypothesis that fewer cancelled limit orders would encourage liquidity.

The above mentioned theories of signaling, trading range and tick size hypothesis detect the unexpected return behavior on the announcement day and ex-dates for splits; however, these theories fail to shed light on the ex-date behavior of splits since no new information concerning splits is attributable to the ex-date[6]. For instance Grinblatt, Masulis and Titman (1984) find that ex-date period returns are greater for AMEX than for NYSE. Both AMEX and NYSE returns are significantly greater than the benchmark returns throughout the sample period. They cannot find an explanation for the abnormal ex-date returns observed. They suggest that splits are rarely canceled so there is little uncertainty to be resolved on the ex-date and so the abnormal returns cannot be attributed to the incentive of facing reduced uncertainty. Grinblatt, Masulis and Titman argue that these ex-date returns may be the result of transaction costs. They claim that the inventory practices of the specialists lead to an above-average number of trades at bid prices on the day preceding the split and the abnormal returns on the ex-date simply represent the movement from bid to ask prices. This sequence results in a positive ex-date return amounting to one half the bid-ask spread as a percentage of the stock price. The earlier finding of higher ex-date returns for AMEX stocks is consistent with this idea since AMEX stocks are observed to have relatively higher bid-ask spreads. However, Grinblatt, Masulis and Titman also note that this

[6] Ex-date is the day on which the split stocks are distributed to the shareholders.

argument fails to explain the continuance of abnormal returns on days 1 through 3 following the execution of splits.

There are alternative explanations for the existence of ex-date abnormal returns. One common approach in the literature is to look at the change in price volatility in the split stocks on and following the ex-date. If the standard idea that a firm's equity can be viewed as an option on the firm's assets is true, then the volatility increase following the ex-date may account for the existence of ex-date abnormal returns.

In one study, Ohlson and Penman (1985) examine the "irrelevance hypothesis" which states that the total market value of a firm's equity is independent of the number of shares outstanding. They test this hypothesis by analyzing the stock return volatilities prior to and subsequent to the ex-dates of stock splits since the hypothesis assumes that the return generating process is independent of the number of shares outstanding and no difference in variances preceding and following ex-date is expected. Their sample contains 1257 stock splits with a split factor greater than or equal to 100% that are instituted by 910 firms in NYSE between 1962 and 1981. Their results demonstrate a statistically significant increase in the return variances following splits. Moreover, the number of relatively large returns is found to increase significantly following the ex-date. Ohlson and Penman control for the day-of-the-week effects and calendar effects and find that partitioning the data over the number of days between the announcement and split dates has no impact on the results. They also suspect that positive effects on returns observed at the time of the announcement may be positively related to the subsequent volatility increase. It is also mentioned in the

study that the causes of the volatility increase are not apparent and the authors argue that the "overreaction" idea lacks to answer the complex questions that can be raised about the precise meaning of informationally efficient markets[7].

In accordance with the idea presented in Ohlson and Penman (1985), Sheikh (1989) attempts to test the efficiency of the Chicago Board Options Exchange with respect to the pricing of options, regardless of the efficiency of the underlying stock behavior. It is expected that an increase in the post-split volatility should increase the price of call options on the splitting stock that expire after the ex-date relative to those that expire before the ex-date. These relative price changes are expected to occur on the announcement date of the split in an efficient options market. Thus, the relevant question for the study is whether implied standard deviations (ISDs) of stocks that announce a stock split increase relative to ISDs of other stocks. The sample includes 83 stock splits of optionable stocks between 1976 and 1983. The findings support the results of Ohlson and Penman in that the split sample exhibits a significant ex-date increase in return variances since the post-split standard deviation estimated from daily returns is found to be significantly larger than the pre-split estimated standard deviation in 55 out of 83 cases. This increase on the ex-date is suggested to provide excess returns for market makers in the options market from calls on splitting stocks. Sheikh states that no significant increase in ISDs at the announcement date is detected and concludes that the CBOE is not efficient since it did not anticipate the post-split increase in stock return variances.

[7] The overreaction idea assumes that investors are more concerned with absolute price changes rather than percentage changes. Thus, investors are more likely to overreact to information about relatively low priced shares.

The alternative "tax-option hypothesis" presented in Lamoureux and Poon (1987) is part of an approach that does not include signaling as a possible explanation for stock splits. Actually, the study provides a methodological extension of Ohlson and Penman (1985) by including reverse splits in the study, differentiating between systematic and nonsystematic components of volatility and establishing a link between trading volume and increased volatility. Lamoureux and Poon argue that trading volume, as measured by the number of shares traded daily, expands upon announcement of a split due to the lower price associated with split. The increase in volume increases the noisiness of the security's return process and the nonsystematic (diversifiable) risk increases. The increase in volatility results in an increase in the number of possible tax alternatives available to investors (increase in tax-option value) and this value generates the announcement effects of stock splits. The chain of events defined above is supported by the findings of Constantinides who, in his 1984 study, finds that security volatility is desirable given the nature of the US tax code. Additionally, it is also argued that the clientele for a stock changes following a split. The stock becomes less desirable for tax-exempt investors after a split since they have to forego expected returns in exchange for a tax option that is worthless to them. Splits make stocks more attractive to individual investors who tend to dominate the higher tax brackets. This argument suggests that the "tax-option effect" expects an increase in the number of shareholders following stock splits. In order to test the tax option hypothesis, Lamoureux and Poon employ an event-time methodology on a split sample of 217 stocks from NYSE and AMEX during the 1962 - 1985 period. The findings are consistent with the predictions of the theory.

Lamoureux and Poon also find that the announcement effects and ex-day effects are positively related but the first one reflects market valuation while the latter is related to shifting clientele. They report a significant increase in the number of shareholders and the trading volume around the announcement of a split, a result which reflects market valuation. In addition, the abnormal ex-day behavior creates some form of price pressure which results in a one time clientele-shift given that the tax-exempt institutions are not willing to trade off lower expected returns for the tax option. The study also extends the study of Copeland (1979) by examining the volume pattern of reverse splits and showing that the effects are opposite of those that are found for splitting stocks. Generally, a split reduces liquidity and the opposite takes place after a reverse spit. However, this change in liquidity is not priced in the market. The authors conclude that the market's positive reaction to stock splits is due to its tax option impact but managerial motives for declaring a stock split may be completely different.

Later, Angel, Brooks and Mathew (1997) examine the increase in stock volatility subsequent to stock splits. They try to provide an explanation as to why volatilities increase after the effective date of the split. They argue that prior theories of "discreteness" and "bid-ask spread" do not provide a complete explanation[8]. Angel, Brooks and Mathew also analyze an alternative approach presented by Black (1986) which states that a stock split may induce more noise

[8] Dravid (1988) attempts to explain the post-split variance increase as the result of stock price discreteness and the bid-ask spread. Dravid shows that the bid-ask spread and discreteness (rounding of stock prices to the nearest $0.125) creates an upward bias for the estimated return variances. However, Ohlson and Penman(1985) suggest that this is only a partial explanation and show that the median post-split serial covariance of returns is positive for a sample of 1257 stock splits executed by 910 NYSE firms while the discreteness and bid-ask spread effects would be expected to make this covariance negative.

trading by lowering the stock price with the underlying assumption that noise traders prefer lower price levels. They find evidence in support of this hypothesis. However, they also mention that the noise trader hypothesis is incomplete since it fails to explain why the number of noise traders jumps significantly on the ex-date of the split, given that no additional information is conveyed on the ex-date. Angel, Brooks and Mathew state that a plausible reasoning can be obtained from Brennan and Hughes (1991) in that brokers would earn higher commissions when they delay marketing the stock until the effective date of the split. This creates an incentive for brokers to wait until the ex-date to market the stock. Such an increase in marketing may account for the effects of splits on price and trading volume on the ex-date. Angel, Brooks and Mathew use a sample of 210 stock splits of NYSE-listed firms which had "when issued" trading from 1989 to 1992[9]. The first finding of the study is that, when there is "when-issued" trading in the post-split shares prior to the effective date of the split, the when-issued shares have higher volatility than the regular shares. Angel, Brooks and Mathew conclude that this higher volatility is related to the new price regime after the split but not to the information about the volatility of the stock revealed on the ex-date. Secondly, they find that small and large trades respond in opposite directions in the case of a split. Trading frequency, trading volume and trading value are examined as three measures of trading activity. After the ex-date, more trading activity by small investors is observed while the number of large trades decreases. This finding is supportive for the marketing hypothesis in the study which states that splits are followed by increased activity by small, uninformed investors due to increased marketing by

[9] When issued shares trade prior to the execution of the split but represent claims on post-split shares.

intermediaries. According to this hypothesis, the motivation for splits is to give incentives to financial intermediaries to market the stock.

The rationale for the ex-date abnormal returns is further examined by Maloney and Mulherin (1992). They argue that the "transaction cost" argument presented by Grinblatt, Masulis and Titman (1984) and the "tax-timing" hypothesis presented by Lamoureux and Poon (1987) only provide partial explanations for the ex-day price movement. Maloney and Mulherin's model provides a combination of transaction cost and tax-timing arguments. They claim that the anomalous ex-date return for stock splits is tied to the market microstructure phenomena and does not represent real wealth changes. They use a sample of 446 NASDAQ firms that split once over the 1984 -1990 period. They find that trades of splitting stocks congregate at ask prices on and immediately following execution and the asymmetric increase in the ask price compared to the bid price results in abnormal ex-date returns.

Two additional studies by Pilotte and Manuel (1996) and Pilotte (1997) contribute to the split literature by showing that the previous split experience is important and information conveyed by splits is time-period specific.

Pilotte and Manuel (1996) adopt a different approach for investigating the information content of stock splits. They examine firms that split their stock at least twice during the 1970 - 1988 period in order to analyze the market's use of previous split experience in interpreting a recurring event. They claim that previous split experience may provide information about the earning consequences of subsequent splits and suggest three reasons to support this idea. First, market may use previous split experience to differentiate between managers who signal

truthfully and those that signal falsely. A reputation for truthful signaling would help managers to keep their plausibility the next time they signal information by means of a stock split. Second, managers' previous success about estimating post-split performance may be perceived by investors as an indicator of the forecasting abilities of managers. Thus, managers who overestimate post-split performance are likely to have their next signal discounted. Third, even if the management's motivation in declaring a split is not related to conveying information, it is possible that many investors still interpret the split as a signal. However, the assumption that investors learn from previous experience suggests that the change in the earnings of a firm following previous splits should be an indicator of the likely earnings consequences of the current split as long as the management's goals do not change. The major finding of the study is that, conditional on the earnings that were realized following previous splits, stock price responds to the current split and post-split changes. The study finds evidence that a more positive market reaction takes place if the firm has experienced a high rather than low standardized earnings change following its previous split. The price response is also found to be positively related to standardized earnings change that followed the announcing firm's previous split. The findings also suggest a stronger-than-normal price response to the most recent earnings announcement for firms that experienced a low standardized earnings change following their prior split, but a high standardized earnings change following the current split or vice versa. Pilotte and Manuel conclude that the stock price response to split announcements depends on previous experience since market utilizes the previous split experience while

forming expectations about the current split which is interpreted as a recurring event.

