ISTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

INVESTOR SENTIMENT AND ITS EFFECT ON STOCK RETURNS

Ph.D. Thesis by
Özgüç AKDAĞ

Department : Management Engineering

Programme : Management Engineering

JULY 2011

ISTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

INVESTOR SENTIMENT AND ITS EFFECT ON STOCK RETURNS

Ph.D. Thesis by
Özgüç AKDAĞ
(507062005)

Date of submission : **17 May 2011**
Date of defence examination: **01 July 2011**

Supervisor (Chairman) : **Assoc. Prof. Dr. Oktay TAŞ (ITU)**
Members of the Examining Committee : **Prof. Dr. Fahir Bilginoğlu (IU)**
Prof. Dr. Burç Ülengin (ITU)
Prof. Dr. Suat Teker (OU)
Assist. Prof. Dr. Cumhur Ekinci (ITU)

JULY 2011

İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

YATIRIMCI DUYGUSU VE HİSSE SENEDİ GETİRİLERİNE ETKİSİ

DOKTORA TEZİ

Özgüç AKDAĞ
(507062005)

Tezin Enstitüye Verildiği Tarih : 17 Mayıs 2011
Tezin Savunulduğu Tarih : 1 Temmuz 2011

Tez Danışmanı : Doç. Dr. Oktay TAŞ (İTÜ)
Diğer Jüri Üyeleri : Prof. Dr. Fahir Bilginoğlu (İÜ)
Prof. Dr. Burç Ülengin (İTÜ)
Prof. Dr. Suat Teker (OÜ)
Yrd. Doç. Dr. Cumhur Ekinci (İTÜ)

TEMMUZ 2011

FOREWORD

I would like to express my gratitude for my advisor Assoc. Prof. Dr. Oktay Taş for his support and understanding throughout the preperation of this thesis. I also thank Prof. Dr. Burç Ülengin for his remarks and corrections on the statistical tests and all members of the examining comitee for their appreciation of my work.

Especially, I would like to give my special thanks to my mother Nurten Akdağ whose encouraging support enabled me to complete this work

July 2011 Özgüç Akdağ

Management Engineering

TABLE OF CONTENTS

Page

ABBREVIATIONS

C	: Constant
ESS	: Error sum-of-squares
GARCH	: Generalized Autoregressive Conditional Heteroskedasticity
NL	: Netherlands
DV	: Volume Trend
PCA	: Principle Component Analysis
R	: Return
UAE	: United Arab Emirates
USA	: United States of America
V	: Volume

LIST OF TABLES

Page

LIST OF FIGURES

Page

INVESTOR SENTIMENT AND ITS EFFECT ON STOCK RETURNS

SUMMARY

The information in the past and present trading volume is related to investor sentiment, and its ability in predicting stock returns is investigated. Investor sentiment in this work is defined as the propensity of irrational investors to buy or sell an equity, relative to that of rational investors. As stated by Baker and Stein (2004); an increase in trading volume reflects a rise in investor sentiment.

Investor sentiment, liquidity and stock volume are closely related concepts. Past literature mainly focusses the level of stock volume as a liquidity and the change of stock volume as an investor sentiment indicator.

The change in trading volume per unit of time, which is called as the trading volume trend, is used as a measure of investor sentiment on individual stocks. There is a positive and left skewed beta coefficient distribution of the volume trend values for predicting the present return. This relation holds after controlling for several liquidity measures and other possible determinants of expected returns such as GARCH(1,1) volatility series of the volume trend values, sentiment indices of various financial resources and volume trend of the the corresponding market. The effect of volume trend is more remarkable in stocks of small, financially distressed and losing firms. These findings suggest that the positive effect of the trading volume trend on stock's returns is robust for about half of the companies being evaluated.

Finally in the cross section analysis; regions, sectors, market capitalizations, free floating percentages, geometric growth levels, price to earning ratios, dividend yields, gross margins, return on asset ratios, current ratios, quick ratios, long term debt ratios, weighted average cost of capital levels, stock betas and alphas are being investigated.

Findings suggest that, firm characteristics such as regions, sectors, market capitalizations, free floating percentages, debt structure and profitability effect exploratory power of the volume trend betas representing investor sentiment.

YATIRIMCI DUYGUSU VE HİSSE SENEDİ GETİRİLERİNE ETKİSİ

ÖZET

Bu çalışma kapsamında 2005-2010 tarihlerinde yaklaşık 80 ülkeden 15000'e yakın hisse senedinin, geçmiş ve bugünkü işlem hacmi değişimleri yatırımcı duygusu ile ilişkilendirilerek, bu değerlerin hisse senedi getirilerinin tahminindeki etkisi gözlemlenmiştir. Yatırımcı duygusu bu çalışma için, irrasyonel yatırımcının, rasyonel yatırımcıyı göre bir hisse senedini alma ya da satma eğilimi olarak tanımlanmıştır. Baker ve Stein (2004) çalışmasında da belirtildiği gibi işlem hacmindeki artış yatırımcı duygusu artışı yansıtmaktadır.

Yatırımcı duygusu, likidite ve işlem hacimleri birbirleriyle yakın ilişkili kavramlardır. Literatür incelendiğinde hacim seviyesinin çoğunlukla likidite, buna karşın hacim değişiminin de yatırımcı duygusu göstergesi olarak kullanıldığı görülmektedir.

Bir hisse senedinin işlem hacminde birim zamanda meydana gelen değişme, işlem hacmi eğilimi olarak adlandırılmakta ve bu değer bireysel hisse senetlerindeki yatırımcı duygusunu gösteren bir değer olarak kullanılmaktadır. İşlem hacmi eğilimleri, mevcut hisse getirililerini açıklamada kullanıldığında ortaya pozitif ortalamalı ve sola çarpık bir dağılım çıkmaktadır. Bu ilişki aynı zamanda işlem hacmi trendinin GARCH(1,1) serisi, farklı finansal kurumların yatırımcı duygusu endekseleri ve ilgili hissenin bağlı bulundu piyasanın toplam işlem hacmi gibi farklı değişkenlerle test edildiğinde de geçerliliğini korumaktadır. Sonuçlara bakıldığında tüm gözlemlerin yarısından fazlasında işlem hacmi eğiliminin anlamlı katsayılara sahip olduğu görülmektedir.

Son olarak yatay kesitte, bölgesel, sektörel, firma büyüklüğü, halka açıklık oranı, geometrik büyüme değerleri, fiyat getiri oranları, temettü verimi, kar marjları, varlık getirileri, cari oranları, asit-test oranları, uzun vade borç oranları, ağırlıklı ortalama sermaye maliyetleri, alfa ve beta açısından analizler yapılmıştır. Küçük, halka açıklık oranı yüksek, finansal sıkıntıda olan ve zarar yazan firmalarda işlem hacmi trendinin daha yüksek bir etkisi olduğu gözlemlenmiştir.

Çalışma bulguları göstermiştir ki, bölge, sektör, piyasa değeri, halka açıklık oranı, firmanın borç yapısı ve karlılığı, yatırımcı duygusunu temsil eden işlem hacmi trendinin açıklayıcı gücüne etki etmektedir.

1. INTRODUCTION

Trading volume reflects a remarkable amount of information on the price of equities within a certain period. In most cases the more volatile the volume, the more volatile the equity prices. In some previous works like, Brennan, Chordia, and Subrahmanyam (1998), Datar, Naik, and Radcliffe (1998), and Chordia, Subrahmanyam, and Anshuman (2001) volume is the proxy of liquidity. Liquid equities are less likely to earn higher expected returns. On the other hand, equities with lower levels of trading volume, which can also be called illiquid equities, mostly have higher expected returns when compared with their liquid counterparties. There are also some alternative approaches like Lee and Swaminathan (2000), which do not count volume as a liquidity indicator. Their work shows that momentum profits depend on the past level of trading volume. To be precise, high volume winner or low- volume loser stocks has faster return reversals. Trading volume has an explanatory role in medium-term momentum.

In this thesis, an alternative approach for the relation between trading volume and stock returns is being introduced. According to Baker and Stein (2004), the market liquidity as measured by trading volume can be an indicator of investor sentiment. Literature on investor sentiment mostly concentrates on the sentiment of the overall economy, rather than individual stocks. Sentiment on a single stock is rarely investigated. On the other hand, volume return relationship is mostly researched within the liquidity context. This thesis mainly focuses on the sentiment side of volume movements, and its contribution to explaining the variance of stock returns.

Baker and Stein (2004) classifies investors into two groups, such as rational and irrational or overconfident investors. Both groups have positive weights in the pricing function of the corresponding equity. Irrational investors are likely to overestimate their information when investing. Short-sales constraints and insider trading are also added in their model. Irrational investors underreact to insider trading. The more their beliefs are justified, the more weight in the pricing function is likely to be possessed by irrational investors. Once overconfident investors enter the scene, prices are driven up and prices are no longer vulnerable to liquidity shocks. Once the prices rise and the expected return falls down and the trading volume becomes higher accordingly. Rational investors are unable to counteract the irrational investors because of the short sale constraints. Under normal circumstances, irrationally elevated prices trigger rational investors to take short positions, however the short sale constraints avoid this tendency. In the absence of rational investors, irrational investors dominate the market, which also indicates the rising of investor sentiment, and leads price stability and high trading volumes. All in all, increasing volume shows the market activity of irrational investors and rising investor sentiment.

Obviously there is a link between investor sentiment and trading volume. Vast majority of the research on investor sentiment focuses on the pricing deviation of rational and irrational investors (Zweig, 1973; Lee, Shleifer and Thaler, 1991; Baker and Stein, 2004; Brown and Cliff, 2005). Therefore, there is a strong linkage between investor sentiment and investor heterogeneity, where the proportion of irrational investors exceeds those of the rational investors. There are some works on the linkage between investor heterogeneity and trading volume, like Karpoff (1986) and Harris and Raviv (1993).

However, trading volume was mostly used as a liquidity indicator in numerous works. These works can be categorized in two groups such as; models referring trading volume as an inherent liquidity indicator (Stoll, 1978a; Amihud and Mendelson, 1986a) and models referring to the relation between trading volume and transaction costs, which is also a frequently used proxy for illiquidity (Chordia, Roll, and Subrahmanyam, 2000). The percentage change of consecutive trading volumes, are used here as a sentiment indicator and called trading volume trend.

According to Lei (2005) the trading volume trend by definition is the average change on trading volume per unit of time. It shows the propensity of investors to trade. It is a better sentiment measure than the level of trading volume. First, it reflects the movement of overconfident investors on the market in the framework of Baker and Stein (2004).

Second, the sentiment literature suggests that investor sentiment is likely to be formed through a process over time (e.g., Smidt (1968) and Brown and Cliff (2005)). For instance, Brown and Cliff (2005) suggest that “it seems natural to view sentiment as a persistent variable. People become more optimistic as they are reinforced by others joining on the bandwagon." The trading volume trend summarizes the process rather than simply being a snap shot on the process. Third, stocks in the cross section can have the same level of trading volume but very different trading volume trends over a period of time. The trading volume trend thus mitigates the problem of mixing investor sentiment information with liquidity information (Lei, 2005).

First of all, three highly related subjects in the literature are being reviewed such as liquidity, sentiment and volume, as level and change as well. Being very closely related aspects, all of the definitions and commonly used proxies are introduced in this stage. According to the approach being adopted in this work for investor sentiment, the relationship between sentiment and trading volume is also evaluated in this stage. Through clarifying the relationship among these concepts, the measures on investor sentiment and how they represent the sentiment in the market might be understood better.

In order to analyze the effect of volume trend, which can also be described as the percentage change in the volume level according to the previous term (in this work previous week), VAR equation with current and previous returns and volume trends is modeled. In the first level of the analysis, the impact of current and past values of returns and volume trends are being concentrated. So the explanatory variables of the return variance are picked from returns and volume, and of course their derivatives, such as lagged term of volume trends, returns and absolute value of volume trends. For example, according to Chordia, Subrahmanyam, and Anshuman (2001) the cross-sectional relation between the trading volume trend and expected stock returns was found to be negatively related. In other words, the higher the volume trend, the lower the expected return on an equity. Moreover, the return volatility has a strong negative relation with expected stock returns as documented in Amihud (2002). These two findings suggest that the expected return values might be driven by liquidity or non-liquidity reasons. The former work indicates a positive relationship between expected return, where the second work finds the relationship in a negative direction after controlling for level and volatility of volume trend and other return related variables. Both works have a common finding that either as a liquidity proxy or as a sentiment proxy volume trend is already priced in the equity. Previous works on the volume trend effects on returns (Lei, 2005) mostly concentrate on longer observation period such as months or years, where the findings represent the sentiment of the whole months or year. However sentiment is a rapidly changing phenomena, which might change day by day, even in the same day. This work brings an alternative point of view to the sentiment concept with weekly observations. Investor sentiment at its different stages is likely to exhibit different effects on expected returns. The trading volume trends defined over the different lengths of periods can simply reflect the different stages of investor sentiment and exhibit different effects on stock returns (Lei, 2005).

On the second stage of the work, the explanatory variables are extended with some sentiment indices, benchmark indices of the underlying equities and finally, GARCH(1,1) volatilities of the volume trend. Here the robustness of the model is examined via decomposing the variance explained by volume trend. As mentioned before, volume trend is used as a proxy for investment sentiment. Its degree of contribution to cover the unexplained variance should be tested by introducing some kind of sentiment indices or related market index volumes, as well as GARCH(1,1) for testing the memory effect of volume trend. The volume trend adopted in this model, obviously has a short memory as long as one term, however the GARCH of volume trend has a longer memory and therefore it might explain more variance of return.

In the next stage, different beta coefficients (esp. those related to volume trend values) of the underlying equities are evaluated, corresponding to their fundamental ratios, market activity, sectors, countries, market capitalization, free floating rate etc. This is to identify, which stock returns are highly effected by volume changes, such as smaller or larger companies, financially stabile or distressed companies, high or low beta companies etc.

Investor sentiment has a significant effect not only on present but also future returns of equities. Consistent with the trading volume trend as a measure of investor sentiment, stocks with higher trading volume trends earn higher present returns but earn lower returns in the future. An examination of momentum portfolios further reveals that, after controlling for past return momentum, stocks with high trading volume trends still earn lower future returns than stocks with low trading volume trends (Lee and Swaminathan, 2000).

What’s more, smaller firms are much likely to get exposed to the effects of investor sentiment (e.g., Lee, Shleifer, Thaler (1991) and Neal and Wheatley (1998)).

Another important aspect regarding trading volume trend is the short sales constraint, which is mostly proxied by firm size and the availability of an option written on the analyzed stock. Stocks, which are the underlying of some frequently traded options are mostly stocks of bigger firms, which has a decreasing effect on trading volume trend. Lakonishok, Lee, and Poteshman (2004). Lakonishok, Lee, and Poteshman (2004) find that investors did not increase their purchases on put options during the bubble period of late 1990s. In other words, even without short-sales constraints, rational investors may not trade to counteract the transactions of overconfident investors because they may face the noise trader risk (see De Long, Shleifer, Summers, and Waldman (1990)).

Brown and Cliff’s (2004) work shows that in the short run investor sentiment is unable to predict the future returns, however the same authors Brown and Cliff (2005) also show that in the long run such as two to three years, investor sentiment significantly predicts future returns. This work hypothesizes the significant role of investor sentiment, by means of trading volume trend, in explaining the variance in the returns of a stock as well as predict future returns according to trading volume trend. These findings complement several studies that explore the relations between trading volume and expected stock returns, and investor sentiment and expected stock returns. For instance, Lee and Swaminathan (2000) find that past trading volume links intermediate-term momentum and long-term reversal on stock returns. Specifically, high- (low-) volume winners win less (more) than low- (high-) volume winners, and high- (low-) volume losers lose more (less) than low- (high-) volume losers. Further, high- (low-) volume winners (losers) experience faster return reversals than low- (high-) volume winners (losers) (Lei, 2005).

Rest of this thesis is as follows, the beta coefficients of the trading volume trend observations are calculated first. Then these values are categorized and compared for any significant difference among groups. Some new variables are introduced to the model in order to test the robustness of the beta coefficient of trading volume trend. Then moving beta coefficients are calculated, with restricted amount of observations, and these moving beta coefficients are then investigated for any significant effect on predicting the stocks’ future returns.