In a later study, Pilotte (1997) claims that the information conveyed by stock splits is time-period specific and that the market interprets splits more optimistically when economic conditions are stronger. He provides a comparative perspective on the nature of earnings information conveyed by stock splits by presenting a review of prior research from the 1970 -1980 period and comparing these with the findings of his own study of the 1982 - 1989 period. For comparative purposes, he uses a similar sample selection procedure and methodology with that of Asquith, Healy, Palepu (1989), who investigate the 1970 - 1980 period. Pilotte states that his findings obtained from a sample of 88 stock split announcements by non-dividend paying firms during the 1982 - 1989 period generally contradict with those of Asquith, Healy and Palepu. First, he finds that the year before and the year after the split announcements are years of earnings increases and there is no evidence of significant reversal of earnings performance after the split. These results are consistent with results reported by Asquith, Healy and Palepu. Second, Pilotte finds that split announcement period abnormal returns are not related to earnings changes prior to the split, but are positively related to subsequent earnings changes. These results are directly the opposite of Asquith, Healy and Palepu's results which state that split abnormal returns are positively related to annual earnings changes prior to the split and are not related to subsequent earnings changes. Finally, Pilotte finds that the market response to earnings changes is attenuated in the time following the split announcements while Asquith, Healy and Palepu report that the market response is attenuated in the time

prior to the split announcements. Pilotte indicates that for the 1982 - 1989 period all his results are consistent with the idea that splits convey information about subsequent earnings increases and all results, except the first one, are inconsistent with the idea that splits convey information about pre-split earnings. However, the findings of Asquith, Healy and Palepu for the 1970 - 1980 period suggest that the only signal provided by splits is that prior earnings increases will not be reversed. Pilotte concludes that the nature of earnings information conveyed by splits has changed in the 1980s and that the most likely reason for the difference is the change in the economic environment. The market seems to have interpreted an earnings signal more optimistically in the 1980s compared to the 1970s since the economic indicators are better and the long run potential for growth is stronger during the latter period.

The majority of the studies about stock splits examine the US market and the splits undertaken by the issuers of common stocks. Alternatively, it is interesting to examine whether the rationale behind common stock splits discussed for the US market is valid when splits are analyzed in other markets and for other financial securities.

There are not many studies conducted on the Istanbul Stock Exchange (ISE) which attempt to explain the stock price behavior taking place after stock splits and stock dividends. Managers of publicly held companies frequently announce stock splits, stock dividends and simultaneous executions of both in Turkey. According to Özer and Yücel (2001), the widely held belief among Turkish practitioners that the only reason for stock splits is the high inflation and the application of revaluation on the balance sheet items seems to be an incomplete

explanation. Practitioners usually tend to evaluate stock splits as merely a cosmetic change or a type of financial illusion and they claim that the investors' favorable response to stock splits is irrational. No comprehensive study is conducted to examine the timing of these events and the market's reaction to these events for the Turkish stock market. Özer and Yücel point out the above deficiencies about ISE and provide a limited answer to the above arguments by examining the stock price behavior related to stock splits and stock dividends. Their study investigates the change in share prices and abnormal returns around the ex-date associated with stock splits and stock dividends. Özer and Yücel are suspicious as to whether the investors react differently in cases of stock splits and stock dividends and try to determine a trading strategy based on the observed behavior in the market. They use a sample of 686 stock splits, stock dividends and simultaneous executions of both that take place in ISE during the 1990 - 1996 period. Application of the event study methodology reveals statistically significant positive price movements around the ex-date. A 98.19 percent average return in excess of the market return is found for the 11-day interval that spans 9 days before and 2 days after the ex-date. Thus, a trading strategy that buys at the closing price of the 10^{th} day prior to the split and sells at the closing price of the second day after the split would provide a 98.19 percent return in excess of the market. However, the study does not provide evidence that the response of investors is different for stock splits and stock dividends.

For the Swiss market**,** Kunz and Majhensek (2002) conduct a comprehensive study of the impact of stock splits on stock prices and liquidity by using data from a series of stock splits that take place following a change in

corporate law which reduced the minimum par value of shares from 10 to 0.01 Swiss francs on May 1st, 2001. They state that the reduction in nominal value in 1992 from CHF 100 to CHF 10 was a modest change and the new regulatory change in 2001 is more favorable to firms since it creates a greater potential for firms to split further. Kunz and Majhensek analyze 64 different companies carrying out 80 pure splits during the period from 1992 to 2001. 40 out of 80 splits in the sample are announced and carried out in the year 2001 and this allows the authors to demonstrate the effect of the law change on the split decision. Contrary to the situation in the US, the authors do not expect to find a signaling effect associated with stock splits. The main motivator for stock splits in Switzerland is expected to be reducing the historically high stock prices and benefiting from the law change. By examining the historical development of the Swiss Market Index (SMI), they conclude that the previous minimum par value of CHF 10 imposed a severe constraint on the companies' freedom to choose their stock price and an increased desire to split shows itself after the law change. Their findings show that managers prefer their stock prices to trade in the range of CHF 50 to CHF 200 in Switzerland. 29 out of 40 split announcements in 2001 resulted in a price in this range. The study also examines the stock turnover in currency units and the relative bid-ask spreads as indicators of liquidity. The tick size and the short and long-term performance of the splitting stocks are also analyzed. No significant excess returns are observed in the short term associated with stock splits. Relative bid-ask spreads and tick sizes are found to increase while the average daily trading volume remains unchanged. The long term impact of stock splits is also found to be insignificant. On average, splits in Switzerland are found to be value-neutral

transactions. The fact that splits have no influence on stock prices corresponds with the theoretical arguments put forward by Kunz and Majhensek. The companies that split their stocks are found to have unusual pre-split growth and this evidence is consistent with the US case. As expected, no signaling effect is observed. The authors conclude that stock splits are expected to continue in the future since all of the companies have some room left for additional stock splits and it is possible that Swiss splits may assume the same importance in the future in terms of signaling like their US counterparts.

In another study where the splits are analyzed in a slightly different context, Rozeff (1998) argues that signaling, liquidity, and tick size theories would not explain the motivation for stock splits when the split decision is analyzed for mutual funds. He states that since transaction costs do not depend on the fund's price and since funds do not use lower prices to increase broker promotion and research, no security analysts follow mutual funds or generate brokerage commissions via their research. This empirical situation makes the signaling explanations provided by prior research (Brennan and Copeland (1988), Brennan and Hughes (1991)) obsolete. In the case of mutual fund splits, the only consideration about signaling is whether or not it is possible to signal managerial ability by splitting mutual funds. Also, since open-end mutual funds trade with a continuous tick size, Angel's (1997) tick size hypothesis is invalid as well. Lastly, the tax option hypothesis of Lamoreux and Poon (1987) also does not apply to mutual funds since a post-split change in the fund's variance is unlikely to occur. With respect to open-ended mutual funds, liquidity is not a consideration either, since investors can invest or redeem shares easily and without incurring trading

costs that are dependent on the fund's price. Rozeff argues that for mutual fund managers, the gain from a split is related to the increase in the number of stockholders provided that the amount of funds under management simultaneously increases. Thus, he examines the growth in the number of shareholders and total assets by using a sample of 145 (when analyzing prices) and 120 (when analyzing all other characteristics) mutual fund splits in the US during the period from 1966 to 1992. The analysis uses two control samples of mutual funds, called the price control sample and the growth control sample in order to obtain comparative results. His analysis points to both the similarities and differences between mutual fund and common stock splits. Rozeff finds that like common stocks, the most popular split factor for mutual fund splits is two-for-one and the splitting funds experience above-average pre-split prices which are brought back to the average price by the split. The split factor for mutual fund splits is cross-sectionally related to the percentage deviation of a fund's price from the average mutual fund price at the time of the split. Thus, the higher the percentage deviation gets, the larger the split factor gets. Both common stock and mutual fund splits are executed after a period of high returns. However, there are differences in the announcement day and subsequent earnings behavior. First of all, mutual funds do not exhibit higher returns after the split so the argument of signaling does not apply to mutual fund splits. Moreover, splitting funds have a similar growth in the number of shareholders and total assets in the year after the split when compared to a control sample whereas previous studies have detected increases in the number of shareholders in the year after common stock splits. This means that, contrary to common stocks, the splitting funds do not outperform the non-splitting ones that

are included in the control sample. Similarly, no support for several versions of the trading range hypothesis is found. Rozeff states that mutual fund splits have a lower frequency compared to common stock splits and suggests that this might be an indirect support for signaling and tick size hypotheses of common stocks both of which create stronger incentives for company managers to split compared to mutual fund managers. He concludes that the objective of mutual fund splits seems to be bringing the number of shares held per account up to the average levels and this objective is supported by choosing that split factor which brings the fund's price closest to the average of existing prices.

An extension of Rozeff's work comes from Fernando, Krishnamurthy and Spindt (1999). They state that mutual fund splits provide a relatively clean testing ground for the marketability hypothesis (which indicates that stock splits enhance the attractiveness of shares to investors by restoring prices to a preferred trading range) since the existing transaction cost and constraint-driven explanations of a trading range do not apply to mutual fund splits. They examine 194 mutual fund stock splits that were executed in the US between 1978 and 1993. They criticize Rozeff's work on the grounds that it depends on annual data and that Rozeff matches control funds based on asset growth in the year the split occurred. They use quarterly data to obtain more precise time estimation for excess money inflows to the fund. Moreover, their matching procedure is based on prior period characteristics in order to minimize the look-ahead bias of the results. They add the growth-control-matched fund to the control sample to compare their results with those obtained by Rozeff. Fernando, Krishnamurthy and Spindt report significant post-split increases in net asset inflows and the number of shareholders.

A survey conducted among mutual fund managers is also included in the study. Over 90 percent of the respondents agree that the split does not affect the future returns of the fund and less than 8 percent agree that splits convey favorable information about the fund's future performance. These results indicate that mutual fund managers do not regard splits as signaling devices contrary to corporate firm managers. Fernando, Krishnamurthy, and Spindt conclude that the marketability improves following a split. They also indicate that the positive reaction of investors to splits is more likely to be affected from behavioral or cognitive factors and investors irrationally differentiate between various framings of the same cash flows which may create incentives for managers to undertake splits.

The counterpart of direct splits, namely the reverse splits receive relatively less attention in the academic literature. It is mostly believed that the underlying reason for reverse splits is the general dissatisfaction with the price of the stock. The results of the West and Broulette (1970) study indicate that the management's attempt to enhance its image among investors may be a motivating reason for reverse splits.

Woolridge and Chambers (1983) also investigate the effects of reverse splits on shareholder wealth. They analyze 32 reverse splits executed by AMEX and NYSE firms over the 1962 to 1981 period. The mean-adjusted returns approach is employed using daily data in order to successfully isolate the effects of reverse splits. In addition to the effective date of the reverse split, proposal and approval date returns are also examined and the data are filtered to satisfy the condition that other firm specific news are not announced around the date under

examination. Woolridge and Chambers examine the proposal day, approval day, and effective day returns to provide a better understanding of the effects of reverse splits on shareholder wealth. Their findings demonstrate that "negative aspects of the information effects of reverse splits dominate the potentially positive effects" for the proposal and approval dates. They also indicate that the significant decline of the stock price on the effective date may also be caused by trading considerations in addition to the information effect. Contrary to direct splits, reverse stock splits are found to be unanticipated and are not preceded by adverse stock price movements within the previous six weeks. Findings also show that the decline in stock prices continue after the effective date. The effects of earnings performance for reverse splitting firms are also identified such that better performers have smaller absolute negative returns on all three dates.

Later, Han (1995) investigates the potential benefits of reverse splits for the shareholders. For this purpose, the liquidity effects of reverse splits are examined using bid-ask spreads, trading volume and the number of non-trading days as proxies for the liquidity of the stock. He uses a sample of 136 firms (61 NYSE/AMEX firms and 75 NASDAQ firms) from the 1963 - 1990 period and adopts the abnormal return method to examine the stock return behavior associated with reverse splits. Han finds negative abnormal returns on the announcement date and the ex-date of reverse splits. These findings are consistent with the idea that reverse stock splits signal pessimistic expectations about future earnings. Han also argues that transaction costs as a percentage of the share price should decrease after reverse splits since transaction costs are inversely related with the price, ceteris paribus, and the share price increases after the reverse split. The increase in

share price can also improve the margin eligibility of the stock since stocks with too low prices are prohibited from being bought on margin. Both of these effects should result in increased liquidity. Moreover, if there is a desired trading range for the stock, reverse splits are expected to improve the marketability of the stock by moving the price towards the desired range. While testing liquidity, a control group is formed for comparison purposes. The average standardized bid-asked spread for the split group is found to be significantly lower after reverse splits. For the control group no significant change in bid-ask spreads is observed. While measuring trading volume, split-adjusted number of shares is used as a measure since this measure is not affected from price changes. The average standardized trading volume is found to increase significantly and no such pattern is observed for the control group. The third proxy for liquidity, the number of non trading days drops significantly from 15 to 5.3 days, the number of stocks having at least one non-trading day drops from 119 to 97, and 107 stocks experience a decrease in non-trading days after reverse splits while only 12 stocks experience an increase. Again, no significant change is observed for the control group. Prior empirical work shows that the number of non-trading days is negatively related to the liquidity of the stock. Han concludes that reverse splits enhance the liquidity of the stock by creating narrower bid-ask spreads, higher trading volume and a decline in the number of non-trading days

To summarize, four basic theories attempt to explain why companies execute stock splits:

Signaling explanation is based on the assumption of informational asymmetry which exists between managers and investors. The supporters of this

hypothesis argue that splits are used to convey information to stockholders. Empirical evidence for the existence of an inverse relationship between firm size and split announcement returns supports the signaling argument because small firms are expected to receive greater benefits from the additional information provided by splits since these firms are generally neglected by investors due to the low level of publicly available information about them. The finding that excess returns after stock splits are considerably higher when shareholders are being surprised by a larger-than-expected split factor also confirms the signaling hypothesis. There is also evidence that not only splits but also the choice of the split factor by itself conveys information.

The trading range hypothesis, first put forward by Copeland (1979), states that there is an optimal trading range for the stock price of a company. Trading is expected to be most liquid within this range. Thus, a stock split is used to bring the share price back into the optimal price range when the stock experiences abnormal price appreciation.

Alternatively, Angel (1997) argues that stock splits are used to influence the relative tick size when there is an institutionally-mandated constant absolute minimum tick size. Since the stock price declines in magnitude following a split, a higher relative tick size is expected to result in more profitable market-making and this in turn increases the incentive to quote bid and ask prices which further leads to greater liquidity for the stock. However, higher relative tick sizes also result in increased transaction costs for investors. The optimal tick size is the tick size that provides a balance between the costs of wider bid-ask spreads and the benefits of higher liquidity.

Finally, the tax-option hypothesis presented by Lamoureux and Poon (1987) considers the change in volatility following the execution of splits. The main argument is that the increased return variance of common stocks on and following the execution of splits result in greater opportunities for investors to time the purchase and sale of the stock.

However, none of these hypotheses provide a universally accepted explanation for the unexpected effects of stock splits and there is room for further analysis.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Stock splits are among the most puzzling issues in the finance literature. When a stock splits, the number of shares outstanding increases by the split factor and current shareholders receive additional shares such that each shareholder retains his proportionate ownership. Theoretically, no effect on stock returns is expected since stock splits are only accounting changes and do not effect the proportional ownership of shares in the company. However, many researchers find empirical evidence that there is more to say about the effects of stock splits and that the commonly observed positive reaction of investors to stock splits does not completely result from financial illusion. When the extended literature on stock splits is analyzed, it is seen that managers may have many different reasons for splitting their companies' stocks, such as signaling good information about the future of the company or bringing the share price down to a more preferred trading range. Some researchers also argue that availability of new tax options and

creation of an optimal relative tick size following a stock split can explain the positive reaction of investors to stock splits.

The objective of this study is to examine the common stock splits executed in Turkey. Stock splits are expected to affect the pricing and trading of common stocks in a number of ways. The "trading range hypothesis" states that through stock splits managers aim to attract new money and new shareholders by bringing stock prices down to a more preferred range. The specific empirical question answered in this study is whether or not the firms whose share prices rise above their optimal trading ranges are more likely to split their stock than those firms whose share prices are at or below their optimal trading range. An empirical examination of stock split execution decisions in Turkey is meaningful since both stock splits are executed frequently and there is lack of empirical studies conducted with the Turkish split data. Moreover, the unique regulatory environment of Turkey concerning splits can be beneficial to obtain insights about the differences in the effects of and motivations for splits between emerging and developed capital markets.

Concentrating on the trading range hypothesis and the likelihood of a given firm to split its stock makes it possible to develop a clear understanding of why share prices differ among various firms' shares. When stock prices are examined on a given day, it is seen that there is a wide range of stock prices for different firms' stocks. At first, it may seem that this difference reflects the relative success of companies such that the share prices of successful companies go up over time and other firms' prices go down. Thus, the differences in performance over time may explain the cross-sectional variation in stock prices that is observed in a given

day. However, the trading range hypothesis states that the explanation may not be so straightforward. According to this hypothesis, firms take actions to bring their share prices down to a more preferred trading range and managers can use stock splits to affect their share prices. The proponents of the trading range hypothesis state that it is the improved liquidity that characterizes a price range as optimum. However, several studies document that stock splits actually increase the percentage bid-ask spread indicating a lower post-split liquidity level since there is an inverse relation between transaction costs and trading volume. The inverse relationship between share prices and bid-ask spreads leads to the question of "why firms use splits to move their share price to a less liquid trading range?" Dyl and Elliott (2000) point out that Merton's (1987) model of capital market equilibrium with incomplete information can provide at least a partial answer to this question. Merton assumes that investors only invest in securities that they know about. Thus, an increase in the number of existing and potential investors who are aware of the firm increases the market value of the firm. In this case, firms may target a trading range over which the benefits of an increased investor base would more than offset the cost of higher bid-ask spreads following stock splits. Various studies document a post-split increase in the number of shareholders in a firm, a result which implies an increase in the investor base. The increase in the investor base can be the result of a combination of factors like investors' revealed preferences for trading in round lots, the benefits of holding a diversified portfolio, and the limited wealth of most investors. Therefore, it is more likely that stock splits increase the number of shareholders since more individual (small) investors are attracted by lower prices following the splits.

According to Merton's model, one would expect that firms whose owners are primarily individual investors are more concerned with the trading range issue in order to expand their investor base further by keeping their prices low. Conversely, large, well-known and widely-held firms are expected to care little about an optimal trading range since these firms already have a large investor base. Generally, a high percentage of this latter type of companies' stocks belong to institutional and wealthy investors, indicating that changes in the relatively larger investor base of these firms are not expected to have a significant effect on the firm's market value. Thus, for large firms, investors place more importance on greater liquidity and low transaction costs and these factors allow their stocks to be traded at higher price levels. Dyl and Elliott empirically show that the above argument holds for US firms. Specifically, they show that small firms and firms whose owners are primarily small investors prefer lower share prices while larger firms and firms whose owners are primarily institutional investors prefer higher share prices.

This study presents a structured analysis of stock splits executed by Turkish companies. First, the liquidity effect of the split decision is analyzed. Second, the optimal trading range for the sample firms is determined. Finally, the study attempts to determine whether or not Turkish firms whose share prices rise above their optimal trading range are more likely to split their stock.

3.2 Liquidity and Stock Splits

The trading range hypothesis assumes that stocks whose prices are within the optimal range would have lower brokerage fees as a percent of value traded and so, these stocks would be more liquid compared to those that trade outside their optimal trading range. Prior to a stock split decision, there is an implicit trade-off between the diversification benefits which are valued more by small, individual investors and the lower transaction costs of round lot trading which are valued more by large institutional investors. Copeland (1979) argues that small investors can economize on odd-lots by forming investment clubs or by investing in mutual funds; therefore, lower share prices are not a necessity for small investors. Also, Copeland observes that a significant fraction of trading activity results from round-lot trading in the financial markets all over the world. Thus, attracting small investors is not necessarily an incentive for managers who decide to split their company's stock. Finally, he argues that if the price of a security becomes exceptionally high, then the market would oblige by making a smaller number of shares a round lot. Similar to the idea presented by the trading range hypothesis, the marketability hypothesis also states that the number of shareholders increases following stock splits and this indicates a higher trading volume which in turn indicates lower bid-ask spreads and thus higher liquidity. Copeland brings a counter argument to this hypothesis by stating that the number of shareholders is not the sole determinant of the trading volume in a stock. The arguments and counterarguments about the level of liquidity during the post-split

period indicate that the liquidity effect of splits is still an empirical question to be answered.

In order to examine the liquidity effects of stock splits on Turkish stocks, the widely accepted methodology of Copeland (1979) is utilized in this study. Specifically, the volume of trading is taken as a measure of pre- and post-split liquidity.

Copeland develops a Finite Adjustment Time Series Model (FTSM) in which he models the trading volume of a stock as a function of the stock's past volume and the market's contemporaneous and lagged overall volume in the following manner:

$$Vol_{j,t} = a_0 + \beta_1 Vol_{m,t} + \beta_2 Vol_{m,t-1} + \beta_3 Vol_{j,t-1} + e_{j,t} \quad (1)$$

In this model, the dependent variable $Vol_{j,t}$ is the trading volume of firm j at time t, $Vol_{m,t}$ is the contemporaneous market volume, $Vol_{m,t-1}$ and $Vol_{j,t-1}$ are the lagged trading volume of the market and the lagged trading volume of the company, respectively.

In the FTSM, trading volume for a company in time t is dependent upon the trading volume in the market at time t, the lagged trading volume of the market and the lagged trading volume of the firm. β_1 shows the effect of the contemporaneous market volume when everything else is held constant. In other words, keeping the other variables constant, if the trading volume in the market at time t changes by one unit, the trading volume of firm j at time t is expected to change by β_1 units. Similarly, the marginal contributions of the lagged trading volume of the market and the lagged trading volume of the firm on the trading volume of firm j at time t are measured by β_2 and β_3 , respectively. The constant

term a_0 is a proxy for the expected value of the effect of unobservable variables that also affect the trading volume of firm j at time t. The residual, $e_{j,t}$, represents the variation in $Vol_{j,t}$ that cannot be explained by the model.