2. LITERATURE REVIEW

Liquidity and sentiment are intangible concepts, and both are hardly distinguishable. What's more, their relation with stock returns, volume levels and volume trends are much harder to percieve. In the financial literature, there are numerous works regarding the effects of liquidity and sentiment, but a common understanding of both of these concepts seems to be far away. Previous literature mostly introduces trading volume as a liquidity measure along with other measures such as Roll Spread, volume turnover etc. In order to have a clear understanding of the concepts regarding investor sentiment, previous definitions are needed to be evaluated in comparison.

2.1 Liquidity

Liquidity is one of the most elusive concepts in the financial field. Previous works emphasizes this property of liquitidy concept many times (e.g., Kyle (1985), Amihud (2002) and Pastor and Stambaugh (2003)). One of the early definitions on liquidity of Demsetz (1968) takes liquidity as immediacy of exchange and according to Schmidt liquidity is the service that makes quick exchange possible. The common understanding about liquidity is the ease and speed of converting the asset in hand to cash. The easier and the faster the conversion is made, the more liquid is the asset. However liquidity has different aspects such as tightness, depth and resiliency according to Kyle (1985), where tightness refers to the *cost* of turning around a position over a short period of time, depth refers to the *size* of an order flow innovation required to change prices in a given amount, and resilience refers to "the *speed* with which prices recover from a random, uninformative shock. A liquid market is thus one that is "almost infinitely tight," "not infinitely deep," and "resilient enough so that prices eventually tend to their underlying value" (Kyle (1985).

Above are the major aspects of liquidity, yet not constitute all. Timeliness is also one of the important aspects of liquidity. To be precise, the market price in real time is hard to execute all the sale, if not impossible in many cases. Once the sale order is given, price level mostly doesn't meet all the order amount, which in other words leads to liquidity risk. Despite the empirical difficulties in measuring liquidity, the concept of liquidity is useful in helping us understand the dynamics of asset prices. For example, since transaction costs are one dimension of liquidity, and it is directly related to an investor's net holding-period return, there should be a link between liquidity and asset prices (Amihud and Mendelson (1986a)).

From the transaction costs point of view, the lower the transaction costs on an equity, the higher the buying pressures, which will lead the equity price to rise and the expected return to drop. Just in contrast, the higher the transaction costs on an equity, the lower the buying pressures, which will lead the equity price to drop and the expected return to rise. All in all, a negative relation between liquidity and expected returns is obvious, and this relation has been tested many times before (Lei, 2005).

There is also another approach to the impact of liquidity such as Easley, Hvidkjaer, and O'Hara (2002) and O'Hara (2003), where another type of risk called "price discovery risk" is introduced. This risk is based on the information asymmetry between informed and uninformed investors. Holding the same portfolios, both groups have different risk perceptions, according to the biased information, in other words, even same portfolios may lead different exposure according to the type of investor holding the assets. Easley, Hvidkjaer, and O'Hara (2002) and O'Hara (2003), introduced an alternative measure for this risk called probability of informed trading (PIN). Easley, Hvidkjaer, and O'Hara (2002) found that for two consecutive years, if one stock has higher PIN on the first year, the expected return is higher on the second year, even after controlling for betas, BTM and firm sizes. Moreover PIN is also closely related with liquidity by means of transaction costs. Moreover the in the same work, the relation between PIN measure and quoted percentage spread is positive and where the relation is negative with turnover.

As mentioned earlier transaction costs are strongly related with liquidity and that's why the relation between transaction costs and expected returns is obvious. However the first work regarding this issue is written by Amihud and Mendelson (1986a). Previous works mostly concentrated on the effects of transaction costs on liquidity, however complementary linkage between transaction costs and expected returns was not present until 1986. In late 1990s, researchers start to emphasize other dimensions of liquidity and examine their relations with expected returns. Especially right before

2000, the number of researches on this issue skyrocketed. Amihud and Mendelson (1986a) built a model on various types of investors and assets. For example stock 0 has zero spread etc. Buying and selling transactions are made through market making activities via bid-ask prices. Moreover Type-1 investors have a longer holding period than Type-2 investors. All types of investors are trying to maximize the expected return of their portfolios. In other words, investors maximize the expected returns on their portfolios per unit of time. Findings of this work suggest that there is a direct but nonlinear relation between return and relative spread, even after controlling for Merton(1987) risk factors, such as security beta, residual risk, firm size. One other important work on this issue is Eleswarapu and Reinganum (1993), where return is found to be related only in January as a component of liquidity premium.

However there is a clear drawback of both of the works, where the methodology of finding the relative spread is basically averaging all spread values in the corresponding year. So the changes within the year are ignored for relative spreads. An alternative approach to the effect of transaction costs on the expected return is introduced by Brennan and Subrahmanyam (1996), where the transaction costs weren't counted as total costs, but these values are decomposed into fixed and variable components and the same relation with expected returns is found to be still holding. On the other hand, the relation between relational spread and expected returns is found to be negative, which is contradicting the findings of Amihud and Mendelson (1986a). What's more the concave relation in Amihud and Mendelson (1986a) do not hold with the fixed components of the transaction costs. Quoted spread is found to be a better proxy for transaction costs for NASDAQ rather than in NYSE, in many works such as Petersen and Fialkowski (1994), McInish and Woods (1995), Huang and Stoll (1996), and Bessembinder (2003). Relying on this information Eleswarapu (1997) retested the validity of the same relation in NASDAQ from 1973 to 1990, where the relation is found to be stronger than the similar work of Eleswarapu and Reinganum (1993) for NYSE equities. In addition, Eleswarapu (1997) found this effect to be stronger in January then the rest of the months in accordance with the previous works.

Brennan, Chordia, and Subrahmanyam (1998) investigated the expected return and stock characteristics relationship, after controlling for Fama and French (1993) three risk factors and Connor and Korajczyk (1988) five risk factors from the principal component analysis with the data from 1996 to 1995 for NASDAQ and NYSE. Their findings are as follows; Size Book-to-Market value, Dollar trade volume and lagged returns are significant explanatory factors for expected returns. Dollar trading volume has a negative and significant relation, which is consistent with the liquidity premium concept.

Datar, Naik, and Radcliffe (1998) examined the liquidity effect through share turnover, where the negative and significant relation with the expected returns are found for NYSE stocks from 1962 to 1991. Rouwenhorst (1999) along with other possible return factors, examined the relation of share turnover with expected returns of 20 emerging markets from 1982 to 1994, and found no significant relation.

A consistent result is also found by Bekaert, Harvey, and Lundblad (2003). Bekaert, Harvey, and Lundblad (2003) found that the share turnover and proportion of zero returns are introduced together for proxying liquidity for 19 emerging markets from 1987 to 2001, and only proportion of zero returns are found to be significant. Both works suggest that share turnover is less likely to be a good proxy for liquidity in emerging markets. In his panel work Amihud (2002) evaluated both time series and cross section relationship of market liquidity and expected returns. Amihud introduced a new proxy, where illiquidity is represented by the return divided by total dollar volume. For NYSE stocks from 1964 to 1997 a positive and significant effect of illiquidity is detected with expected returns. Besides, unexpected illiquidity shocks have a negative relation with expected returns.

Chordia, Subrahmanyam, and Anshuman (2001) extended the assumptions of Brennan, Chordia, and Subrahmanyam (1998) by introducing the variance of dollar trading volume and share turnover to the model. Their assumption is consistent with the risk return relationship, such as the level of the liquidity should be reinforced by the volatility information in order to proxy the volatility level. Unexpectedly the volatility of liquidity proxies are found to be negative. To explain this astonishing result, they resort to alternative approaches like GARCH volatilities, adding macroeconomic variables etc. However the negative relationship was robust enough to remain.

There are also some works referring liquidity as a sentiment indicator. As stated above, liquidity measures mostly have negative relations with expected returns. Baker and Stein (2004) made another interpretation for this relation. As mentioned before in their work Baker and Stein (2004) set two different groups of investors; rational and irrational. Both parties have positive weights on the functions of equities, but irrational investors tend to overshoot the information available. Short sale constraints and insiders are also present. When investor sentiment rises, overconfident investors tend to take greater role on the pricing function. Their effect drives security prices up and because of the fictive liquidity caused by irrational investors, the security is less vulnerable to price impact of trades.

Obviously the rising prices, diminished the expected return on that equity. The elevated prices do not trigger a counter positioning of rational investors because of the short sales constraints. So the market is dominated by irrational investors. The market under the domination of irrational investors is characterized by with high liquidity and high trading volume. An increase in trading volume thus reflects the participation of overconfident investors in the market, and indicates an increase in investor sentiment. Since high sentiment leads to lower expected returns, this model provides an alternative explanation for the negative time-series relations between liquidity measures and expected returns (Lei, 2005).

2.2 Trading Volume

Trading volume and its derivatives are most widely used proxies for asset pricing models. It has obvious contribution for explaining the variance of expected returns. Because it has a close relation with liquidity and negative relation with transaction costs. Trading volume has three mostly used derivatives which are turnover, volume in currency and volume in amount (share volume).

Within the framework of this thesis, Amihud and Mendelson (1986a) is one of the mostly cited example to explain the effect of turnover. Amihud and Mendelson (1986a) built a model on various types of investors and assets. For example stock 0 has zero spread etc. Buying and selling transactions are made through market making activities via bid-ask prices. Moreover Type-1 investors have a longer holding period than Type-2 investors. All types of investors are trying to maximize the expected return of their portfolios. In other words, investors maximize the expected returns on their portfolios per unit of time. Findings of this work suggest that there is a direct but nonlinear relation between return and relative spread, even after controlling for Merton(1987) risk factors, such as security beta, residual risk, firm size.

The empirical evidence on turnover suggests that, it is a robust explanatory variable for expected returns. For example; Datar, Naik, and Radcliffe (1998) address this issue and find supporting evidence. They found out a negative and significant relation between share turnover and expected returns for NYSE nonfinancial stocks from 1962 to 1991. Also Chordia, Subrahmanyam, and Anshuman (2001) had similar results for NYSE and AMEX securities within 1966 and 1995 period even after controlling for firm size, Book-to-Market, dividend yield, lagged returns and turnover volatility. However the volatility of turnover in Chordia, Subrahmanyam, and Anshuman (2001) was found to have negative relation, inconsistent with the previous findings.

Rouwenhorst (1999) and Bekaert, Harvey, and Lundblad (2003) used the same model for emerging markets, but their findings are more insignificant than those of the previous works.

Another derivative of the trading volume is volume in currency or the so called dollar volume. This is the most frequently used method for proxying liquidity because it is the most easily found data usually available publicly. The most frequently cited works on dollar volume are Stoll(1978a) and Stoll(1978b). Here Stoll argues on a market maker rendering orders by borrowing at risk free rate. The market maker has a constrained wealth and aims to maximize its terminal wealth. For sustaining this process, the market maker faces holding, order and information costs.

Especially holding cost decreases the availability of reversing current position of market maker, therefore holding cost is of more importance, when compared with other costs. The higher the dollar trading volume, the easier it is for the market maker to have reverse position. So volume in currency is negatively related with holding costs and positively related with liquidity.

Stoll (1978b) found out a negative relation for quoted spreads and dollar volume. He used dollar trading volume for proxying the market maker’s holding cost. Empirical findings on a sample of 6 days on some NASDAQ stocks hold with his previous expectations. In Brennan, Chordia, and Subrahmanyam (1998) expected stock returns and security characteristics are being investigated as mentioned above. Findings about dollar trading volume shows that it is negatively related with expected returns. Using this findings they attribute to the existence of liquidity. Chordia, Subrahmanyam, and Anshuman (2001) extended the assumptions of

Brennan, Chordia, and Subrahmanyam (1998) by introducing the variance of dollar trading volume and share turnover to the model. Their assumption is consistent with the risk return relationship, such as the level of the liquidity should be reinforced by the volatility information in order to proxy the volatility level. Unexpectedly the volatility of liquidity proxies are found to be negative. To explain this astonishing result, they resort to alternative approaches like GARCH volatilities, adding macroeconomic variables etc. However the negative relationship was robust enough to remain.

Another important derivative of trading volume is volume in amount of shares, which can also be called share volume. Smidt (1968) suggests that liquidity can be measured by the number of shares exchanged within a certain trading period, mostly one day. As mentioned earlier turnover is the share volume divided by the total number of shares outstanding, and dollar volume is the security price multiplied with share volume. So for both of the previous proxies of liquidity (dollar volume and turnover) share volume is the common component.

If the number of shares outstanding remains the same, the higher the share volume the higher the turnover and the dollar volume, therefore share volume is one of the fundamental proxies of liquidity by definition. However past literature do not frequently use models with share volume when compared with dollar volume. For example Brennan and Subrahmanyam (1995) used simultaneous equation methodology with share volume and share volume is found to be an important explanatory variable of adverse selection costs, which proves share volume to be a proxy of liquidity.

In addition to the trading volume derivatives, there are also other measures such as number of trades or average size of trades. Jones, Kaul, and Lipson (1994) has proven the relation on volatility of NASDAQ stocks from 1986 to 1991 is much stronger than the relation with other trading volume derivatives. The biggest drawback of these data are, the need to dig into intraday data to explore needed values, which is mostly unavailable for a long time horizon.

Trading volume is an explicit value which mostly don’t need any interpretation. However researchers sometimes need different proxies to measure different aspects of liquidity. Here only the most frequently used three specially purposed liquidity measures are introduced. Depending on the availability of data some of them used in some models within this work. These measures are Roll Spread, Proportion of Zero Returns and Price Impact Measure of Amihud. First two measures are mostly used for transaction side of liquidity, where the later is for the market depth and resilience. Remaining measures on liquidity require intraday data, therefore hard to provide and statistical estimation.

Examples in the first category include spread-based liquidity measures such as the quoted spread, the effective spread, the relative spread (see Stoll (2000) for definitions of the above), the quoted slope (Hasbrouck and Seppi (2001)), and the amortized spread (Chalmers and Kadlec (1998)). Examples of liquidity measures that rely more heavily on statistical estimation, i.e., more model parameters need to be estimated, include the round-trip proportional transaction costs by Lesmond, Ogden, and Trzcinka (1999), the probability of informed trading by Easley, Kiefer, O'Hara, and Paperman (1996) and Easley, Hvidkjaer, and O'Hara (2002), and the extent to which price changes reverse by Pastor and Stambaugh (2003). Because intraday data are not available for a long period of time and because monthly parameters heavily estimated with daily data can be inaccurate, therefore these values are not frequently used for control of liquidity. As mentioned earlier, frequently used variables will be evaluated here.

The first proxy to be introduced is Roll Spread. Roll's (1984) bid-ask spread estimator for financial securities is based on the assumptions that the securities market is informational efficient, and the distribution of security value innovations is weakly stationary. Roll (1984) shows that the effective bid-ask spread is a function of the serial covariance of successive price changes. The appeal of simplicity of the spread measure is muted somewhat by some troubling empirical regularities; i.e., the spread estimate is undefined for large portions of stock samples because serial covariance estimates are positive, increasing the return interval from daily to weekly leads to fewer positive covariance estimates, and the estimates of average bid-ask spreads from daily data are significantly smaller than those from weekly data. (Bhardwaj and Moore, 1998).