In order to determine whether there is a change in trading volume on a before- and after-split basis, dummy variables are added to Copeland's original FTSM model. The model to be estimated is the following:

$$Vol_{j,t} = a_0 + \beta_1 Vol_{m,t} + \beta_2 Vol_{m,t-1} + \beta_3 Vol_{j,t-1} + \beta_4 Split + \beta_5 Split.Vol_{m,t} + \beta_6 Split.Vol_{m,t-1} + \beta_7 Split.Vol_{j,t-1} + e_{j,t} \quad (2)$$

In the above equation, the dependent variable $Vol_{j,t}$ is the logarithm of the weekly trading volume of firm j at time t, $Vol_{m,t}$ is the logarithm of the weekly contemporaneous market volume, $Vol_{m,t-1}$ and $Vol_{j,t-1}$ are the logarithms of the weekly lagged trading volume of the market and the weekly lagged trading volume of the company, respectively. "Split" is a dummy (binary) variable with a value of 1 for post-split periods and a value of 0 for pre-split periods. The dummy variable "Split" is multiplied with each of the independent variables in order to capture the change in the parameters on a before- and after-split basis. In this setting, the interactive dummy variables $Split.Vol_{m,t}$, $Split.Vol_{m,t-1}$ and $Split.Vol_{j,t-1}$ are used to examine if the relationships between the trading volume of a stock at time t and contemporaneous market volume and lagged trading volume of the market and the lagged trading volume of the company change after the split.

The estimated relationships for the before- and after-split periods are as follows:

$$\text{Before: } E(Vol_{j,t}) = \hat{a}_0 + \hat{\beta}_1 Vol_{m,t} + \hat{\beta}_2 Vol_{m,t-1} + \hat{\beta}_3 Vol_{j,t-1} \quad (3)$$

$$\text{After: } E(Vol_{j,t}) = (a_0 + \hat{\beta}_4) + (\hat{\beta}_1 + \hat{\beta}_5) Vol_{m,t} + (\hat{\beta}_2 + \hat{\beta}_6) Vol_{m,t-1}$$

$$+(\hat{\beta}_3 + \hat{\beta}_7)Vol_{j,t-1} \quad (4)$$

As can be seen from equations (3) and (4), β_4 measures the difference in the intercept for the post-split period. Similarly β_5, β_6 and β_7 measure the differences in the slope coefficients on a before- and after-split basis. The following hypotheses are tested to compare the volume relationship of splitting stocks on a pre- and post-split basis:

$H_0(a)$: The intercept term does not change after the split ($\beta_4=0$)

H_0 (β_i) : The coefficients of $Vol_{m,t}$, $Vol_{m,t-1}$ and $Vol_{j,t-1}$ do not change after the split ($\beta_5= \beta_6= \beta_7=0$)

These null hypotheses state that there is no change in the trading behavior of the split-up securities. If the hypotheses cannot be rejected, this would indicate that stock splits do not have an effect on the trading volume and, thus, on the liquidity of the splitting stocks. Theoretically, the trading range hypothesis expects these estimates to be positive and significant indicating higher post-split liquidity for splitting stocks.

3.3 Firm Characteristics and Share Prices

As discussed earlier**,** Merton's (1987) model of capital market equilibrium assumes that investors trade in securities that they know about. This argument implies that the number of potential investors who are aware of the firm may be an important determinant of firm value. Moreover, small firms are more likely to care about making their stocks known to public. Therefore, as pointed out by Dyl and Elliott (2000), it makes sense to test the hypothesis that relatively lower stock

values are characteristics of small firms and firms with a limited investor base and higher share prices are characteristics of large firms and firms with a large investor base.

In order to test whether this argument holds for the Turkish stock market, following Dyl and Elliott, a regression model is estimated where the stock price is modeled as a function of firm size and investor base:

$$SharePrice_{j,t} = b_0 + b_1 TotalAssets_{j,t} + b_2\ Public_{j,t} + e_{j,t} \qquad (5)$$

The dependent variable, $SharePrice_{j,t}$, is the average price per share of firm j's common stock during year t, measured as the average of its monthly closing prices.

The first independent variable, $TotalAssets_{j,t}$, is the logarithm of the book value of firm j's assets at the end of the year t. This variable represents firm size.

The null and alternative hypotheses to be tested about this variable are the following:

H_0 (b_1) : Firm size has no significant effect on share prices ($b_1=0$)

H_a (b_1) : Firm size has a significant effect on share prices ($b_1 \neq 0$)

Theory predicts that the coefficient on firm size (b_1) should be positive and significant indicating that larger firms are expected to have higher share prices and vice versa. The expectation of a positive b_1 is based on Merton's argument regarding the relationship between firm size and stock price.

The second independent variable, $Public_{j,t,}$ is the percentage of the firm j's shares that is publicly held during year t. This variable is a proxy for the investor base of the company. The logic behind selecting this proxy is that, for a given firm size, the larger the percentage of publicly traded ownership, the larger the investor

base is expected to be. Thus, the null and alternative hypotheses regarding this variable are the following:

H_0 (b_2) : Investor base has no significant effect on share prices ($b_2=0$)

H_a (b_2) : Investor base has a significant effect on share prices ($b_2 \neq 0$)

Theoretically, b_2 is also expected to be positive and significant implying that a larger investor base is associated with higher prices, again on the basis of Merton's argument.[10]

3.4 Share Prices and Stock Splits

The trading range hypothesis states that firms split their stocks in order to keep their prices within an optimal trading range. In this study, the optimal trading range is defined in terms of firm size and ownership characteristics. Dyl and Elliott(2000) empirically show that lower trading ranges are preferred by firms owned by the so-called "small" investors (individual investors) and higher prices are preferred by large firms and firms with mostly institutional owners. In addition, as a result of the decreasing effect of splits on stock prices, it is expected that firms whose share prices rise above their optimal trading range are presumably more likely to split their stocks compared to firms whose share prices remain at or below the optimal trading range. This issue is investigated by testing whether firms whose share prices rise above their optimal trade range have a

[10] Dyl and Elliott also include one more independent variable to represent the percentage of the firm owned by institutional investors during year t. However, institutional ownership information is not available for Turkish firms. Moreover, excluding this variable from the model is not expected to dramatically alter the results to be obtained and the power of the test because this is an alternative measure of the firm's ownership structure and differences in ownership structure are already accounted for by the Public $_{j,t}$ variable in the model.

greater probability to split their stock compared to firms whose share prices are not "too high".

The propensity of firms to split their stock is examined by estimating the following logit model presented by Dyl and Elliott (2000):

$$StockSplit_{j,T} = F(\ \beta_0 + \beta_1 TradeRange_{j,t} + \beta_2\ StockApprec_{j,t} + \beta_3\ InvBase_{j,t} + \beta_4\ Cash_{j,t}\ ) \quad (6)$$

In this model, $StockSplit_{j,T}$ represents the probability that firm j will split its stock during time period T. This is a binary variable with a value of 1 if firm j splits its stock during time interval T and 0 otherwise. F is the cumulative density function with four variables: $TradeRange_{j,t}$ represents the location of firm j's share price in year t relative to the stock's predicted optimal trading range. This measure provides an indication of whether or not the price of the stock is "too high". $StockApprec_{j,t,}$ measures the proportionate increase in the firm's stock price over the two years preceding year t. This variable is included in the model to capture the effect of a linear trend inherent in the stock price of a firm prior to the split year. $InvBase_{j,t}$ is a binary variable based on the relative size of the firm's investor base in year t. Finally, $Cash_{j,t}$ represents the amount of cash holdings relative to total assets. When firms are low in their cash holdings, they may find it difficult or even impossible to declare cash dividends. At the same time, these same firms may wish to distribute dividends to their investors. In such cases, distributing stock dividends may be a viable alternative for these firms. Therefore, when cash holdings are relatively low to prohibit the declaration of cash dividends, the probability of the firm to issue stock dividends is expected to increase.

The first independent variable, $TradeRange_{j,t,}$ is calculated as the ratio of the firm's actual share price in year t to its expected share price, given the total assets and investor base for the firm:

$$TradeRange_{j,t} = SharePrice_{j,t} / E\ (SharePrice_{j,t} \mid TotalAssets_{j,t}, Public_{j,t}) \quad (7)$$

In this equation, $E\ (SharePrice_{j,t})$ is the predicted share price based on the regression model estimated in equation 5:

$$E(SharePrice_{j,t}) = \hat{b}_0 + \hat{b}_1 TotalAssets_{j,t} + \hat{b}_2 Public_{j,t} \quad (8)$$

For the variable $TradeRange_{j,t}$, a value greater than 1 suggests that firm j's share price is "too high", given the firm's size and investor base, and a value less than or equal to 1 indicates that the firm's share price is below or close to its optimum trading range.

The second independent variable, $StockApprec_{j,t}$ represents the proportional increase in the j^{th} firm's split-adjusted average stock price over the two years ending with the estimation year. This independent variable is computed as follows:

$$StockApprec_{j,t} = SharePrice_{j,t} / SharePrice_{j,t-2} \quad (9)$$

Share price appreciation is included in the model as an explanatory variable in order to control for the fact that in most studies increase in the split stock's price in excess of the market is found to begin up to five years prior to the announcement of the stock split. A pre-existing upward trend in the stock price, which could be a motivation for a stock split is accounted for by including this variable in the model.

The third independent variable, $InvBase_{j,t}$, is a binary variable created by ranking all firms in descending order on the basis of the percentage of their

publicly-held ownership. The percentage of ownership open to public is used as a proxy for the number of shareholders. The logic behind selecting this proxy is that, for a given firm size, the larger the percentage of publicly traded ownership, the larger the investor base is expected to be. $InvBase_{j,t}$ has a value of 1 when the percentage of publicly held ownership is in the top five percent, otherwise it is equal to 0. This variable is included since Merton's model implies that the size of the firm's investor base is not a concern for firms that already have a great many shareholders.

The last independent variable, $Cash_{j,t}$ is the ratio of firm j's cash holdings to the book value of total assets at time t. This variable is included to account for the fact that cash holdings may be an important determinant for Turkish firms' splits due to the existence of regulations about dividend policy. Up to 1995, firms were mandated to distribute cash dividends when the periodic net income was positive. In 1995, the changes in regulations made it possible for firms traded on the ISE to decide (subject to voting in the annual general meeting) whether or not to distribute cash dividends even if their periodic net income is positive. Moreover, if they decide to distribute dividends, they have opportunity to distribute stock dividends instead of cash dividends. However, the ratio of cash holdings is still important for firms to make a choice between cash and stock dividends. Generally, a firm with limited cash holdings is expected to avoid distributing dividends in form of cash. Thus, the coefficient estimate for cash holdings ratio (β_4) is expected to be negative.

The logit model in equation 6 is estimated to test the hypothesis that a firm whose share price in year t is above its predicted trading range is more likely to

split its stock. The theory predicts that the coefficient on $TradeRange_{j,t}$ (β_1) should be positive and significant indicating that a firm whose share price in year t is above its predicted trading range is more likely to split its stock compared to a firm whose share price is at or below its predicted trading range. The coefficient on $StockApprec_{j,t}$ (β_2) is also expected to be positive and significant since the theory predicts that firms are more likely to split their stock after a period of price appreciation when the stock values start exceeding the optimal range. Finally, regarding the investor base differentials, the theory predicts that firms with larger shareholder bases would be less likely to split since they do not need the price decreasing effect of splits to attract more investors. Thus, the coefficient on $InvBase_{j,t}$ (β_3) is expected to be negative and statistically significant.