Roll Spread is shown with this equation; $s = 2\sqrt{-\operatorname{cov}(\Delta p_t, \Delta p_{t+1})}$

where $\Delta p_t = p_t - p_{t-1}$ is the change in price, $Q_t = 1$ is buy indicator, $Q_t = -1$ is sell indicator. Under the assumption of a constant effective spread:

$$E\left[Q_t Q_{t+1}\right]=0$$

$$E\left[(Q_{t+1}-Q_t)\varepsilon_{t+1}\right]=0$$

$$E\left[(Q_{t+1}-Q_t)\varepsilon_t\right]=0$$

$$E\left[\varepsilon_{t+1}\varepsilon_t\right]=0$$

and;

$$\Delta p_t = p_t - p_{t-1} = \frac{1}{2}(Q_t - Q_{t-1})s + \varepsilon_t \,.$$

Extending the relationship;

$$\operatorname{cov}(\Delta p_t, \Delta p_{t+1}) = \frac{1}{4}E\left[(Q_t - Q_{t-1})(Q_{t+1}-Q_t)s^2\right]+\frac{1}{2}E\left[(Q_t - Q_{t-1})s\varepsilon_{t+1}\right]+\frac{1}{2}E\left[(Q_{t+1}-Q_t)s\varepsilon_t\right]+E\left[\varepsilon_t\varepsilon_{t+1}\right]$$

$$=\frac{1}{4}E\left[(Q_t - Q_{t-1})(Q_{t+1}-Q_t)s^2\right]$$

$$=\frac{1}{4}E\left[Q_T Q_{t+1}s^2\right]-\frac{1}{4}E\left[Q^2{}_t s^2\right]-\frac{1}{4}E\left[(Q_t - Q_{t-1})(Q_{t+1}-Q_t)s^2\right]+\frac{1}{4}E\left[Q_{t-1}Q_t s^2\right]$$

$$=-\frac{1}{4}E\left[Q^2{}_t s^2\right]$$

$$=-\frac{1}{4}s^2 \quad \text{and,}$$

$$s = 2\sqrt{-\operatorname{cov}(\Delta p_t, \Delta p_{t+1})}$$

so the relation is prooved to hold. Moreover Harris (1990) made an adjustment on this equation, in order to eliminate the complex component, coming form the negative covariance in the square root, such as;

$$s=-2\frac{\operatorname{cov}(\Delta p_t, \Delta p_{t+1})}{\left|\operatorname{cov}(\Delta p_t, \Delta p_{t+1})\right|}\sqrt{\left|\operatorname{cov}(\Delta p_t, \Delta p_{t+1})\right|}\,.$$

The second estimator is proportion of zero returns. Lesmond, Ogden, and Trzcinka (1999) propose using the proportion of zero returns in stock's return series as a proxy for the stock's illiquidity. This proxy requires only the time series of daily stock returns, which is relatively easy to obtain. In their model, an informed marginal investor will trade only if the value of his private information outweighs his transaction costs. Consequently, a larger proportion of zero returns in a security's return series implies that this security has higher transaction costs. With the additional assumptions that the market model (without the intercept term) is the underlying return generating process and the marginal investor (Lei, 2005).

Proportion of zero returns, can be modeled as;

$$R_{jt}^{*} = \beta_j R_{mt} + \varepsilon_{jt}$$

$$R_{jt} = R^{*}{}_{jt} - \alpha_{1j} \qquad \text{if} \qquad R_{jt}^{*} < \alpha_{1j}$$

$$R_{jt} = 0 \qquad \text{if} \qquad \alpha_{1j} < R_{jt}^{*} < \alpha_{2j}$$

$$R_{jt} = R^{*}{}_{jt} - \alpha_{2j} \qquad \text{if} \qquad R_{jt}^{*} > \alpha_{2j}$$

Where R_{jt} is the observed return of stock j on time t, and R_{jt}^{*} is the true return of stock j on time t. R_{mt} is the market return and ε_{jt} is the error term. $\alpha_{1j} < 0$ is the transaction cost threshold for negative information and $\alpha_{2j} > 0$ is the transaction cost threshold for positive information and $\alpha_{2j} - \alpha_{1j}$ is the difference between negative and positive transaction cost thresholds.

The third proxy is the Amihud's price impact ratio. Amihud (2002) defines for a stock the average ratio of its daily absolute return to its dollar trading volume on the same day as the proxy of its illiquidity. This measure requires only daily returns and dollar volume as its inputs. This measure shows the average daily price responses to each one dollar in trading volume for stock i. Since stocks with better liquidity should be able to absorb more dollar volume without corresponding price movements, a stock with a higher value on this measure is less liquid in the cross section. This measure thus proxies for the illiquidity of a stock.

If $DVOL_{it}$ denotes the daily dollar volume in stock i on day t, Amihud Price Impact equation will be;

$$RVOL_{it} = \frac{1}{T}\sum \frac{|R_{it}|}{DVOL_{it}} .$$

2.3 Investor Sentiment

As mentioned above, investor sentiment has many common points with liquidity. Therefore investor sentiment is a concept as elusive as liquidity. Numerous researchers stated descriptive definitions about investor sentiment. For example, Zweig (1973) states that, investor sentiment is the result of biased expectations of investors on asset values. Black (1986) calls investor sentiment as the noise in financial markets. Baker and Wurgler (2006) made a unique definition such as the investor's propensity to speculate or the level of investor optimism/pessimism. Lee, Shleifer, Thaler (1991) state that investor sentiment is the portion of investors' expectations on markets which does not have any fundamental justification. Finally according to Baker and Stein (2004) investor sentiment is the misvaluation of investor on an asset.

All in all, investor sentiment is the discrepancy caused by the current value of an asset and the level of the value that should be. In a group of investors, where one party has rational expectations and the rest have biased expectations; investor sentiment is the difference between the two groups. Under the assumption of rationally deciding investors, there would be no explanation for investment sentiment. Even if asset values deviate from their fundamental values they would be corrected by arbitrageurs. However in the real market conditions there exists short sale constraints, transaction costs or some limitations on price movements which avoids arbitrageurs to act as the immune system for price discrepancies (Black, 1986; Shleifer and Vishny, 1997). Because of the short sale constraints, stock prices are said to reflect only the most optimistic opinions of the investors on that stock (Miller ,1977). So when the investors become optimistic, in other words when the investor sentiment rises up, the stock prices are driven to higher levels, which is a proof of the relation between return structure and investor sentiment (Lei ,2005).

Smidt found a corrective price movement through modeling the time series relation between investor sentiment and expected stock returns. Zweig (1973) has two different types of investors in their model, professionals and non-professionals. Non-professionals mostly invest on their unjustifiable and sentimental information, which leads the equity prices deviate from their fundamental values. On the other hand, professional investors are aiming to profit from these deviations in prices by non-professional investors. Through this profiting activity the equity prices return to their fundamental levels again. Baker and Stein (2004) and Brown and Cliff (2005) have a similar model and they found that the higher the investor sentiment in the previous period the lower the current expected returns. If we have a look at the cross-sectional researches made on this issue, De Long, Shleifer, Summers, and Waldman (1990) also divide investors in two groups, such as rational and irrational investors.

Irrational investors have an effect on investor sentiment, where rational investors do not play any role. Irrational investors' trading activities create a noise trader risk exposure on the stocks. Given the fact that different stocks have different noise trader risk exposure, the cross section of the stocks differ in sentiment effects. Lee, Shleifer, Thaler (1991) used the discount rate on closed end investment trusts and returns of small firms to model the sentiment.

Hong, Kim and Kang (2011) used investor sentiment index for tactical portfolio allocation in the Korean stock market. They constructed a Korean investors' sentiment index by considering prior literature and expert opinions and then investigate whether the index can predict both level and cross sectional variations of stock returns. They found that sentiment index predicts both level and cross sectional variations of stock returns and the tactical asset allocation generates significant excess return after adjusting risks and transaction costs.

Baker and Wurgler (2006) argue that investor sentiment affects asset prices in the cross section. Specifically, a broad sentiment wave on the market can have different effects on stocks either because sentiment-based demand shocks or arbitrage constraints differ across stocks. Therefore, the time-series relations between investor sentiment and expected stocks returns will exhibit most on stocks vulnerable to sentiment waves and/or stocks with difficulties in arbitrage. They hypothesize that those stocks are small, young, unprofitable, non-dividend-paying, distressed, or with high volatility or extreme-growth. Consistent with their predictions, they find that those stocks earn high future returns when their beginning of period proxies for investor sentiment are low, and the patterns attenuate or reverse when the beginning sentiment proxies are high (Lei, 2005). Hvidkjaer (2008) states that stocks with low density high number of low density trades are more vulnerable to sentiment effects.

Lee, Shleifer, Thaler (1991), consistent with findings of Long, Shleifer, Summers, and Waldman (1990). Found that closed end fund discount rate has an explanatory effect on the returns of the small firms. Neal and Wheatley (1998) additionally document the relation of discount rate with size premium. Swaminathan (1996) found the relation between closed end fund and inflation, which makes discount rate to be counted as depreciation effect. Brown and Cliff (2004) didn't find any significant relation between investor sentiment and expected returns in short periods such as daily, weekly or monthly data. However, Brown and Cliff (2005) found a long tern relation between the above variables, for two to three years. Brown and Cliff (2004) had an original way of modeling sentiment, through data reduction methods such as Kalman Filtering and Principal Component Analysis on survey data, IPO records and some technical indicators. This work was criticized for unobservable sentiment values and constituting a sentiment index which is probably much noisier than a single sentiment index (Baker and Wurgler, 2006).

There are two main approaches to measure investor sentiment. First, investor sentiment can be obtained by surveys that directly ask individuals about their sentiment: a certain group of market participants or other individuals is asked on a regular basis how they feel about current or future economic and stock market conditions. The answers are then used to get a measure of overall sentiment. These survey based measures are mostly called explicit sentiment proxies. Second, investor sentiment can be measured based on market variables. These indirect measures of sentiment use trading patterns, price movements, or other market statistics to derive the overall degree of investor sentiment. These measures are referred to be implicit sentiment proxies (Finter, Niessen-Ruenzi, Ruenzi, 2010).

The first model to be introduced using fund discount rates was Zweig (1973), where 24 different closed end fund discount data from 1966 to 1970 used for obtaining superior return on DJI. Lee, Shleifer, Thaler (1991) used monthly data form 1956 to 1985 of 20 different closed end fund and they found out a closer relation between small firm returns and this sentiment index. The result hold with the findings of De Long, Shleifer, Summers, and Waldman (1990), where a value weighted index of 74 funds from 1933 to 1993 are used for the same purpose and the results are still consistent with previous work.

Chen, Kan, and Miller (1993a, 1993b) criticized the methods in Lee, Shleifer, Thaler (1991) are mistaken and missing economic significance. With closed-end fund discount data from 1965 to 1990, Swaminathan (1996) has proven the relation between closed end fund discounts and small firm returns, but he also said that the information in closed-end fund discounts is in accordance with expectations on future return growth and inflation. This result shows that investor sentiment may not be the only reason of the relation between closed-end fund discounts and small firm returns. Elton, Gruber, and Busse (1998) document that sentiment indices based on closed-end stock fund discounts from 1969 to 1994 are not priced in the market, so investors do not care about sentiment.

For example, mutual fund redemptions and IPO volumes are used as investor sentiment proxies by Lee, Shleifer, Thaler (1991). Neal and Wheatley (1998) added mutual fund redemptions and odd-lot sales divided by purchases in their model. Another approach was made by Qiu and Welch (2006) and Otoo(1999) as using survey data such as Michigan Consumer Confidence Index, Confidence Conference Board CCI, UBC/GALLUP Investor Optimism. Brown and Cliff (2004) also use American Association of Individual Investors and Investor Intelligence index for modeling sentiment, where the later index is also used by Brown and Cliff (2005).

Ben-Rapheal, Kandel and Wohl (2010) used monthly shifts from money market mutual funds to equity funds as a sentiment indicator and found a positive relation with the excess stock returns of especially growth companies and smaller companies.

Brown and Cliff (2004) also use sentiment indices such as the ratio of the number of advancing issues to declining issues, the ARMS index, the ratio of new highs to new lows, the change in margin borrowing and short interest, the ratio of short sales to total sales, the ratio of specialists' short sales to total short sales, the ratio of odd-lot sales to purchases, the ratio of CBOE equity put to call volume, the change in the net position in SPX futures by trader type, the expected option volatility to current volatility ratio, the closed-end fund discounts, the proportion of fund assets held in cash, the first day returns on IPOs, and the number of IPOs (Derrien and Kecskes, 2009; Lei, 2005).

Klein and Chow (2010) used Marginal Conditional Stochastic Dominance tests on sentiment beta sorted stocks according to Baker and Wurgler (2007) sentiment index and they found out that both positive and negative sentiment stocks dominated sentiment insensitive stocks.

Hengelbrock, Thiessen and Westheide (2010) focussed on the predictive power of investor sentiment via publication of sentiment survey. In order to reflect the effect of sentiment surveys, they used the AAII index for USA and Sentix index for Germany. According to the expected effect of sentiment they found out that the immediate effect of investor sentiment is positively related to the intermediate and long term return of that stock in Germany, however in the USA this relation is negative. Kim and Ha (2010) investigated the effect of investor sentiment on the price of stocks traded in the Korean stock market, by constructing a composite sentiment index using principal component of ten sentiment variables following Baker and Wurgler (2007)'s methodology and based on the Kumar and Lee (2006)'s work, they built quintile portfolios sorted on firm size, book to market value, institutional ownership, and price and examined the effect of investor sentiment on the respective portfolio returns with the constructed sentiment index. Results of their work imply that investor sentiment systematically affects the stock price of Korean firms with small cap, low price, and low book/market value.

Glushkov (2009) found that more sentiment-sensitive stocks are smaller, younger, with greater short sales constraints, higher idiosyncratic volatility and lower dividend yields. Moreover, after accounting for size and volatility, stocks with higher values of sentiment beta tend to have more of an analyst following, greater institutional ownership and investors' disagreement, a higher likelihood of S&P500 membership, higher turnover and lower book-to-market ratios. Cullen, Gasbarro and Le (2010) states the selectivity of fund managers should be more prevalent when fund managers trade stocks that are more sensitive to investor sentiment and, therefore, less efficiently priced. They used the Baker and Wurgler (2007) investor sentiment index to calculate stock sentiment betas and found that the higher the fund's weighted average sentiment beta at the start of a quarter, the more likely it is that the stocks it trades will be mispriced.

Baker and Stein (2004) has taken liquidity as a sentiment measure and used turnover as a sentiment measure. Baker and Wurgler (2006) constructed a composite sentiment index through six variables. These variables are discount rates of closed end investment trusts, turnover, IPO numbers, first day returns on IPO's, equity share of new issues and dividend premiums.

Verma and Soydemir (2009) examined the effect of individual and institutional investor sentiment on the market price of risk derived from DJIA and S&P500 index returns. Consistent with behavioral asset pricing models, they found significant positive response of rational sentiment suggesting greater incentive for rational investors to engage in arbitrage when the compensation for taking risk is greater and an increase in irrational optimism leads to a significant downward movement, but an increase in rational sentiment does not lead to a significant change market price of risk. Yu and Tam (2007) developed two indicators to measure investors' attitude towards risk in the Hong Kong stock market such as a risk appetite index, an investment sentiment index and found that although the risk appetite index based on the work of Gai and Vause (2006) is able to capture episodes of extreme optimism and pessimism between 1996 and 2006, it is volatile and in some cases gives spurious signals. They also show that the investment sentiment indicator, a sentiment measure derived by combining the current realized return and the expected short-term return of the stock market, has adequate power to predict the subsequent return of the stock market over a period of 6 to 12 months.

As seen above there are numerous measures on investor sentiment and it is a hard decision which measure to adopt. Here there are some common features of these measures such as; most measures aim to reflect the market's sentiment rather than individual stock level and these measures mostly effect individual investor decisions rather than corporate investors.

An interesting work of Hwang (2011) shows the relationship between popularity of a country and the investment demand for securities from US investors. The popularity of a country reflects the country specific investor sentiment, which is positively related to the intensity of US cross-border mergers and acquisitions activity. Zouaui, Nouyrigat and Beer (2010) examined the influence of investor sentiment on the probability of occurrence of stock market crises over the period 1995-2009, by using panel data of 15 European countries and the United States to estimate a multivariate logit model. They found that the sentiment of investors positively influence the probability of occurrence of stock market crises within a one-year horizon. The impact of investor sentiment on stock markets is found to be stronger for countries that culturally more prone to herd-like behavior and overreaction and countries with low efficient regularity institutions. This result is important for portfolio managers; investors' sentiment is a good predictor of securities' overvaluation.

Lee, Mucklow, and Ready (1993) found that intraday spreads increase and depth levels fall in case of abnormally rising share volume. Chordia, Subrahmanyam, and Anshuman (2001) says that the higher the past returns, the higher the subsequent turnover, so turnover should be treated carefully as a liquidity proxy. Lee and Swaminathan (2000) found a significant relation between current momentum profits and previous high volume structure. So low-volume losers significantly outperform high-volume losers, and obviously turnover is unlikely to be a good liquidity proxy. More return volatility is found to dominate the negative relation between affective spread and turnover is positively related to return volatility (Chalmers and Kadlec, 1998). Cullen, Gasbarro, Monroe and Zumwalt (2010) used actual mutual fund trades by means of momentum trades and momentum contrarian trades, to identify managers that follow these strategies. Proxying Baker and Wurgler's (2007) sentiment index to calculate individual stock sentiment betas they find that more momentum funds hold stocks with high sentiment betas and contrarian funds hold stocks with lower sentiment betas. In addition, momentum funds found to have relatively wide spreads of sentiment betas, and make larger changes to their sentiment beta when they trade and in contrast, more contrarian traders hold stocks with a narrower range of sentiment betas and make closely related with investor structure, such as homogeneity, in terms of different information smaller changes when they trade.

Several models indicate the trading volume is obtained or how investors percept public information. For example, diverse priors and disagreement among investors can both cause trading volume to change in Karpoff (1986). Harris and Raviv (1993) document the role of publicly available information in generating trading volume if investors percept the information differently. Therefore both private information and public information that can cause trading volume to rise or fall. Liao, Huang and Wu (2011) applies the Lakonishok et al.'s (1992) measure and Wylie's (2005) trinomial-distribution approach to monitor fund manager's comovement, and uses the principal component analysis as the means of extracting the composite unobserved sentiment measure from ten market weather indicators that can be categorized into three groups: individual stock sentiment indicator, overall market sentiment indicator, and fund sentiment indicator. The empirical results suggest that investor sentiment plays a significant role in explaining mutual fund herding cross-sectionally, especially on the sell-side. Fund managers show a stronger tendency to herd out of stocks with high prior investor sentiment than to herd into stocks with high prior sentiment. In other words, managers herd sell because, at least in part, they observe and counteract the optimistic sentiment.

According to Lee, Mucklow, and Ready (1993) when public information dominates the market, the liquidity grow beyond normal levels. Berry and Howe (1993) further found that the public information also increases the trading volume. On contrast, private information lead information heterogeneity and decreases liquidity. Blume, Easley, and O'Hara (1994) say that trading volume is an indicator of the quality of investor information, and the average level of information is reflected in the market price. Jones, Kaul, and Lipson (1994) also made a similar statement that trading value is directly related with the quality of the information. Llorente, Michaely, Saar, and Wang (2002) take trading volume consisting of two components; first is the volume of hedging demand and second is the volume of speculative needs. Here two group members have different information, but the information within each group is homogenous.

Investors' hedging demands come from the correlations between expected returns of assets in the hand and the cost of not investing in alternative assets. Speculative demands reflect the trades of investors with excess information. Since excess information can cause information asymmetry between investors, trading volume reflecting investors' speculative demands reduce liquidity (Koski and Michaely, 2000). Chalmers and Kadlec (1998) shows that both the effective spread and turnover increase with return volatility. In an economy without arbitrage of Ross (1989) where there asset prices are measured by martingales, the variance of price changes totally depend on the rate of information flow. Chalmers and Kadlec's (1998) findings are consistent with the view that trading volume related to private information reduces liquidity. Moreover, high investor sentiment can also lead to high trading volume. Baker and Stein (2004) document that high trading volume shows the effectiveness of overconfident investors, which is caused by rising investor sentiment. High investor sentiment can also lead opinion diversification between with rational investors and investors with biased asset valuations. If high investor sentiment causes the level of speculative demand to rise, as suggested by Baker and Wurgler (2006), Llorente, Michaely, Saar, and Wang's (2002) model would also suggest a positive relation between investor sentiment and trading volume. Kling and Gao (2008) used vector autoregression models with survey data on Chinese institutional investor forecasts in order to test the predictive power of sentiment on explaining future returns on Chinese stocks. According to Granger causality; a decline in stock returns pull down the level of the sentiment, but not vice versa. Schmelling (2008) examined whether consumer confidence, as a proxy of individual investor sentiment, affects expected stock returns internationally in 18 industrialized countries and found that sentiment negatively forecasts aggregate stock market returns on average across countries, in other words When sentiment is high, future stock returns tend to be lower and vice versa. He further found this relation that holds for returns of value stocks, growth stocks, small stocks, and for different forecasting horizons. Finally, he employed a cross-sectional perspective and provide evidence that the impact of sentiment on stock returns is higher for countries which have less market integrity and which are culturally more prone to herd-like behavior and overreaction.

The view that there is a market-driven component in trading volume has been accepted in the literature, however a theoretical model for a security's trading volume as a function of the market trading volume is not available until 1999. Tkac (1999) assumes two types of investors with different preferences and risk tolerances. They trade only for their rebalancing needs to hedge against the endogenous risks on asset returns. Two-fund separation holds in this model and all assets have the same turnover as the value-weighted market portfolio. This model doesn't explain the deviations of individual asset's trading volume from the market turnover as a whole, Tkac (1999) says using a volume market model for firm-specific characteristics and the market volume at the same time. In this model, trading volume elevates from firm's specific characteristics (the regression intercept), the relation between an asset's trading volume with the market volume (the market component), and exogenous information events (the residual). Nevertheless, there is no role for private information to cause trading volume in the model of Tkac (1999). The sources of the endogenous risks on asset returns, which lead to rebalance needs, are also not clear. Judd, Kubler, and Schmedders (2003) show in a general equilibrium with mutually exclusive agents, rebalancing needs don't generate essential trading volume values.

In contrast, it is widely accepted that trading volume series are mostly nonstationary. Specifically, trading volume rises over time and may not have a constant mean and a constant variance. Mean and variance alone are not sufficient statistics to characterize a trading volume series.

Lo and Wang (2000) shows that the evidence of secular trends in trading volume measured by weekly turnover for NYSE and AMEX stocks from 1962 to 1996. Statistical tests reject the stationarity of the value-weighted market turnover. However, in attempts to detrend the nonstationary market volume series, Lo and Wang (2000) report that different detrending methods can have substantial impacts on the resulting time series. The detrending methods they used, include the linear detrending, the log-linear detrending, the first differencing, a four-lag moving average normalization, the linear-quadratic detrending and deseasonalization, and the nonparametric detrending via kernel regression. In face of those problems, Lo and Wang (2000) use raw turnover in their analyses but confine the analyses to 5-year sub-periods.

Finter, Niessen-Ruenzi, Ruenzi (2010) introduced a Generalized Sentiment Index (GSI), where well known macro investor sentiment proxies such as industrial production, inventory orders, factory orders, retail sales and employment levels are decomposed into an index via principle component analysis. Using this index and German Stock Market data from 1993 and 2006 for 765 stocks, investor sentiment is found to have a predictive power for hardly arbitraged and valued stocks

There are still other problems that researchers will encounter in detrending trading volume series. For instance, a detrending method applicable to one trading volume series is not necessarily applicable to another trading volume series. Although statistically it is possible to detrend a time series until further tests do not reject its stationarity, for thousands of stocks over a prolonged period of time, this methodology would suggest numerous specifications and render further analysis infeasible (Lei, 2005).

In the model of Baker and Stein (2004), there are one class of rational investors and one class of overconfident investors. Both classes of investors have non-negative weights on the pricing function of the underlying security but the overconfident investors outweigh their own information. There are also short-sales constraints on the market and insiders who trade on their private information. When investor sentiment increases, the overconfident investors under-react further to the information contained in the insiders' trades and gain a greater weight on the pricing function. Their transactions drive security prices up and lower the price impact of trades. The elevated prices lead to lower expected returns and the lowered price impact attracts trading volume. Since there are short-sales constraints on the market, the rational investors cannot counteract the overconfident investors' transactions. To the extreme, when investor sentiment becomes very high, the overconfident investors dominate the market, which is characterized with high liquidity and high trading volume. An increase in trading volume thus reflects the participation of overconfident investors in the market, and indicates an increase in investor sentiment.

Using the Australian data Bird and Yeung (2010) examined the impact of uncertainty on the market response to earnings announcements. They added the level of VIX in addition to the change in VIX to diversify their work form Williams (2009) in order to proxy how the market responds to earnings information. They found evidence of a slight optimistic bias in the reaction of investors to earnings released at a time of low market uncertainty.

Chung and Yeh (2009) searched the relationship between return predictability and investor sentiment when the stock fundamentals exhibit regime shifts. They proposed a simple way to explore this issue within the conventional predictive regression framework and a testing procedure to tackle the potential econometric problems. Their findings are roughly; the effects of sentiment on predicting the cross-section of future stock returns are significant only under a certain regime; dividend- and earning-oriented portfolios show strong conditional predictability patterns only after conditioning on sentiment; regime and the appearance of the size and value effects is associated with sentiment and the state of regime.

For the Brazilian Stock Exchange Yoshinaga and Junior (2010) estimated a pricing model including a self built sentiment index variable for the period comprehending 1999 to 2008, stocks of non-financial firms listed at BM&FBOVESPA. The pricing model was estimated by GMM considering the sentiment index, systematic risk (beta) and factors as firm size, market-to-book ratio, leverage and return predictability measured by momentum or revenues growth. Different estimation procedures were employed in order to find parameters which are less affected by unobserved heterogeneity, outliers or endogeneity. Results suggest that sentiment is a relevant factor in Brazilian asset pricing models. A negative and statistically significant relationship between the sentiment index and stock returns was consistently found in different specifications. These findings suggest the existence of a reversion pattern in stock returns, meaning that after a positive sentiment period, the impact on subsequent stock returns is negative and vice-versa.

Stambaugh, Yuan and Yu (2011) investigated the role of investor sentiment in a broad set of anomalies in cross-section of stock returns, in a model where the presence of market-wide sentiment is combined with the argument that overpricing should be more prevalent than underpricing, due to short-sale constraints. They found that, each anomaly is stronger (its long-short strategy is more profitable) following high levels of sentiment, the short leg of each strategy is more profitable following high sentiment and sentiment exhibits no relation to returns on the long legs of the strategies.

Yacob (2010) introduced the investor sentiment composite index constructed specifically for the emerging markets, in particular the Bursa Malaysia. The composite index is constructed comprising of liquidity proxy, the information IPOs and advancer decliners ratio. A proxy known as oversubscription ratio is taken from the IPO literature is also added that shows investors demand in the market. Bursa Malaysia is found to closely represent the emerging markets as to study the impact investor sentiment has on the returns and also the contribution to the bull and bear stock market defined by the leading indicator KLCI.

In their work Antoniou, Doukas and Subrahmanyam (2010) focused on the sentiment effects on the profitability of price momentum strategies. In their model when sentiment is high and investors are optimistic, news that contradicts investors' optimism causes cognitive dissonance which leads slower diffusion of adverse signals and thus stronger momentum. They found that momentum profits arise only under optimism, and are driven principally by strong momentum in losing stocks, consistent with their model setup.

Above was the review of what had been done in the sentiment literature, in the context of trading volume and liquidity, which are closely related concepts. As said before, the sentiment literature mostly concentrate on the sentiment of market as a whole, and therefore the majority of the proxies that have been developed are on the market sentiment. However, a relatively less used indicator, the so called trading volume trend is able to provide some information about the corresponding stock as a unique entity. The trading volume trend by definition is the average change on trading volume per unit of time. It reflects the average propensity of investors to trade. It is a better sentiment measure than the level of trading volume for the following reasons: First, it reflects the movement of overconfident investors on the market in the framework of Baker and Stein (2004). Second, the sentiment literature suggests that the formation of investor sentiment is likely through a process over time (Smidt, 1968; Brown and Cliff, 2005). The trading volume trend can summarize the process rather than being a snap shot on the process. Third, stocks in the cross section can have the same level of trading volume but very different trading volume trends over a period of time. The trading volume trend thus mitigates the problem of mixing investor sentiment information with liquidity information (Lei, 2005).

Siriopoulos and Fassas (2010) proposed a new measure of Greek stock market volatility based on the prices of FTSE/ATHEX-20 index options. Greek Implied Volatility Index is calculated using the model-free methodology that involves option prices summations and is independent from the Black and Scholes pricing formula. The specific method is applied for the first time in a peripheral and illiquid market as the Athens Exchange. Their empirical findings show that the proposed volatility index includes information about future realized volatility beyond that contained in past volatility and in addition, show that there is a statistically significant negative and asymmetric contemporaneous relationship between the returns of the implied volatility index and the underlying equity index. They also investigated the effects of the Greek Implied Volatility index on New York Stock Exchange and the Deutsche Börse.

3. DATA AND METHODOLOGY

Stock characteristics are found to effect the return patterns of the stocks. This work mainly focuses on the existence and the extent of this relationship with investor sentiment. Regions, sectors, market capitalizations, free floating percentages, geometric growth levels, price to earning ratios, dividend yields, gross margins, return on asset ratios, current ratios, quick ratios, long term debt ratios, weighted average cost of capital levels, stock betas and alphas are first grouped into different clusters, and then the relationship among groups are observed.

Time series relationship between return and volume trend series are tested and then the cross-sectional relation between the trading volume trend and expected stock returns are examined. The return series are regressed on lagged terms of return (up to four weeks), volume trend (up to four weeks), volume level and absolute values of volume trends. On the second stage new variables are introduced to the model, such as overall investor sentiment indicators, market indices of the corresponding country and GARCH volatilities for the return and volume trend series. Within the framework of this work, 78 different countries and 14637 different stocks are being evaluated.

3.1 Data

The complete data is consisting of seven regions such as, Africa and Middle East, Developed Asia, Developing Asia, East Europe, West Europe, Latin America, North America, where the number of countries to be evaluated are tried to be as homogenous as possible. For some regions such as Africa, Ex-Soviet Union Countries and Latin American Coutries, stock data is mostly either not available or data structures are not appropriate for handling. Almost all of the data are obtained from Bloomberg data source, except macroeconomic indicators, which are taken from the IMF World Economic Outlook Report (April 2011) publicly available on IMF website.

3.1.1 Volume and return data of separate equities

Below is the number of countries and stocks being evaluated within this work, with respect to their regions. According to the number of countries West Europe has the highest share with 24.4% among all countries. Second region to have the highest share is Middle East and Africa, where 17 countries are available with 21.8% in the data pool. Third region is East Europe, where 16 countries are available with 20.5% in the data pool. Fourth region is Developing Asia, where 11 countries are available with 14.1% in the data pool.

Rest of the regions are below 10% share. Latin America has 7.7% share with Argentina, Brazil, Chile, Colombia, Peru and Venezuella. Developed Asia has 6.4% share with Australia, Hong Kong, Japan, Singapore and South Korea. North America has 5.1% share with the USA, Canada, Mexico and Jamaica.

With respect the to number of shares within the region however, this ranking changes quite much, because of the number of shares substantially differ among countries according to their level of development. Totally 14637 shares are being evaluated and among them, the first places belongs to Developed Asia with 20% (2928 equities), the second region is North America with 19.3% (2819 equities). As mentioned above these regions are ranked in the last three according to the number of countries, however high levels of capitalization leads these countries to have numerous equities traded in organized markets. Just like Developed Asia and North America, another developed region West Europe has the third place with 18.6% (2727 equities).

Rest of the regions contitute 42% percent of all of the data, such as; Developing Asia (16.4%, 2402 equities), Africa and Middle East (13.6%, 1996 equities), East Europe (8.6%, 1266 equities) and Latin America (3.4%, 499 equities).

Table 3.1: Numbers and percentages of countries according to regions.

Region	No of Countries	% of Countries	No of Stocks	% of Stocks
Africa&M. East	17	21.8%	1996	13.6%
Asia (Developed)	5	6.4%	2928	20.0%
Asia (Developing)	11	14.1%	2402	16.4%
East Europe	16	20.5%	1266	8.6%
Latin America	6	7.7%	499	3.4%
North America	4	5.1%	2819	19.3%
West Europe	19	24.4%	2727	18.6%
Total	78		14637	

In order to investigate the countries within each region, below the highlight macroeconomic indicators of each country are given. The countries are listed in the alphabetical order. This sample aims to represent the entire financial market across the board. Therefore the sample is chosen from both developing and developed countries. Off course, the capitalized nature of developed countries leads the number of equities to rise, that’s why the total number of observations from the developed countries exceed the number of developing countries.

Looking at the table below, the first country by the number of equities is the USA with 2534 equities, which is followed by South Korea and Japan with 1431 and 1182 equities. Some of the other countries enlisted in the higher ranks are; China (748 equities), Israel (734 equities), India (649 equities) and UK (636 equities).

The equities are picked in order to homogenize the number or equities within each region, therefore number of equities are less per country if that region has more number of countries. Therefore the number of equities is 2534 for the USA where there are only four countries available, but on the other hand the number of equities remained as low as 336 for Germany where the number of countries is 16 for West Europe. Turkey has 277 equities to be evaluated.

According to the Gross Domestic Production, the USA is the first with more than \$14.5 Trillion, far beyond the secondary listed country China with around \$6 Trillion. On the third place Japan is positioned with just below \$5.5 Trillion. The following three countries are Western European countries Germany (\$3.3 Trillion), France (\$2.5 Trillion) and the UK (\$2.2 Trillion). Turkey is on the seventeenth place with just below \$750 Billion. The last six position, in other words countries with the lowest GDP are Estonia (\$20 Billion), Jamaica (\$14 Billion), Iceland (\$13 Billion), Mauritius (\$10 Billion), Malta (\$8 Billion) and Zimbabwe (\$7 Billion).