The details of the analysis are as follows: The analysis starts by dividing the 1992-2002 period into eight two-year periods. These sub-periods are 1994-1995, 1995-1996, 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, and 2001-2002. For each two-year period, three variables are calculated for the year immediately preceding the given period. The first one is the ratio of actual price to expected price (which is the TradeRange variable). This variable indicates whether the stock price is too high or not. Second, the firms in the sample are ranked on the basis of their publicly held ownership and binary values of 1 or zero are assigned depending on whether the firm is in the top five percent or not. Third, the ratio of cash holdings to total assets is determined for each firm. In addition, Share Price Appreciation variable which shows how much the stock has increased in value over the two years preceding the analysis period is calculated for the two-year time window immediately preceding each two-year period.

For example, for the 95-96 period, analysis starts by taking the sample of all firms who executed a stock split between 1992 and 2002, with at least 24 months between the two consecutive splits for a given firm. From this sample, the split and non-split firms for the 1995-1996 period are determined. For each firm, the ratio of actual price to expected price is determined for 1994 and the TradeRange variable takes a value 1 if Actual Price/Expected Price exceeds 1 and 0 otherwise. Second, each firm's ranking on the basis of public ownership is determined for 1994 and the InvBase variable takes a value of 1 if the ranking is in the top five percent and 0 otherwise. Third, the ratio of cash holdings to total assets is determined for each firm. Finally, the amount of share price appreciation for the January 1993 to December 1994 period is calculated for each firm.

CHAPTER 4

ANALYSES AND RESULTS

4.1 Data and Descriptive Statistics

The initial sample of the study includes all firms listed on the Istanbul Stock Exchange who split their stock during the period from 1992 to 2002. The split information is gathered from ISE Companies yearbooks. This initial sample is composed of 740 split events executed by 263 firms. In this sample, there are 167 split events executed by 60 financial firms and 573 split events executed by 203 non-financial firms. The frequency of splits and the split factors in each year is analyzed to obtain preliminary insights about the nature of the stock split executions in Turkey. The findings are summarized in Tables 1, 2, 3 and 4.

Table 1 shows the number and percentage of splitting firms in each year from 1992 to 2002 among all firms listed on ISE national market. Parts A, B and C represent non-financial, financial and all firms in national market, respectively. The first column in each part (NM) shows the number of firms listed

on national market for each category. The column "Split" shows the number of firms that executed a split in the given year and the third column (%) shows the percentage of splitting firms. Analysis of this table indicates that the percentage of splitting firms is more stable for non-financial firms compared to financial ones. For non-financial firms, the percentage of splitting firms which is around 20%s up to 1996 jumps to 30%s after year 1996 and do not fall to previous levels in the following years. A plausible explanation for this increase might be that there is an important regulatory change in the dividend policy of Turkey which has taken place in 1995. Up to 1994, firms which are subject to Capital Market Law in Turkey are required to pay a certain percentage of their profit as cash dividends. It was not legally possible to make payments to employees or keeping it as retained earnings without paying this compulsory dividend, known as "first dividend". However, the changes in dividend policy in 1995 granted flexibility for corporations that are traded at ISE. With the change, the "first dividend" is no longer compulsory for these corporations. Thus the initiative of the managers gained more importance. After the change, the ISE corporations which decide to distribute "first dividend" have three main choices for their dividend policy provided that the selected alternative is accepted in the annual general meeting. First, all of the "first dividend" can be distributed in cash. Second, all of the first dividend can be distributed as stock dividends. Third, part of the first dividend can be distributed in cash and part of it can be distributed as stock dividends. Alternatively, the corporation can retain the entire "first dividend" without paying it in cash or stock dividends. The corporation can retain the leftover amount even it chooses to distribute a certain percentage as "first dividend". Thus both bonus

issues and stock dividends in Turkey are expected to gain more importance after this regulatory change as alternatives for cash dividend payments. The increase in percentage of splitting firms after 1995 for non-financial firms supports this expectation however no such behavior is observed for financial firms. This difference may be attributable to differences in regulatory requirements between financial and non-financial firms. For instance, financial leasing companies are prohibited to increase their capital through bonus issues by using revaluation fund created for the assets used for leasing. Another strict regulation is applied to banks which are permitted to declare stock dividends only if they issue new shares for cash by the amount of conversion. A detailed analysis of these differences between financial and non-financial firms is beyond the scope of this thesis study and requires an empirical research which will take into account the differences in cash dividend and bonus issue distributions following the regulatory change which took place in 1995 as well as other differences concerning dividend policies.

Table 2 summarizes the means of splits factors and the associated standard deviations for each year from 1992 to 2002 among all firms listed on ISE national market. Parts A, B and C represent non-financial, financial and all firms in national market, respectively. The first column in each part (SF) shows the mean value of the split factors for the given year executed by the firms of the given category. The second column represents standard deviation. Split factor (SF) is defined as the total number of shares of stock an individual would own after the split for each pre-split share. A split factor 2, for example, implies a 2 for 1 (100%) stock split and a split factor 1.25 represents a 5 for 4 (25%) split. An analysis of Table 2 indicates that for non-financial firms the standard deviation values are

very high compared to mean values. Thus, making a suggestion depending on the split factors from this table would be misleading. Alternatively, Table 4 summarizes the means of splits factors and the associated standard deviations for each year from 1992 to 2002 for the non-financial firms listed on ISE national market after the outsiders are excluded. A stock split greater than or equal to 900% is excluded as an outsider. The exclusion procedure is only applied to non-financial firms since only one split of financial firms is greater than 900% and a high standard deviation is not a problem for financial firms. When the splits executed by non-financial firms in the initial sample are analyzed, it is seen that some firms tend to execute splits with very high split factors and low split factors are really rare events for Turkish firms so no lower limit is determined while detecting outliers. Analysis of Table 2 and 3 indicates that the mean split factor for non-financial firms have increased slightly through 1992 to 2002. There is no such trend for financial firms. Another interesting observation is that the mean split factor for financial firms is usually lower than the mean split factors of non-financial firms even after the outsiders are excluded. This is one indication that the stock splits of non-financial firms may target a lower price range that will attract the small investors.

Table 4 contains additional descriptive statistics about stock splits executed by non-financial firms listed on the ISE national market from 1992 to 2002. The number and percentage of splits that fall into different categories of split factors are illustrated. This table shows that split factors lower than 1.25 are rarely used by Turkish firms. Most commonly, firms prefer split factors ranging from 1.25 to 3. Nearly 74% of stock splits fall into this category. Finally, it can be seen that,

contrary to very low split factors, high split factors are not rare events for splitting firms since 20.11% of the splits in the sample have a split factor greater than 3.

In the second part of the analysis, the liquidity effects of the split decision on Turkish stocks are examined. The sample for this part includes those non-financial firms listed on the ISE national market who executed only one stock split during the period from 1992 to 2002. In this analysis, financial firms are excluded since it is expected that the characteristics of trading may differ between financial firms and other firms. There are 50 non-financial firms with only one split during this period. The trading volume information is obtained from the databases maintained by the ISE.

In the third stage, the relationship between firm characteristics and share prices is analyzed. The sample for this part includes those non-financial firms that executed at least one split during the 1992-2002 period provided that there are at least 24 months between the two consecutive splits for a given firm. After the 24 month filter is applied, the sample includes 192 split executions by 141 non-financial firms. 14 splits are excluded due to the fact that the executing firm is not listed on the ISE national market at the time of the split. Splits of five other firms are also excluded due to either the lack of balance sheet information, or having more than one type of share quoted in the market or inconsistency of balance sheet time with other firms. Therefore, the final sample for this part of the study is composed of 124 non-financial firms who have altogether executed 170 splits during the 1992-2002 period. Monthly closing prices of each stock are obtained from the ISE database. All stock prices in this study are adjusted for splits, dividend issues, bonus issues and rights issues. Year-end total assets are collected

from the balance sheets provided on the official website of the ISE. Finally, the information on the percentage of a firm's shares that is publicly held in a given year is obtained from the ISE.

In the final part of the analysis, the 124-firm sample from the previous part is used again. Among the 170 split events of 124 firms, the number of splits for each year is given in Table 5. The expected share price calculations for this part are based on the results obtained in the second part of the study. The cash holdings of each firm are collected from the balance sheets provided at the official website of the ISE.

4.2 Results about the Liquidity Effects of Splits

The trading range hypothesis assumes that it is improved liquidity that characterizes a price range as optimum. In order to build up a background about the validity of the trading range considerations for Turkish firms, liquidity effects of the split decisions on Turkish stocks is the starting point of this study. While investigating whether or not stock splits enhance the liquidity of Turkish common stocks that undergo a stock split, the methodology of Copeland (1979) is utilized such that the volume of trading is taken as a measure of pre-and post-split liquidity. According to the Finite Adjustment Time Series Model (FTSM) of Copeland, the trading volume of a stock is a function of the stocks' past volume and the market's contemporaneous and lagged overall volume. The long-run effects of stock splits on trading volume relationship is analyzed by including a dummy variable which takes the value of 1 for post-split periods and 0 otherwise.

The results for the liquidity effects of splits obtained for 50 non-financial firms that executed only one stock split during the interval 1992-2002 are summarized in Table 6. The results indicate that Copeland's FTSM model is a good proxy for estimating the volume of a given firm at a given time for Turkish stock market. The adjusted R^2 is 0.9247 indicating that 92.47 percent of the variation in weekly volume for a firm's stock at time t is accounted for by the contemporaneous market volume, the lagged trading volume of the market and the lagged trading volume of the company. Thus the explanatory power of the estimated regression equation is extremely high. The F statistics is also very high (25943.1) indicating that overall the model is significant.

The intercept term (a_0) is negative and significant at the 0.05 level indicating that the unobservable variables have a negative effect on trading volume. The coefficient estimate for contemporaneous market volume (β_1) is positive and significant indicating that an increase in the overall market volume also increases the trading volume of the company. This finding is expected since the overall economic condition in the market which positively affects the market volume is also expected to affect each firm positively. The coefficient estimate for lagged trading volume of the market (β_2) is negative and significant indicating that high levels of lagged trading volume in the market will result in a lower contemporaneous trading volume for a given firm. This finding may be explained by a possible continuous error correction mechanism. As new information about all stocks enters market each week the investors might be reexamining whether they have overreacted or under-reacted to last week's information. This kind of a correction mechanism may explain the negativity of β_2 since lagged and

contemporaneous volumes of trading are inversely related in such a setting. The coefficient estimate for lagged trading volume of the company (β_3) is positive and significant meaning that the marginal contribution of the lagged trading volume is positive for each firm. This finding can be interpreted by how the investors perceive the firm, if investors believe that trading in a certain firm's stock is profitable then this belief is most probably supported by the fact that the lagged trading volume for the shares of that company is high.