Table 3.2: Main economic facts about the countries.

Country	Total	GDP (Billion $)	GDP/Capita ($1000)	Population (Mio)	Unemployment (%)	Country	Total	GDP (Billion $)	GDP/Capita ($1000)	Population (Mio)	Unemployment (%)
Argentina	56	370	9	41	8%	Malta	4	8	20	0	7%
Australia	10	1236	56	22	5%	Morocco	70	103	3	32	9%
Austria	41	377	45	8	4%	Mauritus	32	10	8	1	7%
Bahrain	36	23	20	1	0%	Mexico	51	1039	10	109	5%
Belgium	81	466	43	11	8%	Nether.	75	783	47	17	4%
Brazil	223	2090	11	193	7%	Nigeria	80	217	1	156	5%
Bulgaria	58	48	6	8	10%	Norway	152	414	84	5	4%
Canada	284	1574	46	34	8%	Oman	46	56	19	3	0%
Chile	73	203	12	17	8%	Pakistan	73	175	1	167	6%
China	748	5878	4	1341	4%	Peru	33	153	5	30	8%
Colombia	31	286	6	46	12%	Philipp.	81	189	2	94	7%
Croatia	77	61	14	4	12%	Poland	373	469	12	38	9%
Czech	9	192	18	11	7%	Portugal	31	229	22	11	11%
Denmark	116	311	56	6	4%	Qatar	38	-	-	-	-
Egypt	140	218	3	78	9%	Romania	96	162	8	21	8%
Estonia	11	20	15	1	17%	Russia	162	1465	10	140	8%
Finland	66	239	44	5	8%	S.Arabia	134	444	17	26	10%
France	349	2583	41	63	10%	Serbia	27	39	5	7	19%
Germany	336	3316	41	82	7%	Singapore	7	223	43	5	2%
Greece	58	305	27	11	12%	Slovakia	1	87	16	5	14%
HK	145	225	32	7	4%	Slovenia	27	48	24	2	7%
Hungary	35	129	13	10	11%	S.Africa	247	357	7	50	25%
Iceland	3	13	39	0	8%	S.Korea	1431	1007	21	49	4%
India	649	1538	1	1216	0%	Spain	98	1410	31	46	20%
Indonesia	152	707	3	234	7%	Sri Lanka	55	50	2	20	5%
Ireland	27	204	46	4	14%	Sweden	285	456	49	9	8%
Israel	734	213	29	7	7%	Switzer.	211	524	67	8	4%
Italy	151	2055	34	60	8%	Taiwan	153	-	-	-	-
Jamaica	24	14	5	3	12%	Thailand	133	319	5	64	1%
Japan	1182	5459	43	127	5%	T&Tob.	5	21	21	1	8%
Jordan	177	28	5	6	13%	Tunisia	44	44	4	11	13%
Kazak.	6	138	9	16	6%	Turkey	277	742	10	71	12%
Kenya	41	32	1	40	0%	UAE	57	302	60	5	0%
Kuwait	121	131	36	4	2%	UK	636	2247	36	62	8%
Latvia	10	24	11	2	19%	Ukraine	24	136	3	45	8%
Lebanon	3	39	10	4	0%	USA	2534	14658	47	310	10%
Lithuania	32	36	11	3	18%	Venezuela	3	291	10	29	9%
Luxembourg	8	55	109	1	6%	Vietnam	480	104	1	88	5%
Malaysia	45	238	8	28	3%	Zimbabwe	15	7	1	13	0%

According to the Gross Domestic Production per Capita, Luxembourg is the first with more than $100000, the secondary listed country is Norway with around $84000. On the third place Switzerland is positioned with around $67000.

The following three countries are UEA ($60000), Denmark ($56000) and Australia ($56000). Turkey is on the forty seventh place with $10000. The last six position, in other words countries with the lowest GDP per Capita are Nigeria, India, Vietnam, Pakistan, Kenya and Zimbabwe; all has around $1000 of domestic output per capita in 2010.

Looking at the population data of these countries the situation is quite different. China and India has the first two places with 1.3 and 1.2 Billion inhabitants, which is around one third of the world population. Following this two highly populated countries, USA (310 Mio.), Indonesia (234 Mio.), Brazil (193 Mio.) and Pakistan (167 Mio.) has the significantly higher populations. Turkey is on the fifteenth place with 71 Mio. inhabitants. The lowest ranked countries by means of population, in other words countries with the lowest population are Estonia, Mauritius, Bahrain, Trinidad Tobago and Luxembourg; all has around 1 Mio inhabitants; Malta and Iceland below 1 Mio. inhabitants by the end of 2010.

3.1.2 Volume and return data of country stock indices

As mentioned before, in the second stage of this work, the beta coefficients of Volume Trend values are tested for their robustness. With this respect return and volume data of the corresponding index is used as additional explanatory variable, and the significance of these beta coefficients are investigated whether persist or not. Below table shows the details about the indices used as explanatory variables of the corresponding stocks. As shown in the table, indices used in this work are different from each other by market capitalization, values traded and number of stocks. In total, there are 50,275 stocks available for the 78 countries as the population and as mentioned earlier the number of stocks being evaluated within this work is 14638. That makes about %30 of the whole population. So the depth of the sample is useful for the precision and representativeness of the findings of this work.

Table 3.3: Information about the capital markets of the countries.

Rank	Country	Index	Mark.Cap. (Biilion $)	Trd.Value (Biilion $)	No of Stocks	Rank	Country	Index	Mark.Cap. (Biilion $)	Trd.Value (Biilion $)	No of Stocks
1	USA	SPX	20,901	33,252	4,279	39	UAE	DFMGI	105	66	101
2	Japan	TPX	3,827	3,787	3,553	40	Luxemb.	LUXXX	101	-	33
3	UK	UKX	3,613	2,741	2,056	41	Peru	IGBVL	100	3	199
4	China	SHASHR	2,717	4,496	2,063	42	Egypt	HERMES	82	53	211
5	HK	HSI	2,711	1,496	1,396	43	Portugal	PSI20	82	46	47
6	Canada	SPTSX	2,170	1,368	3,805	44	Greece	FTASE	73	52	287
7	India	SENSEX	1,631	258	4,987	45	Morocco	MOSEMDX	69	29	73
8	India	SENS	1,596	801	4,987	46	Argentina	MERVAL	64	3	101
9	Brazil	IBOV	1,545	868	373	47	Kazak.	KZKAK	61	4	60
10	Australia	AS51	1,454	1,062	1,913	48	Nigeria	NGSEINDX	51	5	215
11	Germany	DAX	1,429	1,628	571	49	Czech	PX	43	21	16
12	China	SHAS	1,311	3,572	2,063	50	Ukraine	UX	39	1	183
13	Switzer.	SMI	1,229	788	246	51	Pakistan	KSE100	38	24	644
14	Spain	IBEX	1,171	1,360	3,310	52	Ireland	ISEQ	34	18	50
15	S.Korea	KOSPI	1,091	1,607	1,781	53	Romania	BBETINRM	32	2	1383
16	Russia	RTSI	949	408	345	54	Jordan	JOSMGNFF	31	14	277
17	S.Africa	JALSH	925	340	360	55	Hungary	BUX	28	26	48
18	Nether.	AEX	661	604	113	56	Croatia	CRO	25	1	221
19	Sweden	OMX	581	390	331	57	Vietnam	VNINDEX	20	7	164
20	Mexico	MEXBOL	454	77	130	58	Oman	MSM30	20	6	120
21	Malaysia	FBMKLCI	411	73	957	59	Bahrain	BHSEASI	20	-	44
22	Singapore	FSSTI	370	252	461	60	Sri Lanka	CSEALL	20	1	241
23	S.Arabia	SASEIDX	353	337	146	61	Kenya	KNSMIDX	14	-	53
24	Chile	IPSA	342	38	227	62	Lebanon	BLOM	13	1	10
25	Italy	FTSEMIB	318	460	291	63	T&Tob.	TTCOMP	12	-	37
26	Turkey	XU100	307	244	337	64	Zimbabwe	ZHSMIND	11	-	76
27	Thailand	SET	278	135	541	65	Tunisia	TUSISE	11	1	54
28	Belgium	BEL20	269	128	161	66	Serbia	BELEXLIN	10	1	7
29	Norway	OBX	251	248	195	67	Slovenia	SBITOP	9	1	71
30	Denmark	KFX	232	148	196	68	Bulgaria	SOFIX	7	-	390
31	Israel	TA-100	218	88	596	69	Jamaica	JMSM	7	-	39
32	Indonesia	JCI	211	112	420	70	Mauritus	SEMDEX	7	-	86
33	Colombia	IGBC	209	13	84	71	Lithuania	VILSE	6	-	39
34	Poland	WIG20	190	56	569	72	Slovakia	SKSM	4	-	90
35	Philipp.	PCOMP	157	17	251	73	Venezuela	IBVC	4	-	55
36	Qatar	DSM	124	26	43	74	Malta	MALTEX	2	-	20
37	Kuwait	KWSEIDX	120	-	215	75	Estonia	TALSE	2	-	15
38	Finland	HEXP	118	91	123	76	Iceland	OMXI6ISK	2	-	7
						77	Latvia	RIGSE	1	-	33

The first column in the table above is the market capitalization of the stock exchanges being evaluated in this work. The leading country for market capitalization is obviously the United States, with a far high level such as $21 Trillion, which is about six times higher then the consecutive country Japan with $3.8 Trillion. On the third and fourth place UK and China is coming with $3.6 and $2.7 Trillion. Hong Kong is also around $2.7 Trillion, as high as the rest of China, and Canada is the last country with a market capitalization exceeding $2 Trillion. India, Brazil, Australia, Germany, Switzerland, Spain and South Korea are the countries exceeding $1 Trillion of market capitalization. Turkey is on the twenty-sixth place with $301 Billions of market capitalization. At the end of the list, Slovenia, Bulgaria, Jamaica, Mauritius, Lithuania, Slovak Republic, Venezuela, Malta, Estonia, Iceland and Latvia are finding place with respect to their market capitalization size rankings below $10 Billions.

In the table above the second column is the traded values of the stock exchanges being evaluated in this work. The leading country for traded values is again the United States, with a far high level such as more than $33 Trillion, which is more than seven times higher then the consecutive country China with $4.4 Trillion. On the third and fourth place Japan and UK is coming with $3.7 and $2.7 Trillion. Germany and South Korea is around $1.6 Trillion. Hong Kong, Canada, Australia and Spain are also the countries exceeding $1 Trillion of traded values . Turkey is on the twenty fourth place with $244 Billions of traded values . At the end of the list, Croatia, Tunisia, Lebanon, Slovenia, Sri Lanka, Ukraine and Serbia are finding place with respect to their traded value size rankings below $1 Billions.

In the table above the last column is the number of stocks traded in the corresponding stock exchanges being evaluated in this work. The leading country for traded values is India, with approximately 5000 stocks traded. India is followed by USA with about 4200 stocks. On the third, fourth and fifth places Canada, Japan and Spain are coming with around 3800, 3500 and 3300 stocks. China and UK are slightly over 2000 stocks. Hong Kong, South Korea, Australia and Romania are also the countries exceeding 1000 traded stocks. Turkey is on the twenty fourth place with 337 stocks traded. At the end of the list, Malta, Czech Republic, Estonia, Lebanon, Iceland and Serbia are finding place with respect to their traded values size rankings below 20 stocks traded.

If these indices are ranked with respect to the market capitalization per number of stocks traded, an alternative view on these indices is obtained. For example, the first country with highest market capitalization per number of stocks traded is Netherlands, with approximately $6 Billion, per share. Netherlands is followed by Switzerland and the USA with market capitalization values close to $5 Billion per share. Brazil, Mexico and Luxembourg are the other countries exceeding $3 Billions of market capitalization values per share. Turkey is the thirty first with just below $1 Billion. At the bottom of the list Sri Lanka, Mauritius, Venezuela, Pakistan, Slovak Republic, Latvia, Romania and Bulgaria are finding place with market capitalization per share values below $100 Millions.

Finally if these indices are ranked with respect to the traded values per number of stocks traded, the first country with highest market capitalization per number of stocks traded is the USA, with approximately $8 Billion, per share. The USA is followed by Switzerland and Netherlands with traded values of $5.3 and 3.2 Billion per share. Brazil, Germany, Saudi Arabia and China are the other countries exceeding $2 Billions of traded values per share. Turkey is the twenty third with around $700 Millions. At the bottom of the list Argentina, Tunisia, Nigeria, Peru, Slovenia, Croatia, Sri Lanka, Ukraine and Romania are finding place with traded values per share values below $30 Millions.

3.1.3 GARCH volatilities

As mentioned earlier, GARCH volatility series are calculated and used for testing the robustness of the Volume Trend series. Volume trend has a short memory, dating back just to the previous values on the corresponding variable. However GARCH volatilities have longer memories.

Leptokurtosis, volatility clustering and leverage effects in linear and time series models are hard to be mainly because they assume that the conditional variance is constant. In order to model the non-constant volatility parameter for both returns and differences in weekly volume, GARCH is introduced in the model. GARCH model is found to be parsimonious and gives significant results as per previous literature, because it allows the conditional variance of a stock price or index to be dependent upon previous own lags. The GARCH (p,q) model is given by;

$$R_t = \mu + \varepsilon_t \qquad \text{(Mean Equation)}$$

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 \qquad \text{(Variance Equation)}$$

where p is the order of GARCH while q is the order of ARCH process. Error, ε_t, is assumed to be normally distributed with zero mean and conditional variance, σ_t^2. R_t are return and volume trend series, so their mean value (which will be given by μ) is expected to have an explanatory role in representing the investor sentiment. All parameters in variance equation must be positive, and the sum of α and β is expected to be less than, but close to, unity, with $\beta > \alpha$ by definition (Floros, 2007).

News about volatility from the previous period can be measured as the lag of the squared residual from the mean equation (ARCH term). Also, the estimate of β shows the persistence of volatility to a shock or, alternatively, the impact of old news on volatility. Here the volatility of both return and volume trend series are used with weekly data. As the mostly used method among different GARCH models, GARCH(1,1) is adopted for generating the GARCH volatility series for both return and volume trend series.

3.1.4 Sentiment indicators

Using the sentiment indices available on Bloomberg database, an alternative indicator for representing the investor mood is developed via factor analysis. There are more than 75 sentiment indices available for investor sentiment in Bloomberg database, for the entire world, some of them are from Europe, some of them are from Asia but most of the data is generated from data resources of the United States. However, depending on the contagion effect within developed and emerging markets, sentiment in the developed countries mostly have a significant explanatory role on the return variances in the emerging markets. Here the hardest challenge was the frequencies of the above mentioned sentiment indices. Some of the indices are generated on weekly, some of them on monthly, and the rest is mostly on quarterly basis. This makes investigating the effects with high frequency hard, if not impossible. Data used in this work is prepared on weekly basis, therefore only weekly sentiment indices are taken into account for testing the robustness of volume trend. The approach of interpolating the missing values is not suitable, because especially for quarterly data, most of the observations would be forced to behave according to ending values, so the indices would be biased.

The sentiment indices in Bloomberg database which are available in weekly basis are as follows;

AAII US Investor Sentiment Bearish, Bullish and Neutral Readings

The indices reflect the sentiment of individual investors towards the stock mark et over the next 6 months. The question asked is "I feel that the direction of the stock market over the next 6 months will be.” The American Association of individual Investors (AAII) Polls indicate the bullishness bearishness, neutral view of the stock market. High bullish readings in the poll usually are signs of market tops; lows ones, market bottoms.

Bloomberg Commodity Sentiment Copper Bearish, Bullish and Neutral Readings

Percent of respondents in a weekly Bloomberg News survey of traders, investors, analysts and producers predicting copper prices will fall the following week. The number of participants in the survey, which is completed every Friday, may vary. To see the weekly stories on surveys on commodities, currencies, bonds and stock markets.

Bloomberg Commodity Sentiment Crude Oil Bearish, Bullish and Neutral Readings

Percent of respondents in a weekly Bloomberg News survey of analysts and strategists predicting crude oil prices will rise the following week. The number of participants in the survey, which is completed every Friday, may vary. To see the weekly stories on surveys on commodities, currencies, bonds and stock markets.

Bloomberg Commodity Sentiment Gold Bearish, Bullish and Neutral Readings

Percent of respondents in a weekly Bloomberg News survey of traders, investors, and analysts predicting gold prices will be little changed the following week. The number of participants in the survey, which is completed every Friday, may vary. To see the weekly stories on surveys on commodities, currencies, bonds and stock markets.

Bloomberg New Highs & New Lows Sentiment Index on NYSE & NASDAQ Composite

The New Highs and New Lows indices represent the 52-week highs/lows for a specific100 means that more traders have opened long put options than long call options.

ISE Sentiment Index

The ISE Sentiment Index (ISEE) is designed to show how investors view stock prices. The ISEE only measures customer transactions on ISE. Transactions made by market makers and firms are not included in ISEE because they are not considered representative of market sentiment due to the often specialized nature of those transactions. Customer transactions, meanwhile, are often thought to best represent market sentiment because customers, which include individual investors, often buy call and put options to express their market sentiment toward a particular stock.

Sabrient Insider Sentiment Index

The Sabrient Insider Sentiment Index is designed to help markets incorporate significant insider information into stock valuation. Companies are selected for inclusion in the 100- stock portfolio by using a factor analysis in a process that extracts information from available insider information and confirms it to avoid behavioral pitfalls of the insiders. The resultant portfolio has had a risk profile similar to the market (estimated beta near one) with an expected 10.3% differential return per year (estimated alpha of 0.82% per month vs. the Russell 3000 Index). Sector and industry concentrations are controlled to avoid certain idiosyncratic risks, and turnover is limited to 25% per quarter.

U.S. JP Morgan Treasury Investor Sentiment All Client Short, Neutral & Long

The J.P. Morgan Investor Sentiment Index score is derived from asking survey respondents six questions to clarify the confidence of investors about (Q1) the Hang Seng Index, (Q2) HK economic environment, (Q3) HK investment environment and sentiment, (Q4) global economic environment, (Q5) the possibility of personal asset appreciation, and (Q6) the possibility of increasing their investment. These 6 questions form the sub-indices of the J.P. Morgan Investor Confidence Index. The Index and all sub-indices have a range between 0 and 200. A number greater than 100 represents a positive outlook and vice versa.

Credit Suisse Fear Barometer

The CS Fear Barometer measures investor sentiment for 3-month investment horizons by pricing a zero-cost collar. The collar is implemented by the selling of a 10% OTM SPX call option and using the proceeds to buy an OTM put. The CSFB level represents how far out-of-the-money that SPX put is. The higher the level, the greater the fear.

Smart Money Flow Index

The Smart Money Flow Index is calculated by taking the action of the Dow in two time periods: the first 30 minutes and the close. The first 30 minutes represent emotional buying, driven by greed and fear of the crowd based on good and bad news. There is also a lot of buying on market orders and short covering at the opening. Smart money waits until the end and they very often test the market before by shorting heavily just to see how the market reacts. Then they move in the big way. These heavy hitters also have the best possible information available to them and they do have the edge on all the other market participants. To replicate this index, just start at any given day, subtract the price of the Dow at 10 AM from the previous day's close and add today's closing price. Whenever the Dow makes a high which is not confirmed by the SMFI there is trouble ahead.

BNP PARIBAS ForECASt Barometer Index

The Indices began to be calculated by BNP Paribas on July 30, 2010 and thus have limited performance history available for you to consider when determining whether to invest in this transaction. In addition, BNP Paribas has not previously entered into transactions with third parties based on the Indices to any significant extent. For the period between the base date December 31, 2002 and the launch of the Index the Sponsor has retrospectively calculated the Index values using published historical data. The past performance of the Indices provides no assurance of their performance in the future or of the profitability of any transactions based on the Indices.

Dynamic Carry Index USD 3D

The DCIU3D strategy implements the Forward Bias strategy filtered by Deutsche Bank Risk Barometer (DBRB) signal. Deutsche Bank waits three days for the daily signal to be confirmed before impacting the strategy.

Conference Board UK Leading Economic Indicator

Leading Economic Indicator - Level. This is a barometer of Economic activity for the UK, calculated to highlight the peaks and troughs present in business cycles. The leading indicator is composed of nine components which include order book volume, expected output volume, change in consumer confidence, house building starts, the fixed interest price index, all share price index, new orders in engineering industries, whole economy productivity and the operating surplus of corporations. Data is not adjusted for seasonal influences and based at 2004=100. Copyright The Conference Board Inc. In July 2007 the source made benchmark revisions to the composite indices bringing them up-to-date with the revisions in the source data and updating the standardization factors used in their calculations. The changes take effect from Nov 2006.From January 2009 the base year was changed to 2004=100 from 1990=100. The source made further benchmark revisions to the composite economic indexes to bring them up to date. These revisions do not change the cyclical properties of the indexes.

State Street Investor Confidence Index

The State Street Investor Confidence Index measures the attitude of investors to risk. Developed by Harvard Professor Ken Froot and State Street Associates Director Paul O'Connell, the Index uses the principles of modern financial theory to model the underlying behavior of global investors. Unlike other survey-based confidence measures that focus on expectations for future prices and returns, the Index provides a quantitative measure of the actual and changing levels of risk contained in investment portfolios representing about 15% of the world's tradable assets. This index was rebased on May 2009.

As per details given above, some of these indices are expected to move much or less correlated. Details of the correlation structure of raw sentiment indices are given in appendix. Therefore using this data together may lead some problems depending on the multi-collinearity. In order to get rid of this threat, data should be transformed into uncorrelated form, while being reduced in dimension for ease of interpretation. For data reduction and solving the correlation problem, factor analysis is being implemented for 24 different investor sentiment indices in order to have reduced and uncorrelated sentiment components.

Descriptive statistics of the raw sentiment indices are given in the table below. All indices have mean values close to zero, because the difference in the level of consecutive sentiment indices reflect the potential for returns. It is no surprise for sentiment indices to have an average of zero. On the contrary, their propensity to fluctuate around zero clearly differ from each other. For example AAII US Investor Sentiment Bearish, Bullish and Neutral Readings Index has a standard deviation of 22% with a moderate deviation, where Credit Suisse Fear Barometer, Smart Money Flow Index, BNP PARIBAS ForECASt Barometer Index, Dynamic Carry Index USD 3D have low levels of standard deviation close to zero, which reflects the stabile nature of these indices. On the other hand, Bloomberg New Highs & New Lows Sentiment Index on NYSE & NASDAQ Composite have an extraordinary high level of standard deviation around 80%, reflecting the fluctuating nature of these indices. Data is consisting of 309 observations and 24 variables.

Table 3.4: Descriptive statistics of the public sentiment indices.

	Mean	Std. Deviation	Analysis N
AAIIBEAR	-.0014	.21971	309
AAIIBULL	.0011	.22494	309
AAIINEUT	-.0004	.23868	309
CMSEHGBR	.0000	.44740	309
CMSEHGBL	.0007	.49999	309
CMSECLBR	.0003	.42809	309
CMSECLBL	.0011	.48088	309
CMSECLNU	-.0016	.54094	309
CMSEGCBR	.0000	.68792	309
CMSEGCBL	-.0007	.36489	309
CMSEGCNU	.0043	.64737	309
NWHLSENY	.0003	.86509	309
NWHLSEAM	.0009	.74333	309
NWHLSEND	.0008	.82312	309
TRADSENI	.0004	.56754	309
ISESENT	.0012	.27298	309
SBRIN	.0015	.03538	309
TINSALLO	-.0059	.25578	309
TINSALNE	.0012	.11237	309
TINSALHI	.0055	.32308	309
CSFB	.0010	.06436	309
SMART	.0000	.02656	309
BPFCSTBU	.0030	.01758	309
DCIU3D	.0009	.01667	309

In order to test the data for adequacy to factor analysis KMO and Bartlett's Spherity test results are given below;

Table 3.5: KMO and Bartlett's Test results for PCA of public sentiment indices.

Kaiser-Meyer-Olkin Measure		.565
Bartlett's Test of Sphericity	Approx. Chi-Square	3637.976
	df	276
	Sig.	.000

Kaiser-Meyer-Olkin Measure of Sampling Adequacy measure, varies between 0 and 1, and values closer to 1 are better. A value of .6 is a suggested minimum. Here this value is slightly below this limit, reflecting less adequacy for factor analysis. Bartlett's Test of Sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is a matrix in which all of the diagonal elements are 1 and all off diagonal elements are 0.

Null hypothesis is rejected here with the significant Chi-Square value, so the correlation matrix cannot be assumed as identity matrix. Running the factor analysis on these data, 10 factors are exceeding eigenvalues 1.

Table 3.6: Total explained variance for PCA of public sentiment indices.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.597	19.155	19.155	4.597	19.155	19.155
2	2.335	9.728	28.883	2.335	9.728	28.883
3	1.977	8.237	37.120	1.977	8.237	37.120
4	1.699	7.081	44.201	1.699	7.081	44.201
5	1.594	6.644	50.844	1.594	6.644	50.844
6	1.477	6.152	56.997	1.477	6.152	56.997
7	1.425	5.937	62.933	1.425	5.937	62.933
8	1.182	4.924	67.857	1.182	4.924	67.857
9	1.110	4.624	72.481	1.110	4.624	72.481
10	1.024	4.266	76.747	1.024	4.266	76.747
11	.926	3.858	80.605			
12	.855	3.563	84.168			
13	.749	3.123	87.290			
14	.690	2.875	90.165			
15	.629	2.621	92.786			
16	.364	1.518	94.304			
17	.283	1.180	95.484			
18	.249	1.037	96.521			
19	.212	.885	97.406			
20	.170	.708	98.115			
21	.157	.654	98.769			
22	.129	.536	99.305			
23	.100	.417	99.722			
24	.067	.278	100.000			

Extraction Method: Principal Component Analysis.

As seen above, the first component is explaining about 20% of the variance alone, where the second and third are about 9% and 8%. Taking all factors with eigenvalues higher than one, more than 75% of the variance can be explained. Here the number of variables are reduced to 10 and all factor will have zero correlations among each other. In order to see the interactions of calculated factor with raw variables, below table of component matrix is useful. For example, the first component is mainly related with Bloomberg New Highs & New Lows Sentiment Index on NYSE & NASDAQ Composite indices, where the second factor is mainly related with Bloomberg Commodity Sentiment Copper Bearish, Bullish and Neutral Readings and Bloomberg Commodity Sentiment Gold Bearish, Bullish and Neutral Readings indices.

On the other hand, the third component is mainly related with AAII US Investor Sentiment Bearish, Bullish and Neutral Readings. Rest of the relations are given in the table below.

Table 3.7: Component matrix for PCA of public sentiment indices.

	Component									
	1	2	3	4	5	6	7	8	9	10
AAIIBEAR	-.064	.044	-.842	.229	-.061	-.268	.185	-.178	.032	-.069
AAIIBULL	.071	-.076	.818	-.398	-.232	.119	-.032	-.085	-.022	.043
AAIINEUT	.072	.115	.127	.320	.526	.162	-.290	.441	-.039	.014
CMSEHGBR	-.196	.666	-.030	-.109	.014	-.359	-.357	-.140	-.256	-.102
CMSEHGBL	.189	-.678	-.019	.157	-.023	.294	.422	.089	.231	.033
CMSECLBR	-.172	.274	.154	-.063	.664	.017	.501	-.271	-.073	-.046
CMSECLBL	.207	-.462	-.144	.307	-.279	.054	-.542	-.270	.041	.109
CMSECLNU	.036	.215	-.113	-.323	-.445	-.123	-.008	.687	-.008	-.120
CMSEGCBR	-.382	.425	.036	.464	-.124	.218	-.078	-.061	.098	.385
CMSEGCBL	.356	-.639	-.113	-.382	.315	-.133	-.169	.061	-.205	-.095
CMSEGCNU	-.032	.376	.227	.091	-.342	-.015	.288	-.097	.407	-.425
NWHLSENY	.836	.221	-.061	-.014	-.046	-.072	.095	-.024	.025	.129
NWHLSEAM	.738	.109	-.183	-.188	-.022	-.131	.180	.013	-.034	.142
NWHLSEND	.761	.189	-.189	-.078	-.084	-.037	.180	.057	.022	.142
TRADSENI	.924	.144	-.071	-.055	.014	-.058	.006	-.018	-.024	.091
ISESENT	.213	-.049	.049	.394	.071	-.095	-.194	.213	.379	-.198
SBRIN	.792	.162	.195	.169	.079	.110	-.153	-.109	-.024	-.043
TINSALLO	.078	.031	-.211	-.019	-.343	.616	.089	-.158	-.391	-.155
TINSALNE	.078	-.248	.377	.426	-.020	-.640	.227	.100	-.133	.132
TINSALHI	-.051	.178	-.290	-.452	.373	.231	-.249	.013	.523	.037
CSFB	.489	.108	.057	.216	.068	.186	.120	.125	.057	-.152
SMART	.622	.257	.160	.248	.097	.267	-.114	-.006	-.184	-.077
BPFCSTBU	-.251	.164	-.034	-.086	-.071	.145	.170	.216	.013	.648
DCIU3D	.329	-.031	.200	-.218	-.112	-.217	-.157	-.357	.367	.203

Extraction Method: Principal Component Analysis.
a 10 components extracted.

3.2 Methodology

Here first, time series relationship between return and volume trend series are tested and then the cross-sectional relation between the trading volume trend and expected stock returns are examined. The return series are regressed on lagged terms of return (up to four weeks), volume trend (up to four weeks), volume level and absolute values of volume trends. As mentioned before, this work focusses on the effect of volume trend on the return variance, therefore the lagged terms of volume trend up to four weeks are also introduced in the model, as well as the same lagged return structure as autoregressive component of the model. This constitutes a vector autoregressive model, where present return is regressed on lagged return terms and volume trend terms, moreover present volume level, present volume trend and the absolute value of the present volume trend.

Volume level is representing the liquidity in the model. Volume trend is the proxy for investor sentiment, where the overall change of weekly trading volume reflects investor's propensity to trade the correspondind underlying. Model can summarized as;

$$R_t = \beta_0 + \beta_1 \partial V + \beta_2 V + \beta_3 \left|\partial V\right| + \sum_{i=1}^{4} \beta_i R_{t-i} + \sum_{j=1}^{4} \beta_j \partial V_{t-i}$$

Where;

R_t denotes the logarithmic present weekly return of the corresponding equity,

∂V denotes the logarithmic change in the level of weekly trading volume, or the so called trading volume trend,

V denotes the weekly present share volume level of the corresponding equity,

$\left|\partial V\right|$ denotes the absolute value logarithmic change in the level of weekly trading volume, which is introduced for investigating the impact of volume trend, ignoring the sign of the change,

$\sum_{i=1}^{4} \beta_i R_{t-i}$ denotes the lagged logarithmic weekly return up to four weeks,

$\sum_{j=1}^{4} \beta_j \partial V_{t-i}$ denotes the lagged trading volume trends up to four weeks.

On the second stage new variables are introduced to the model, such as overall investor sentiment indicators, market indices of the corresponding country and GARCH volatilities for the return and volume trend series. Here the main goal is testing the robustness of the trading volume trend, via introducing some variables which might have explanatory effect on the return series of the correspoding equity. The first variable to add is the country indices and their corresponding volume data. As mentioned earlier, trading volume trend of a separate equity, cannot be evaluated regardless of the bulk volume information of the corresponding country index. There for both return R_M and volume trend V_M series are introduced in the model below. In addition, GARCH volatility series are calculated and used for testing the robustness of the Volume Trend series.

Volume trend has a short memory, dating back just to the previous values on the correspontiong variable. However GARCH volatilities have longer memories, as mentioned before. So an alternative and long memory way of representing the trading volume trend is using the GARCH volatility series σ_{DV} for indicating the overall level of volume trend deviation in the recent weeks. Finally the composite sentiment index consisting of ten different zero correlated factor score series is introduced in the model($\sum_{m=1}^{10} \beta_m S_m$) for checking the sentiment explained by publicly available sentiment indices, given with details above. All in all, adding all the controlling variable, the previous model will be extended as shown below. Number of explanatory variables will rise from eleven to twenty six.

$$R_t = \beta_0 + \beta_1 \partial V + \beta_2 V + \beta_3 \left|\partial V\right| + \sum_{i=4}^{7} \beta_i R_{t-i} + \sum_{j=8}^{11} \beta_j \partial V_{t-j} + \sum_{m=12}^{21} \beta_m S_m + \beta_{22} \sigma_r + \beta_{23} \sigma_{DV} + \beta_{24} R_M + \beta_{25} V_M$$

Finally, at the end of this work, these beta coefficients obtained from the above equation about the volume trend, would be evaluated in the cross section such as; the regions, countries, sectors, free floating equities, currency adjusted market capitalizations, total market values, dividend yields, weighted average cost of capitals, revenue and profitability ratios, equity betas, price-earning ratios, book-to-market ratios, debt ratios, earnings before tax, current ration, quick ratio, equity alpha, number of analysts recommending, average volume, asset turnover, accounts, receivable day, inventory days, accounts payable days, etc.