The long run effects of splits on the liquidity of a stock is analyzed by using the coefficient estimates of the dummy and interactive dummy variables which take the value of 0 for pre-split periods and 1 for the after split periods. The coefficient estimate for the dummy variable (β_4) is insignificant indicating that there is no difference in the intercept term between pre-and post split periods. Thus, the effect of unobservable variables on trading volume remains unchanged. The coefficient estimate for the interactive dummy variable obtained by multiplying the dummy variable with contemporaneous market volume (β_5) is insignificant indicating that the relationship between the volume of a stock at time t and the contemporaneous market volume remains unchanged after the split. Similarly the coefficient estimate for the second interactive dummy variable which was created to analyze if the relationship between trading volume and lagged market volume changes after the split is also insignificant. Therefore, the null hypotheses which state that the intercept term, coefficient estimates for contemporaneous market volume and lagged trading volume of the market do not change after split cannot be rejected. The only significant change in the volume relationship after split takes place in the coefficient estimate for the lagged trading

volume of the company. The coefficient estimate for the interactive dummy variable obtained by multiplying the dummy variable with lagged trading volume of the company (β_7) is negative and significant indicating that the relationship between volume of a stock at time t and lagged trading volume of the company changes after split. Specifically, the marginal effect of the lagged trading volume of the company on trading volume (thus on the liquidity) is lower in split up stocks compared to non-splitting ones indicating lower for post-split liquidity for the splitting stocks. This finding may be attributed to the information content of splits. While discussing the positive effects of the lagged company volume on contemporaneous volume, it is argued that the information concerning higher lagged trading volume for a company might be interpreted by investors such that trading in that tock is profitable. As new information concerning splits enter market with the execution of a stock split, the positive effect of the lagged trading volume of the company might be diminished.

To summarize, the results given in Table 6 do not seem to support the enhanced liquidity assumption of the trading range hypothesis since only β_7 is significantly different from zero. Moreover, the estimate for β_7 is negative which shows that the trading volume of a stock thus the liquidity is lower for the after split period. Finally, it is concluded that the liquidity decreases after splits and the only change in the volume relationship in the post-split period is that the positive effect of the lagged trading volume of a company on contemporaneous volume of that firm is diminished by the amount of β_7. The null hypotheses regarding the intercept term, contemporaneous market volume, and the lagged trading volume of

the market cannot be rejected since β_4, β_5, and β_6 are not significantly different from zero.

4.3 Results for Share Prices and Firm Characteristics

According to Merton's (1987) model of capital market equilibrium with incomplete information, investors prefer to trade in securities that they know about. In this setting, small firms and firms whose owners are primarily individual investors are more likely to be concerned with the trading range issue since they may want to increase their investor base further by keeping their prices low. Thus, the optimal trading price range for a firm may be modeled as a function of firm size and investor base. Dyl and Elliott (2000) empirically show that Merton's argument holds for US firms such that relatively lower stocks values are associated with small firms and firms with a limited investor base. Conversely, higher share prices are found to be associated with large firms and firms with a large investor base. The findings presented in this part of the study determine whether this argument holds for the Turkish stock market. The results of the regression analysis regarding share prices are summarized in Table 7. This table shows the coefficient estimates of the share price regression with the independent variables of firm size and investor base. Firm size is represented by the logarithm of the year-end book value of a firm's assets. The investor base of the company is proxied by the percentage of publicly held ownership. The dependent variable is the average price per share of a firm's common stock during a given year, measured as the yearly average of its monthly closing prices. The numbers in parentheses are p values and

* denotes statistical significance at the 0.05 level. The annual cross-sectional regression results show that the model utilized in this study to determine the share prices for firms traded in the Istanbul Stock Exchange is incapable of explaining the variation in share prices when the regression is run independently for each year. The adjusted R^2 values vary between -0.0480 and 0.0278 and the F values are generally insignificant even at the 0.10 level. There is a slight improvement in the explanatory power of the model from 1992 to 2000 as the number of firms in the analysis sample increase by time.

The intercept term (b_0) is statistically insignificant for all years. The coefficient for the logarithm of the total assets (b_1) is always positive and it is only significant in the year 2000. The coefficient for publicly held ownership (b_2) is statistically insignificant for all years from 1992 to 2000.

To put it briefly, analysis of Table 7 indicates that, it would be impossible to use the results of these cross-sectional annual regression results in the logit model since the results are found to be insignificant. Alternatively, a statistically meaningful relationship is investigated by estimating the regression model for the whole period from 1992 to 2002. The results of this regression are shown in Table 8. According to this table, the adjusted R^2 is 0.1744 indicating that 17.44 percent of the variation in the share price of a firm at a given time is accounted for by the variation in the total assets of the company and the public ownership percentage of that firm. The F value (100.62) and overall p-value (<0.0001) of the model also show that the regression equation is statistically significant.

The intercept term (b_0) is -16695 and significant indicating that the unobservable variables that affect the share price of a firm have a negative effect

on the share price. The coefficient on firm size (b_1) is positive and significant, a finding consistent with the hypothesis that larger, well-known firms have higher share prices and vice versa. The coefficient on publicly held ownership (b_2) is statistically insignificant. While interpreting this result, care should be taken because the insignificance of b_2 may not indicate that the investor base variable has no significant effect on share prices. In the methodology section of the study, the percentage of publicly held ownership for a firm is used as a proxy for the investor base of that firm assuming that a higher percentage of publicly held ownership would be associated with a larger investor base. A plausible explanation for the insignificance is that publicly held ownership may not be a good proxy for the investor base of the company. The inadequacy of this proxy may come from the fact that a firm may have a 100% public ownership and yet its shares may be held by a small number of investors. In that case, the assumption utilized in the methodology section indicating that larger percentages of publicly held ownership are associated with a larger investor base is questionable.

To summarize, when the regression results obtained for the whole period is analyzed, firm size is found to have a positive effect on share prices. This result is consistent with Merton's argument regarding firm size and is also consistent with the findings of Dyl and Elliott who have shown that larger firm sizes are associated with higher share prices in the US market. However, the study cannot draw strong conclusions about the relationship between investor base and the share price of a firm since the information about the number of shareholders is not publicly available in Turkey and the alternative measure of publicly held

ownership utilized in this study as a proxy for investor base does not seem to be a good proxy.

4.4 Results about Share Prices and Stock Splits

The optimum trading range hypothesis implies that lower trading ranges would be preferred by smaller firms with limited investor bases, and higher prices would be preferred by large, well-known firms and firms with large investor bases[11]. Since stock splits decrease the stock price by the split factor, it is expected that firms whose share prices rise above their optimal trading range are more likely to split their stocks compared to ones whose share prices are at or below their optimal trading range. This part of the study investigates this issue for the Turkish stock market by testing whether Turkish firms whose share prices rise above their optimal trade range have a higher probability to split their stock compared to firms whose share prices are not "too high." This question is investigated by estimating a logit model similar to the one suggested by Dyl and Elliot. In this model the probability that a firm will split its stock is a function of four factors: the location of that firm's share price in a given year relative to its predicted optimal trading price range, the proportional increase in the average split-adjusted stock price over the last two years, the size of the investor base and the ratio of cash holdings to total assets. The optimum trading range for each firm is determined by using the regression equation results obtained from the previous stage of the study where the

[11] Dyl and Elliott (2000) empirically show that this idea holds for the US market. In section 4.2 of this study, it is also shown that the positive relationship between firm size and share prices is valid for the Turkish stock market. However, no meaningful relationship between investor base and share price could be detected due to the inefficiency of publicly held ownership as a proxy for investor base.

relationship between firm characteristics and share prices is analyzed. Specifically, the coefficient estimates presented in Table 8 are used to determine the expected share price for each firm. The coefficient estimates obtained for the whole period are utilized in determination of share prices instead of the estimates from the yearly regression results due to the low overall statistical significance levels observed for the yearly regression results.

The analysis is conducted for eight two-year periods. These sub-periods are 1994-1995, 1995-1996, 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, and 2001-2002. For each two-year period, the ratio of actual price to expected price, the investor base, and the ratio of cash holdings to total assets for each firm are calculated for the year immediately preceding the given period. In addition, share price appreciation variable which shows how much the stock has increased in value over the two years preceding the analysis period is calculated for the two-year time window immediately preceding each two-year period.

For example, while analyzing the 1995-1996 period, the split and non-split firms for the 1995-1996 period are determined among the sample of all firms who executed a stock split between 1992 and 2002, with at least 24 months between the two consecutive splits for a given firm. Then, the ratio of actual price to expected price, the percentage of public ownership, and the ratio of cash holdings to total assets are determined for 1994 for each firm. The TradeRange variable takes a value 1 if Actual Price/Expected Price exceeds 1 and 0 otherwise. Finally, the amount of share price appreciation for the January 1993 to December 1994 period is calculated for each firm.

Two alternative logit models are estimated in this study. In Model 1, the actual versus predicted price comparison is done by defining a binary variable which takes the value of 1 if the ratio of the actual stock price to the predicted price in a given year is greater than one and 0 otherwise. Thus, Model 1 investigates whether or not the firms whose share prices exceed their optimum trading ranges are more likely to split. Alternatively, in Model 2, the ratio of the actual stock price to the predicted price is used in its level form without transforming it into a binary variable. Therefore, the second version of the model investigates whether or not the probability of split changes for firms whose share prices are somewhat higher (lower) than their predicted prices as compared to firms whose share prices are significantly higher (lower) than their predicted prices.

The results obtained for the first logit model are summarized in Tables 9 and 10. An examination of these tables reveals that nearly all coefficient estimates are insignificant. The estimate for the intercept (β_0) is only significant for periods 1995-1996, 1996-1997 and 1999-2000 and these significant values are all negative. This means that the unobservable variables which affect the split probability exert a negative impact for these sub-periods.

The coefficient estimate for the binary trading range variable (β_1) is negative and significant in the last period and always insignificant in other periods. Similarly the coefficient estimates for the stock price appreciation (β_2) and relative cash holdings (β_4) are only significant during the 2001-2002 period. In that period, (β_2) is negative and (β_4) is positive. The coefficient estimate for investor base (β_3) is insignificant in all periods.

These significant results are somewhat unexpected since the theory predicts that a firm whose share price rises above the optimum trading range is more likely to split. Thus, the coefficient on the trading range variable (β_1) is expected to be positive contrary to the findings of this study for the 2001-2002 period. Similarly, theory also predicts that the coefficient of stock price appreciation (β_2) should be positive since previous empirical studies show that splits generally take place after a period of price appreciation. The theoretical expectations about (β_1) and (β_2) are not mutually exclusive since an increase in share prices indicates that the share is more likely to exceed the appropriate trading range. Theoretically, firms with larger shareholder bases are expected to be less likely to split since they do not need the price-decreasing effect of splits to attract more investors. Thus, the coefficient of the investor base proxy (β_3) is expected to be negative and statistically significant. The insignificance of the coefficient estimate for investor base proxy (β_3) can be explained by the inefficiency of public ownership variable as a proxy for the investor base of a company. Finally, the positive and significant coefficient estimate of the cash holdings to total assets ratio (β_4) during the 2001-2002 period also contradicts with the theoretical expectation of a negative β_4. The logic behind the a priori expectation for β_4 to be negative is that firms whose cash holdings are limited would be more likely to prefer distributing stock dividends instead of cash dividends.