4. EMPIRICAL FINDINGS

As mentioned earlier, the results of this work covers three steps. On the first stage, the results for the vector-autoregressive equation of return on lagged volume trend and return values are given. Next, some explanatory variables on investor sentiment are introduced in the model, and the robustness of the volume trend variable is tested with its persistence to remain significant. Finally, on the third stage the beta coefficients of volume trend are evaluated in cross section according to some distinctive demographic and fundamental features.

4.1 Effects of Volume Trend on Stock Return

Using the first equation given above in the Methodology chapter, numbers and percentages of significant coefficients are given below with respect to their regions. Due to the difference of observations within each region, were the percentages are being focused first.

Table 4.1: Numbers and percentages of significant regression coefficients per region.

<table>
<tr><th></th><th colspan="2">Africa &M.East</th><th colspan="2">Developed Asia</th><th colspan="2">Developing Asia</th><th colspan="2">East Europe</th><th colspan="2">West Europe</th><th colspan="2">Latin America</th><th colspan="2">North America</th></tr>
<tr><td>Beta_C</td><td>703</td><td>35%</td><td>1183</td><td>40%</td><td>1216</td><td>51%</td><td>439</td><td>35%</td><td>765</td><td>28%</td><td>141</td><td>28%</td><td>973</td><td>35%</td></tr>
<tr><td>Beta_DV</td><td>848</td><td>42%</td><td>1424</td><td>49%</td><td>1765</td><td>73%</td><td>582</td><td>46%</td><td>631</td><td>23%</td><td>181</td><td>36%</td><td>709</td><td>25%</td></tr>
<tr><td>Beta_V</td><td>966</td><td>48%</td><td>1253</td><td>43%</td><td>1538</td><td>64%</td><td>711</td><td>56%</td><td>974</td><td>36%</td><td>207</td><td>41%</td><td>1040</td><td>37%</td></tr>
<tr><td>Beta_|DV|</td><td>384</td><td>19%</td><td>877</td><td>30%</td><td>827</td><td>34%</td><td>272</td><td>21%</td><td>418</td><td>15%</td><td>95</td><td>19%</td><td>460</td><td>16%</td></tr>
<tr><td>Beta_R1</td><td>699</td><td>35%</td><td>1282</td><td>44%</td><td>897</td><td>37%</td><td>448</td><td>35%</td><td>821</td><td>30%</td><td>204</td><td>41%</td><td>970</td><td>34%</td></tr>
<tr><td>Beta_DV1</td><td>512</td><td>26%</td><td>750</td><td>26%</td><td>815</td><td>34%</td><td>374</td><td>30%</td><td>422</td><td>15%</td><td>140</td><td>28%</td><td>455</td><td>16%</td></tr>
<tr><td>Beta_R2</td><td>394</td><td>20%</td><td>520</td><td>18%</td><td>454</td><td>19%</td><td>364</td><td>29%</td><td>525</td><td>19%</td><td>109</td><td>22%</td><td>523</td><td>19%</td></tr>
<tr><td>Beta_DV2</td><td>359</td><td>18%</td><td>502</td><td>17%</td><td>516</td><td>21%</td><td>271</td><td>21%</td><td>362</td><td>13%</td><td>122</td><td>24%</td><td>357</td><td>13%</td></tr>
<tr><td>Beta_R3</td><td>337</td><td>17%</td><td>576</td><td>20%</td><td>393</td><td>16%</td><td>275</td><td>22%</td><td>501</td><td>18%</td><td>117</td><td>23%</td><td>862</td><td>31%</td></tr>
<tr><td>Beta_DV3</td><td>307</td><td>15%</td><td>519</td><td>18%</td><td>457</td><td>19%</td><td>203</td><td>16%</td><td>305</td><td>11%</td><td>72</td><td>14%</td><td>331</td><td>12%</td></tr>
<tr><td>Beta_R4</td><td>304</td><td>15%</td><td>469</td><td>16%</td><td>299</td><td>12%</td><td>230</td><td>18%</td><td>432</td><td>16%</td><td>87</td><td>17%</td><td>490</td><td>17%</td></tr>
<tr><td>Beta_DV4</td><td>240</td><td>12%</td><td>343</td><td>12%</td><td>288</td><td>12%</td><td>157</td><td>12%</td><td>321</td><td>12%</td><td>64</td><td>13%</td><td>278</td><td>10%</td></tr>
<tr><td>Total</td><td>1996</td><td>14%</td><td>2928</td><td>20%</td><td>2402</td><td>16%</td><td>1266</td><td>9%</td><td>2727</td><td>19%</td><td>499</td><td>3%</td><td>2819</td><td>19%</td></tr>
<tr><td>14637</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

The first row on the table above, represents the numbers and percentages of beta coefficients of constant term, found to be significant. More than half of all observations are found to be significant for Developing Asia, where the rest of the regions mostly stay between 35 to 40%. The region with the lowest level of significance for constant term is West Europe with 28% significance. The second row on the table above, represents the numbers and percentages of beta coefficients of volume trend, which is the most important term for investor sentiment indication, found to be significant. Here there is an obvious difference among regions. Again Developing Asia has the highest percentage, but this time very close to three thirds of all observations. It is followed but Developed Asia with about half of the observations to be significant. East Europe and Africa & Middle East have also high levels such as 46 and 42% with respect to the order. On the other hand, for West Europe and North America, where the level of development is for more advanced than the other regions, the percentage of significance of volume trend coefficients is clearly low with 23 and 25%. As mentioned before, developed countries are less vulnerable to sentiment impacts. Here this statement holds with diminishing levels of significance for volume trend, as a sentiment indicator.

Yet on the liquidity side, there is a similar view with an exception of the magnitude of difference. Here volume level is used as a liquidity proxy for the model. According to the volume level coefficients, Developing Asia is still the first for significant betas, however the level of significance falls to 64%. Just in contrast these values rise for West Europe and North America, with 36 and 37%. Rest of the regions almost remain the same. So its obvious that volume trend is a better distinctive variable of the level of development.

Finally, the fourth row on the table represents the the and beta coefficient percentages of the absolute value of volume trend., found to be significant. Here this variable is introduced for reflecting the level effect of volume trend. As seen in the results above, level of volume trend has a far less explanatory power on stock return. Only Developing Asia keeps above 34%, which was 73% for volume trend. Rest of the observations stay between 15 to 20%. Here we can conclude that the direction of the volume trend movement reflects a major part of the information about the stock return series.

Rest of the rows in the table are related with the lagged values of return and volume trend series. It is obvious that the level of significance is dying down with the course of lagging. The higher the level of lagging, the less the level of significance. This is a very common feature of autoregressive processes. For the return series the first lagged return series is significant with a higher level around 40%, however the second lag falls to around 20% level, and this value falls up to 15% for the fourth lagged term. The same pattern is also valid for the lagged terms of volume trend, where the percentages differ more among regions than in the lagged return series.

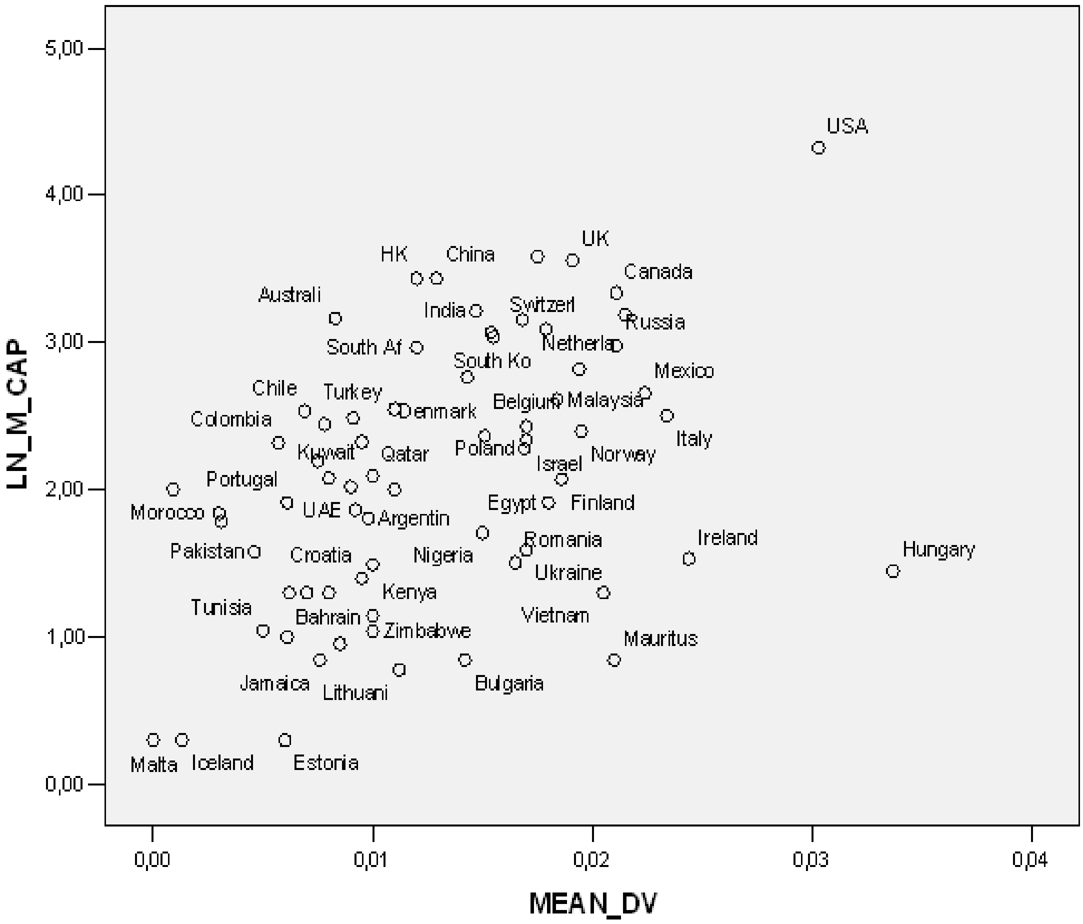

Figure 4.2: Logtransformed market capitalization with mean volume trend betas.

Above graph represents the scatter-dot diagram of the mean volume trend betas of all the countries being evaluated, according to the log-transformed market capitalization values. There is a progressive relationship between two variable, in other words the higher total market capitalization, the higher mean effect of volume trend or investor sentiment on the corresponding stocks in the country. Elliptic shape of this positive relationship can be seen clearly above. The highest market capitalization and mean volume trend beta belongs to the USA, where the lowest are Malta and Iceland as seen in the figure above. UK, Canada, Mexico and Russia are the closest countries to the USA with relatively higher mean volume trend betas and market capitalization. On the other hand, Morocco, Pakistan, Tunisia, Jamaica and Lithuania are the closest countries to Malta and Iceland with relatively lower mean volume trend betas and market capitalization. Hungary seems to be an outlier like the USA with its relative higher mean volume trend beta when compared with its moderate market capitalization.

4.1.1 Details of Africa and Middle East results

As mentioned before, Africa & Middle East region is consisting of 17 countries and 1996 stocks being evaluated, and 21.8% of all countries and 13.6% of all stocks in this work. Here a brief summary of the details of findings on African and Middle Eastern data will be given.

First of all, the descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Also standard deviations of both of the variables are 1%. Kurtosis for normal distribution is 3, however return and volume trend distributions deviate for normal distribution with 9.5 and 5.3 kurtosis values. Skewness values of both return and volume trend distribution are 0.06 and 0.13, which is close to the zero, like normal distribution.

Table 4.2: Details of the return and volume trend distributions for Africa and Middle East.

	Mean	Std.Deviation
Mean R	-0.001	0.010
Mean DV	-0.001	0.010
Median R	-0.002	0.001
Median DV	-0.020	0.051
Kurtosis R	9.550	13.872
Kurtosis DV	5.311	3.040
Skewness R	0.062	1.291
Skewness DV	0.131	0.341

For the African and Middle Eastern stocks, the mean value of significant DV coefficients is close to 1.5%, which reflects a positive effect of volume trend on stock returns for the mean value, where the standard deviation level is as high as the mean, 1.6%. The minimum significant DV beta coefficient value is found to be -5.9% and the maximum value is %8.7. The higher the value of this bate coefficient the higher the effect of volume trend on the stock. Non parametric descriptive statistics are also given for normality concerns. According to findings below, the non-parametric and parametric distributions do not differ remarkably. Number of observations exceeding the lower and upper tails are 0.65% and 1.5%.

Table 4.3: Distribution information of regression coefficients for Africa and Middle East.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	-1.5%	1.5%	1.9%	0.8%
Std. Deviation	1.7%	1.6%	12.1%	1.8%
Variance	0.0%	0.0%	0.0%	0.0%
Minimum	-11.6%	-5.9%	-27.3%	-6.7%
Maximum	6.0%	8.7%	327.2%	8.0%
1.Quarter	-2.4%	0.6%	0.0%	-0.6%
Median	-1.6%	1.4%	0.1%	0.9%
3.Quarter	-1.0%	2.3%	0.8%	1.8%
% of Lower Tail	0.80%	0.65%	0.05%	0.30%
% of UpperTail	0.90%	1.50%	0.60%	0.55%
% of Sig.Cases	35.26%	42.53%	48.45%	19.26%

In the table above, descriptive statistics of the volume data coefficients are multiplied with 100,000 in order to reach comparable values. The mean value of significant volume coefficients is close to 1.9%, however standard deviation is much higher than the mean level. The minimum significant volume beta coefficient value is found to be -27.3% and the maximum value is %327.2, as a result of high standard deviation. Number of observations exceeding the lower and upper tails are 0.05% and 0.60%.

For the volume trend impact variable, or in other words absolute value of volume trend, the mean value of significant volume coefficients is close to 0.8%, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -6.7% and the maximum value is %8.0, similar to the values regarding the coefficients of volume trend. Number of observations exceeding the lower and upper tails are 0.30% and 0.55%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all 1994 regressions made is close to 12%, where the maximum R-square is calculated to be 70% and the minimum is found 1%. Adjusted R-square statistics mean falls to 7%.

Table 4.4: R-squared and adjusted r-squared distributions for Africa and Middle East.

	R-square	Adj.R-square
Mean	11.9%	7.0%
Stdev	7.9%	7.7%
Variance	0.6%	0.6%
Min	1.0%	0.0%
Max	69.9%	68.8%

For normality and independency Jarque-Berra, for autoregression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected.

Table 4.5: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for Africa and Middle East.

Jarque-Berra	1875
Lagrange-Multiplier	1793
Dickey-Fuller	1994

Test results suggest that, according to Jarque-Berra test only 119 stocks out of 1994, have independently and normally distributed values, according to LM test 1793 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test none of the observations have unit root.

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend. The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.6: Correlation between beta coefficients for Africa and Middle East.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	-31%	-6%	-84%
Beta_DV	-31%	100%	-25%	61%
Beta_V	-6%	-25%	100%	-7%
Beta_|DV|	-84%	61%	-7%	100%

Finally, the breakdown of all countries in the Africa & Middle East region is given below. Egypt, Tunisia, Saudi Arabia and Kuwait are the countries with the highest percentage of volume trend coefficients above 70%. Mean coefficients of these countries are also relatively high, such as 2.6% for Egypt and 2.9% for Saudi Arabia. On the other hand, Nigeria, South Africa and Israel are the countries with the lowest percentage of volume trend coefficients below 25%. Zimbabwe has the highest mean volume trend coefficient with 5.2%, in spite of the fact that the percentage of the significant volume trend coefficients are slightly over 50%.