Similar results are obtained for Model 2. Results for Model 2 are summarized in Tables 11 and 12. The only difference between the results for the two models is that the coefficient of stock appreciation (β_2) becomes statistically

insignificant for all years when the ratio of actual price to predicted price is used in its level form instead of transforming it to a binary variable.

To summarize, the coefficient estimates of explanatory variables are generally found to be insignificant both in Model 1 and Model 2. Moreover, it should be noted that the few significant results that are presented do not really offer statistical findings that are in contradiction with the theoretical expectations. Since the vast majority of the estimates are insignificant, the few significant results do not really provide any evidence, and, therefore, they can be characterized as sporadic at best. Thus, the study fails to provide empirical support for the validity of the trading range hypothesis for the Turkish stock market. However, it would be misleading to conclude that trading range consideration is not a consideration for Turkish firms executing stock splits since improvements in the model may provide conclusions with much better statistical properties.

Table 1: Frequency of Stock Splits in Turkey

	A Non-Financial			B Financial			C Total		
Years	NM	Split	%	NM	Split	%	NM	Split	%
1992	125	13	10.4	20	-	-	145	13	8.96
1993	136	22	22.53	24	-	-	160	22	13.75
1994	148	29	19.29	28	-	-	176	22	12.5
1995	154	34	22.08	39	8	20.51	193	42	21.76
1996	170	64	37.65	43	9	20.93	213	73	34.27
1997	194	65	33.51	50	14	28	244	79	32.38
1998	206	58	28.16	56	24	42.85	262	82	31.3
1999	193	69	30.56	63	21	33.33	256	90	35.16
2000	216	58	26.85	71	30	42.25	287	88	30.66
2001	211	65	30.51	68	27	39.7	279	92	32.98
2002	202	60	29.7	60	26	43.33	262	86	32.62

This table shows the number and percentage of splitting firms in each year from 1992 to 2002 among all firms listed on the ISE national market. Panels A, B and C represent non-financial, financial and all firms in the national market, respectively. The first column in each panel (NM) shows the number of firms listed on national market for each category. The column "Split" shows the number of firms that executed a split in a given year and the third column (%) shows the percentage of splitting firms in that year.

Table 2. Split Factors in Turkey

	A NonFinancial		B Financial		C Total	
Years	SF	St.Dev.	SF	St.Dev.	SF	St.Dev.
1992	1.72	0.349	-	-	1.72	0.349
1993	2.65	3.259	-	-	2.65	3.259
1994	2.45	3.168	-	-	2.45	3.168
1995	3.15	4.98	1.76	0.547	2.89	4.509
1996	2.78	2.403	2.39	1.452	2.73	2.302
1997	2.69	1.93	1.95	0.31	2.56	1.770
1998	2.97	2.259	2.15	1.003	2.73	2.004
1999	3.59	5.41	2.49	2.118	3.33	4.874
2000	4	6.61	2.29	0.87	3.42	5.437
2001	2.4	1.46	1.73	0.508	2.2	1.296
2002	4.68	14.47	1.61	0.679	3.75	12.148

This table summarizes the means of splits factors and the associated standard deviations for each year from 1992 to 2002 among all firms listed on ISE national market. Panels A, B and C represent non-financial, financial and all firms in national market, respectively. The first column in each panel (SF) shows the mean of the split factors for the given year executed by the firms of the given category. The second column represents standard deviation. Split factor (SF) is defined as the total number of shares of stock an individual would own after the split for each pre-split share. A split factor 2,for example, implies a 2 for 1 (100%) stock split and a split factor 1.25 represents a 5 for 4 (25%) split.

Table 3. Split Factors Excluding Outliers

Years	SF	St.Dev.
1992	1.72	0.349
1993	1.96	0.61
1994	1.88	0.79
1995	2.31	0.79
1996	2.42	1.36
1997	2.53	1.43
1998	2.67	1.57
1999	2.45	1.27
2000	2.81	1.68
2001	2.29	1.12
2002	2.83	1.89

This table summarizes the means of splits factors and the associated standard deviations for each year from 1992 to 2002 for non-financial firms listed on ISE national market after the outsiders are excluded. A stock split greater or equal to 900% is excluded as an outsider. The first column (SF) shows the mean of the split factors for the given year executed by non-financial firms. The second column represents standard deviation. Split factor (SF) is defined as the total number of shares of stock an individual would own after the split for each pre-split share. A split factor 2,for example, implies a 2 for 1 (100%) stock split and a split factor 1.25 represents a 5 for 4 (25%) split.

Table 4. Stock Split Characteristics for Non-Financial ISE Firms 1992-2002

	SF≤1.25		1.25< SF≤1.25		2< SF≤3		SF>3	
Years	Nbr.	%	Nbr.	%	Nbr.	%	Nbr.	%
1992	1	7.69	11	84.62	1	7.69	0	0.00
1993	0	0.00	18	81.82	2	9.09	2	9.09
1994	9	31.03	11	37.93	6	20.69	3	10.34
1995	1	2.94	16	47.06	11	32.35	6	17.65
1996	5	7.81	32	50.00	13	20.31	14	21.88
1997	1	1.54	40	61.54	11	16.92	13	20.00
1998	4	6.90	29	50.00	9	15.52	16	27.59
1999	2	2.90	35	50.72	19	27.54	13	18.84
2000	2	3.45	30	51.72	9	15.52	17	29.31
2001	3	4.62	36	55.38	18	27.69	8	12.31
2002	4	6.67	26	43.33	14	23.33	16	26.67
Total	32	5.96	284	52.89	113	21.04	108	20.11

This table contains descriptive statistics about stock splits executed by non-financial firms listed on ISE national market from 1992 to 2002. The number and percentage of splits that fall into different categories of split factors are illustrated. Split factor (SF) is defined as the total number of shares of stock an individual would own after the split for each pre-split share. A split factor 2,for example, implies a 2 for 1 (100%) stock split and a split factor 1.25 represents a 5 for 4 (25%) split.

Table 5. Sample Firms Splitting Their Stock

Period	Number of Split Firms	Percentage	Total Number of Firms
1994-1995	10	8.06	124
1995-1996	10	8.06	124
1996-1997	20	16.12	124
1997-1998	28	22.58	124
1998-1999	34	27.42	124
1999-2000	47	37.9	124
2000-2001	44	35.48	124
2001-2002	44	35.48	124

This table shows the distribution of stock splits by year for the sub-periods used for the logit estimation.

Table 6. Liquidity Effects of Stock Splits

Coefficients	Coefficient Estimates	P values
a_0	-0.35005	0.0028*
β_1	0.82021	<0.0001*
β_2	-0.74984	<0.0001*
β_3	0.92482	<0.0001*
β_4	0.13173	0.6596
β_5	-0.041	0.2535
β_6	0.04662	0.1974
β_7	-0.13173	0.0412*
Adj. R^2	0.9247	
F value	25943.1	
P value	<0.0001*	

This table reports the estimates of the following regression model obtained for the 1992-2000 period:

$$Vol_{j,t} = a_0 + \beta_1 Vol_{m,t} + \beta_2 Vol_{m,t-1} + \beta_3 Vol_{j,t-1} + \beta_4 Split + \beta_5 Split.Vol_{m,t} + \beta_6 Split.Vol_{m,t-1} + \beta_7 Split.Vol_{j,t-1} + e_{j,t}$$

In this model, the dependent variable $Vol_{j,t}$ is the logarithm of the weekly trading volume of firm j at time t, $Vol_{m,t}$ is the logarithm of the weekly contemporaneous market volume, $Vol_{m,t-1}$ and $Vol_{j,t-1}$ are the logarithms of the weekly lagged trading volume of the market and the lagged trading volume of the company, respectively. "Split" is a dummy variable which takes the value of 1 after the split and 0 before the split. "Split. $Vol_{m,t}$ ", "Split.$Vol_{m,t-1}$", "Split.$Vol_{j,t-1}$ " are interactive dummy variables created for each of the independent variables in the model. For the p values, * denotes significance at the 0.05 level.

Table 7. Share Prices and Firm Characteristics

Year	b_0	b_1	b_2	Adj. R^2	F-test	P-value
1992	22.95834 (0.7314)	0.50784 (0.9149)	0.13956 (0.6851)	-0.0480	0.08	0.919
1993	-206.1931 (0.3286)	21.38916 (0.1521)	0.88145 (0.3003)	0.0099	1.24	0.2973
1994	-421.3788 (0.2978)	39.34182 (0.1463)	1.99012 (0.2314)	0.0153	1.38	0.2614
1995	-572.8404 (0.4757)	64.62916 (0.2119)	2.52383 (0.3907)	-0.0027	0.91	0.4076
1996	-920.3740 (0.4377)	105.81647 (0.1503)	0.81016 (0.8512)	0.0021	1.09	0.3411
1997	-1695.79277 (0.4829)	211.93895 (0.14441)	-2.87514 (0.7355)	0.0071	1.35	0.2642
1998	-1383.62426 (0.7431)	205.85124 (0.4056)	10.74361 (0.4695)	-0.0093	0.52	0.5970
1999	-6689.45830 (0.22)	558.2481 (0.0738)	8.17169 (0.6709)	0.012	1.64	0.1985
2000	-17659 (0.1844)	1520.3514 (0.0426*)	-38.70003 (0.4123)	0.0278	2.62	0.0775

This table reports the parameter estimates for the following regression model for each year from 1992 to 2000:

$$SharePrice_{j,t} = b_0 + b_1\ TotalAssets_{j,t} + b_2\ Public_{j,t} + e_{j,t}$$

The dependent variable, $SharePrice_{j,t}$, is the average price per share of firm j's common stock during year t, measured as the average of its monthly closing prices. The first independent variable, $TotalAssets_{j,t}$, is the logarithm of the book value of firm j's assets at the end of the year t. This variable represents firm size. The second independent variable, $Public_{j,t,}$ is the percentage of the firm j's shares that is publicly held during year t. This variable is a proxy for the investor base of the company. The numbers in parenthesis are p values and * denotes significance at the 0.05 level.

Table 8. Share Prices and Firm Characteristics
1992-2002

Period	b_0	b_1	b_2	Adj. R^2	F-test	p-value
1992-2002	-16695 (<0.0001*)	1216.7075 (<0.0001*)	1.5298 (0.8627)	0.1744	100.62	<0.0001*

This table reports the parameter estimates for the following regression model for the period from 1992 to 2002:

$$SharePrice_{j,t} = b_0 + b_1\ TotalAssets_{j,t} + b_2\ Public_{j,t} + e_{j,t}$$

The dependent variable, $SharePrice_{j,t}$, is the average price per share of firm j's common stock during year t, measured as the average of its monthly closing prices. The first independent variable, $TotalAssets_{j,t}$, is the logarithm of the book value of firm j's assets at the end of the year t. This variable represents firm size. The second independent variable, $Public_{j,t,}$ is the percentage of the firm j's shares that is publicly held during year t. This variable is a proxy for the investor base of the company. The numbers in parenthesis are p values and * denotes significance at the 0.05 level.

Table 9. Results of Logit Model 1
(1994 – 1998)

	1994-1995	1995-1996	1996-1997	1997-1998
β_0	-1.137 (0.4057)	-1.7427 (0.0186**)	-2.384 (0.0009**)	-1.0038 (0.1286)
β_1	-91037 (0.9779)	0	1.5493 (0.3123)	0.8188 (0.3195)
β_2	-0.00385 (0.9761)	-0.0461 (0.4158)	0.2054 (0.1638)	-0.0443 (0.6784)
β_3	-0.0428 (0.3227)	0.0215 (0.2019)	0.0186 (0.2475)	-0.00527 (0.7120)
β_4	-16.2101 (0.5254)	1.2781 (0.7553)	0.3977 (0.9192)	5.0263 (0.1370)
Likelihood ratio	2.2770 (0.685)	2.5282 (0.4702)	4.1728 (0.3831)	3.1274 (0.5367)
Total #of Firms	48	50	66	80
# of Split. Firms	3	10	14	22

This table shows the results of the following logit model for years 1994 through 1998:

$StockSplit_{j,T} = F(\beta_0+\beta_1 TradeRange_{j,t}+\beta_2\ StockApprec_{j,t} + \beta_3\ InvBase_{j,t} + \beta_4\ Cash_{j,t})$

In this model, $StockSplit_{j,T}$ equals 1 if firm j has a stock split during time period T(where T=2 years), F is the logistic cumulative density function with four variables: $TradeRange_{j,t}$ is a binary variable which takes the value of 1 if the ratio of the actual stock price in year t to the predicted price from the regression reported in Table 8 is greater than 1 and 0 otherwise. $StockApprec_{j,t,}$ measures the proportionate increase in the firm's stock price over the two years preceding year t [=(closing price at 31 December of year t/ closing price at 31 January of year t-1)] . $InvBase_{j,t}$ is the percentage of publicly held ownership for a given firm. Finally, $Cash_{j,t}$ is the ratio of cash holdings to total assets at year t. β's are parameters of the model. The numbers in parentheses are p values and ** denotes significance at the 0.1 level.

Table 10. Results of Logit Model 1
(1998-2002)

	1998-1999	1999-2000	2000-2001	2001-2002
β_0	-0.2689 (0.6093)	-0.8535 (0.0620*)	-0.6536 (0.1755)	0.2234 (0.6904)
β_1	-0.7006 (0.2711)	-0.9755 (0.1197)	-0.1914 (0.7053)	-1.0043 (0.0259**)
β_2	-0.1019 (0.2341)	-0.0177 (0.9415)	0.0561 (0.6425)	-0.1871 (0.0832**)
β_3	0.00997 (0.3896)	0.0170 (0.1430)	-0.00473 (0.6717)	0.000686 (0.9531)
β_4	-0.6350 (0.8078)	-1.9898 (0.4409)	0.7759 (0.7133)	8.5034 (0.0049**)
Likelihood ratio	3.7380 (0.4426)	5.9083 (0.2061)	0.7768 (0.9415)	17.3651 (0.0016**)
Total # of Firms	88	97	106	100
# of Split Firms	35	34	36	45

This table shows the results of the following logit model for years 1998 through 2002:

$StockSplit_{j,T} = F(\beta_0+\beta_1 TradeRange_{j,t}+\beta_2\ StockApprec_{j,t} + \beta_3\ InvBase_{j,t} + \beta_4\ Cash_{j,t})$

In this model, $StockSplit_{j,T}$ equals 1 if firm j has a stock split during time period T(where T=2 years), F is the logistic cumulative density function with four variables: $TradeRange_{j,t}$ is a binary variable which takes the value of 1 if the ratio of the actual stock price in year t to the predicted price from the regression reported in Table 8 is greater than 1 and 0 otherwise. $StockApprec_{j,t,}$ measures the proportionate increase in the firm's stock price over the two years preceding year t [=(closing price at 31 December of year t/ closing price at 31 January of year t-1)] . $InvBase_{j,t}$ is the percentage of publicly held ownership for a given firm. Finally, $Cash_{j,t}$ is the ratio of cash holdings to total assets at year t. β's are parameters of the model. The numbers in parentheses are p values and ** denotes significance at the 0.1 level.

Table 11. Results of Logit Model 2
(1994-1998)

	1994-1995	1995-1996	1996-1997	1997-1998
β_0	-1.0379 (0.4567)	-1.3025 (0.1185)	-2.3429 (0.0010**)	-0.9372 (0.1485)
β_1	0.1300 (0.9116)	-77.3971 (0.3425)	-0.1706 (0.2756)	0.1013 (0.4656)
β_2	-0.011 (0.9346)	-0.0717 (0.3227)	0.1765 (0.2281)	-0.0482 (0.6498)
β_3	-0.0464 (0.2959)	0.0251 (0.1561)	0.0176 (0.2733)	-0.00527 (0.7092)
β_4	-17.2936 (0.5141)	2.3760 (0.5866)	1.5313 (0.6826)	4.8254 (0.1506)
Likelihood ratio	2.1340 (0.7111)	3.6938 (0.4490)	4.4297 (0.3510)	2.7484 (0.6008)
Total # of Firms	48	50	66	80
# of Split Firms	3	10	14	22

This table shows the results of the following logit model for years 1994 through 1998:

$StockSplit_{j,T} = F(\beta_0+\beta_1 TradeRange_{j,t}+\beta_2\ StockApprec_{j,t} + \beta_3\ InvBase_{j,t} + \beta_4\ Cash_{j,t})$

In this model, $StockSplit_{j,T}$ equals 1 if firm j has a stock split during time period T(where T=2 years), F is the logistic cumulative density function with four variables: $TradeRange_{j,t}$ is the ratio of the actual stock price in year t to the predicted price from the regression reported in Table 8. $StockApprec_{j,t,}$ measures the proportionate increase in the firm's stock price over the two years preceding year t [=(closing price at 31 December of year t/ closing price at 31 January of year t-1)] . $InvBase_{j,t}$ is the percentage of publicly held ownership for a given firm. Finally, $Cash_{j,t}$ is the ratio of cash holdings to total assets at year t. β's are parameters of the model. The numbers in parentheses are p values and ** denotes significance at the 0.1 level.

Table 12. Results of Logit Model 2
(1998-2002)

	1998-1999	1999-2000	2000-2001	2001-2002
β_0	-0.3692	-0.7902	-0.5341	0.1173
	(0.5049)	(0.1051)	(0.2865)	(0.8382)
β_1	-0.0197	-0.4925	-0.3224	-0.3597
	(0.9467)	(0.1705)	(0.3107)	(0.0475**)
β_2	-0.1013	0.00651	0.0599	-0.1363
	(0.2355)	(0.9784)	(0.6191)	(0.2269)
β_3	0.0103	0.0187	-0.00412	0.000624
	(0.3715)	(0.1092)	(0.7115)	(0.9573)
β_4	-0.8310	-1.6378	1.4746	9.1033
	(0.7460)	(0.5202)	(0.5083)	(0.0043**)
Likelihood ratio	2.4495	5.6651	2.1514	17.7744
	(0.6537)	(0.2256)	(0.7079)	(0.014**)
Total # of Firms	88	97	106	100
# of Split Firms	35	34	36	45

This table shows the results of the following logit model for years 1994 through 1998:

$StockSplit_{j,T} = F(\beta_0+\beta_1 TradeRange_{j,t}+\beta_2\ StockApprec_{j,t} + \beta_3\ InvBase_{j,t} + \beta_4\ Cash_{j,t})$

In this model, $StockSplit_{j,T}$ equals 1 if firm j has a stock split during time period T(where T=2 years), F is the logistic cumulative density function with four variables: $TradeRange_{j,t}$ is the ratio of the actual stock price in year t to the predicted price from the regression reported in Table 8. $StockApprec_{j,t,}$ measures the proportionate increase in the firm's stock price over the two years preceding year t [=(closing price at 31 December of year t/ closing price at 31 January of year t-1)] . $InvBase_{j,t}$ is the percentage of publicly held ownership for a given firm. Finally, $Cash_{j,t}$ is the ratio of cash holdings to total assets at year t. β's are parameters of the model. The numbers in parentheses are p values and ** denotes significance at the 0.1 level.

CHAPTER 5

CONCLUSION

5.1 Introduction

The main purpose of this research is to test the validity of the trading range hypothesis as a basis for split decisions of Turkish companies by analyzing the splitting firms whose shares are traded on the Istanbul Stock Exchange during the period from 1992 to 2002. Specifically, it is analyzed whether or not those firms whose share prices rise above their optimal trading range are more likely to split compared to firms whose share prices are at or below their optimal trading range.

The empirical analysis of the study consists of three main parts. In the first part, the liquidity effects of stock splits for Turkish common stocks are analyzed since the main assumption of the trading range hypothesis is enhanced post-split liquidity. In the next step, the objective is to identify the optimal price range for the firms included in the split sample. For that purpose, the share price is modeled as a function of firm size and investor base. In the last stage the empirical question of the study is analyzed by calculating the probability of a firm to execute a stock split when the actual price exceeds expected price. The optimum trading price

range found in stage two is utilized in this final analysis to determine the expected price.

5.2 Summary of the Findings

The empirical findings about the level of liquidity indicate that the trading volume of a stock and thus its liquidity is slightly lower following the split. Liquidity is found to decrease by a small amount after the splits and the only change in the volume relationship in the post-split period is that the positive effect of the lagged trading volume of a company on the contemporaneous volume of that firm is somewhat diminished. This finding is inconsistent with the enhanced liquidity assumption of the optimum trading range hypothesis and consistent with the findings of Copeland (1979).

According to the results obtained in the second stage of the analysis where the relationship between firm characteristics and share prices are analyzed, firm size is found to have a positive effect on the share prices. This result is consistent with Merton's argument regarding firm size and also consistent with the findings of Dyl and Elliott (2000) who have shown that higher firm sizes are associated with higher share prices in the US market. The relationship between the investor base and the share price of a firm is left unexplained since the information about the number of shareholders is not publicly available in Turkey and the alternative measure of publicly-held ownership utilized in this study as a proxy for investor base does not seem to be a good proxy. The insignificance of the results obtained for the logit model does not allow us to make comments about the likelihood of

firms to split. This model is found to be inadequate to determine the probability of firms to split.

5.3 Limitations of the Study and Implications for Future Research

There are two main limitations in this study: (1) the differences in the split regulations between Turkey and other developed markets which render it impossible to test some of the hypotheses that are found in literature, and (2) the non-availability of data and related problems. The first problem of this research stands from the lack of publicly available investor base information for Turkish firms. The results of the analyses indicate that the alternative measure of publicly-held ownership utilized in this study as a proxy for the investor base is an inefficient proxy for the investor base.

The second weakness is from the data used in this study. The number of firms in the analysis sample of the study is very small compared to similar studies conducted for developed financial markets. Thus, the empirical findings are obtained from very small sample sizes, especially for the earlier years where the number of firms traded on the ISE is limited, and this is an obstacle for drawing sound statistical implications.

Given these weaknesses, there is still need for further research about the effects of and motivations for stock splits executed by Turkish firms. This thesis provides a good starting point for analyzing the trading range considerations of Turkish corporations. The statistical models presented in this study require improvement by taking into account the special features of Turkey as an emerging

market. One possible direction is to search for alternative proxies for the investor base. Moreover, the tests might be repeated by including additional variables into the share price and logit models. For instance, sectoral index values might be added to the share price regressions as an explanatory variable to improve the estimation power of the model.

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