Table 4.7: Country-wise details of significant volume trend beta for Africa and Middle East.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Saudi Arabia	134	72.4%	2.9%	1.1%
Libya	3	0.0%		
Bahrain	11	54.5%	0.0%	0.8%
Dubai	2	0.0%		
Egypt	140	80.7%	2.6%	1.8%
Ghana	1	100.0%	0.2%	
Israel	734	25.9%	0.6%	1.7%
Jordan	177	59.9%	1.5%	1.0%
Kuwait	121	76.0%	1.6%	0.8%
Kenya	41	63.4%	1.4%	1.0%
Lebanon	3	0.0%		
Morocco	64	32.8%	0.6%	0.3%
Mauritus	15	33.3%	-0.5%	2.1%
Nigeria	80	18.8%	1.2%	1.5%
Oman	46	45.7%	0.7%	0.7%
Palestine	21	61.9%	0.9%	0.3%
Qatar	38	65.8%	1.6%	1.0%
South Africa	247	19.4%	0.8%	1.2%
Tunisia	43	72.1%	0.7%	0.5%
Uganda	1	0.0%		
UAE	57	52.6%	1.5%	0.9%
Zimbabwe	15	53.3%	5.2%	1.0%
Grand Total	1994			

4.1.2 Details of Developing Asian results

Developing Asia region is consisting of 11 countries and 2402 stocks being evaluated, which constitutes 14.1% of all countries and 16.4% of all stocks in this work. Here a brief summary of the details of findings on Developing Asian data will be given. The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Standard deviations of return and volume trend values are 1 and 2%. Kurtosis for normal distribution is 3, however return and volume trend distributions deviate for normal distribution with 7.5 and 5.75 kurtosis values. Skewness values of both return and volume trend distribution are positive and 0.10 and 0.40.

Table 4.8: Details of the return and volume trend distributions for Developing Asia.

	Mean	Std.Deviation
Mean R	0.001	0.010
Mean DV	0.001	0.020
Median R	0.002	0.010
Median DV	-0.030	0.041
Kurtosis R	7.500	11.310
Kurtosis DV	5.750	4.641
Skewness R	0.101	1.033
Skewness DV	0.402	0.481

For the Developing Asian stocks, the mean value of significant DV coefficients is close to 3.02%, which reflects a positive effect of volume trend on stock returns for the mean value, where the standard deviation level is around 1.65%. The minimum significant DV beta coefficient value is found to be -6.04% and the maximum value is around %11. According to findings of the non-parametric distributions median is smaller than the mean, 2.84%. Number of observations exceeding the lower and upper tails are 0.71% and 2.50%. Here the percentage of significant DV beta coefficients is remarkably high above 70%, and also the mean of these coefficients are comparably high at 3.02%.

Table 4.9: Distribution information of regression coefficients for Developing Asia.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	-2.67%	3.02%	0.69%	2.39%
Std. Deviation	1.67%	1.65%	3.10%	2.01%
Variance	0.03%	0.03%	0.00%	0.04%
Minimum	-18.68%	-6.04%	-2.04%	-6.70%
Maximum	4.27%	10.96%	57.62%	15.17%
1.Quarter	-3.40%	1.83%	0.00%	1.61%
Median	-2.44%	2.84%	0.01%	2.42%
3.Quarter	-1.75%	4.03%	0.19%	3.32%
% of Lower Tail	1.79%	0.71%	0.00%	1.46%
% of UpperTail	1.58%	2.50%	1.50%	0.96%
% of Sig.Cases	50.67%	73.52%	64.07%	34.47%

The mean value of significant volume coefficients is 0.69%, and the standard deviation is around 3%. The minimum significant volume beta coefficient value is found to be -2.04% and the maximum value is 57.62%. Number of observations exceeding the lower and upper tails are 0% and 1.5%.

For the volume trend impact variable the mean value of significant volume coefficients is close to 2.4%, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -6.7% and the maximum value is 15.17%, similar to the values regarding the coefficients of volume trend. Number of observations exceeding the lower and upper tails are 2% and 0.4%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 14%, where the maximum R-square is calculated to be 57.5% and the minimum is found 1%. Adjusted R-square statistics mean falls to 1%.

Table 4.10: R-squared and adjusted r-squared distributions for Developing Asia.

	R-square	Adj.R-square
Mean	14.08%	1.15%
Stdev	8.85%	18.36%
Variance	0.78%	3.37%
Min	1.00%	0.88%
Max	57.50%	43.10%

For normality and independency Jarque-Berra, for auto-regression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected.

Table 4.11: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for Developing Asia.

Jarque-Berra	2034
Lagrange-Multiplier	2357
Dickey-Fuller	2402

Test results suggest that, according to Jarque-Berra test 368 stocks out of 2034, have independently and normally distributed values, according to LM test 2357 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test none of the observations have unit root.

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend, as high as -66%, lower than the previous regions. The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.12: Correlation between beta coefficients for Developing Asia.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	-29%	-17%	-66%
Beta_DV	-29%	100%	-19%	60%
Beta_V	-17%	-19%	100%	-14%
Beta_|DV|	-66%	60%	-14%	100%

Finally, the breakdown of all countries in the Developing Asia region is given below. General level of significant DV beta coefficients are higher than previous regions in Developing Asia. China, Sri Lanka and India are the countries with the highest percentage of volume trend coefficients above 80%. Vietnam anf Indonesia is following these countries with 60.42 and 68.42% of significant coefficients. Kazakhstan and Malaysia has the lowest percentages around 30%. According to mean coefficients of these countries China, India and Vietnam has coefficient above 3%.

Table 4.13: Country-wise details of significant volume trend beta for Developing Asia.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
China	748	83.02%	3.71%	1.29%
Indonesia	152	68.42%	1.56%	0.95%
India	649	85.67%	3.00%	1.47%
Kazakhstan	6	33.33%	1.36%	0.31%
Malaysia	45	26.67%	0.47%	1.84%
Pakistan	73	49.32%	1.04%	0.46%
Philippines	60	56.67%	1.48%	0.75%
Sri Lanka	55	85.45%	1.19%	0.62%
Thailand	133	47.37%	1.49%	0.78%
Vietnam	480	60.42%	3.25%	2.05%
Grand Total	2402			

4.1.3 Details of Developed Asia results

Developed Asia region is consisting of 5 countries and 2928 stocks being evaluated, and 6.4% of all countries and 20% of all stocks in this work. Here a brief summary of the details of findings on Developed Asian data will be given.

The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Standard deviations of return and volume trend values are 0 and 1%. Kurtosis for normal distribution is 3, however return and volume trend distributions deviate for normal distribution with 8.19 and 4.9 kurtosis values. Skewness values of both return and volume trend distribution are -0.08 and 0.48, which is close to the zero, like normal distribution.

Table 4.14: Details of the return and volume trend distributions for Developed Asia.

	Mean	Std.Deviation
Mean R	0.001	0.001
Mean DV	0.001	0.010
Median R	0.002	0.001
Median DV	-0.041	0.040
Kurtosis R	8.190	7.410
Kurtosis DV	4.900	1.971
Skewness R	-0.080	0.861
Skewness DV	0.481	0.352

For the Developed Asian stocks, the mean value of significant DV coefficients is close to 2.7%, which reflects a positive effect of volume trend on sotck returns for the mean value, where the standard deviation level is around 1.7%. The minimum significant DV beta coefficient value is found to be -5.1% and the maximum value is %9.4. According to findings of the non-parametric distributions mean and median are at the same point, 2.7%. Number of observations exceeding the lower and upper tails are 2.7% and 1.2%.

Table 4.15: Distribution information of regression coefficients for Developed Asia.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	-1.6%	2.7%	0.9%	2.0%
Std. Deviation	1.7%	1.7%	11.1%	1.9%
Variance	0.0%	0.0%	0.0%	0.0%
Minimum	-7.8%	-5.1%	-115.4%	-5.8%
Maximum	11.2%	9.4%	202.6%	9.5%
1.Quarter	-2.4%	1.8%	0.0%	1.6%
Median	-1.8%	2.7%	0.1%	2.3%
3.Quarter	-1.2%	3.7%	0.3%	3.0%
% of Lower Tail	0.6%	2.7%	0.2%	2.0%
% of UpperTail	2.3%	1.2%	0.4%	0.4%
% of Sig.Cases	40.4%	48.7%	42.8%	30.0%

In the table above, descriptive statistics of the volume data coefficients are multiplied with 100,000 in order to reach comparable values. The mean value of significant volume coefficients is close to 1%, however standard deviation is much higher than the mean level, around 11%. The minimum significant volume beta coefficient value is found to be -1.15 and the maximum value is 2%, as a result of high standard deviation. Number of observations exceeding the lower and upper tails are 0.2% and 0.4%.

For the volume trend impact variable the mean value of significant volume coefficients is close to 2%, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -5.8% and the maximum value is 9.5%, similar to the values regarding the coefficients of volume trend. Number of observations exceeding the lower and upper tails are 2% and 0.4%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 12%, where the maximum R-square is calculated to be 63.5% and the minimum is found 1%. Adjusted R-square statistics mean falls to 8%.

Table 4.16: R-squared and adjusted r-squared distributions for Developed Asia.

	R-square	Adj.R-square
Mean	11.82%	7.75%
Stdev	8.31%	8.03%
Variance	0.69%	0.65%
Min	0.78%	0.00%
Max	63.54%	57.07%

For normality and independency Jarque-Berra, for auto-regression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected.

Table 4.17: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for Developed Asia.

Jarque-Berra	2842
Lagrange-Multiplier	2713
Dickey-Fuller	2928

Test results suggest that, according to Jarque-Berra test only 87 stocks out of 2929, have independently and normally distributed values, according to LM test 2713 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test only one of the observations have unit root.

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend, as high as -82%. The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.18: Correlation between beta coefficients for Developed Asia.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	-20%	-13%	-82%
Beta_DV	-20%	100%	-15%	58%
Beta_V	-13%	-15%	100%	-17%
Beta_|DV|	-82%	58%	-17%	100%

Finally, the breakdown of all countries in the Developed Asia region is given below. South Korea and Taiwan are the countries with the highest percentage of volume trend coefficients above 70%. Mean coefficients of these countries are also relatively high, such as 3.17% for South Korea and 2.49% for Taiwan. Rest of the coutries have significant DV coefficients around 20%. Singapore has the highest mean significant DV coefficients, however there is only one observation available for singapore, therefore this finding isn't comparable.

Table 4.19: Country-wise details of significant volume trend beta for Developed Asia.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Australia	100	20.00%	-1.87%	0.83%
Hong Kong	145	23.45%	2.23%	1.20%
Japan	1182	22.59%	1.27%	1.75%
South Korea	1431	70.51%	3.17%	1.55%
Singapore	7	14.29%	3.32%	
Taiwan	153	72.55%	2.49%	1.04%
Grand Total	2928			

4.1.4 Details of East Europe results

East Europe region is consisting of 16 countries and 1266 stocks being evaluated, which constitutes 20.5.1% of all countries and 8.6% of all stocks in this work. Here a brief summary of the details of findings on East European data will be given.

The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Standard deviations of return and volume trend values are close to 0 and 2%. Kurtosis for normal distribution is 3, however return and volume trend distributions deviate for normal distribution with 13.3 and 5.18 kurtosis values. Skewness values of both return and volume trend distribution are positive and -0.03 and 0.16.

Table 4.20: Details of the return and volume trend distributions for East Europe.

	Mean	Std.Deviation
Mean R	0.001	0.001
Mean DV	0.001	0.022
Median R	0.002	0.001
Median DV	-0.021	0.056
Kurtosis R	13.261	18.411
Kurtosis DV	5.184	2.640
Skewness R	-0.031	1.681
Skewness DV	0.160	0.331

For the East European stocks, the mean value of significant DV coefficients is close to 1.5%, which reflects a positive effect of volume trend on stock returns for the mean value, where the standard deviation level is around 1.6%. The minimum significant DV beta coefficient value is found to be -9% and the maximum value is around 7%. According to findings of the non-parametric distributions median is close to the parametric mean with 1.7%. Number of observations exceeding the lower and upper tails are 1.74% and 0.63%.

Table 4.21: Distribution information of regression coefficients for East Europe.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	-1.95%	1.53%	12.26%	0.63%
Std. Deviation	1.84%	1.61%	16.72%	2.12%
Variance	0.03%	0.03%	0.00%	0.04%
Minimum	-14.45%	-9.05%	-232.11%	-11.22%
Maximum	16.03%	7.35%	394.30%	5.94%
1.Quarter	-2.67%	1.04%	0.04%	-1.00%
Median	-1.88%	1.69%	0.39%	1.25%
3.Quarter	-1.37%	2.35%	3.41%	1.83%
% of Lower Tail	0.39%	1.74%	0.08%	0.39%
% of UpperTail	1.18%	0.63%	1.50%	0.32%
% of Sig.Cases	34.76%	46.05%	56.24%	21.56%

The mean value of significant volume coefficients is 12.26%, and the standard deviation is around 16.72%. The minimum significant volume beta coefficient value is found to be -2.32 and the maximum value is 3.94. Number of observations exceeding the lower and upper tails are 0% and 1.5%.

For the volume trend impact variable the mean value of significant volume coefficients is 0.63%, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -11.2% and the maximum value is 5.94%, similar to the values regarding the coefficients of volume trend. Number of observations exceeding the lower and upper tails are both close to 0.30%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 14%, where the maximum R-square is calculated to be 71.8% and the minimum is found 1%. Adjusted R-square statistics mean falls to 9%.

Table 4.22: R-squared and adjusted r-squared distributions for East Europe.

	R-square	Adj.R-square
Mean	13.73%	9.17%
Stdev	8.17%	8.03%
Variance	0.67%	0.65%
Min	0.93%	0.00%
Max	71.78%	65.04%

For normality and independency Jarque-Berra, for auto-regression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected.

Table 4.23: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for East Europe.

Jarque-Berra	1254
Lagrange-Multiplier	1216
Dickey-Fuller	1266

Test results suggest that, according to Jarque-Berra test 12 stocks out of 1266, have independently and normally distributed values, according to LM test 1216 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test none of the observations have unit root.

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend, as high as -84%, lower than the previous regions. The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.24: Correlation between beta coefficients for East Europe.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	-25%	2%	-84%
Beta_DV	-25%	100%	-21%	78%
Beta_V	2%	-21%	100%	-10%
Beta_|DV|	-84%	78%	-10%	100%

Finally, the breakdown of all countries in the East European region is given below. Turkey has an outstanding high level of both significant stocks percentage and mean level of beta coefficient. Approximately 83% of all stocks have significant values on volume trend betas, where the mean value of this betas are close to 2.30%. Russia and Romania is following these countries with around 50% of significant coefficients. Serbia, Slovenia and Bulgaria has the lowest percentages around 20%. According to mean coefficients, Hungary has a negative beta coefficient, which reflects the adverse effect of volume trend on stock returns.

Table 4.25: Country-wise details of significant volume trend beta for East Europe.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Bulgaria	58	22.41%	-0.01%	1.42%
Croatia	77	41.56%	1.16%	0.95%
Estonia	11	27.27%	0.88%	0.60%
Hungary	35	25.71%	-0.58%	3.37%
Lithuania	32	37.50%	0.65%	1.12%
Latvia	10	30.00%	0.28%	0.87%
Poland	373	30.03%	0.93%	1.69%
Russia	161	50.00%	1.47%	2.11%
Romania	96	52.08%	1.04%	1.65%
Serbia	27	22.22%	1.02%	0.61%
Slovenia	27	22.22%	0.51%	0.85%
Turkey	277	83.39%	2.29%	0.91%
Ukraine	24	33.33%	1.09%	1.70%
Grand Total	1208			

4.1.5 Details of West Europe results

West Europe region is consisting of 19 countries and 2727 stocks being evaluated, which constitutes 24.4% of all countries and 18.6% of all stocks in this work. Here a brief summary of the details of findings on West European data will be given.

The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Standard deviations of return and volume trend values are close to zero and 1%. Kurtosis for return and volume trend distributions deviate for normal distribution with 12.72 and 4.63 kurtosis values. Skewness values for return is -1.44, which reflects a negatively skewed distribution for return series. On the other hand, volume trend's skewness values has a mean close to zero.

Table 4.26: Details of the return and volume trend distributions for West Europe.

	Mean	Std.Deviation
Mean R	0.001	0.001
Mean DV	0.002	0.012
Median R	0.001	0.001
Median DV	-0.020	0.041
Kurtosis R	12.721	18.310
Kurtosis DV	4.631	2.200
Skewness R	-1.446	4.130
Skewness DV	0.131	0.301

For the West European stocks, the mean value of significant DV coefficients is as low as 1%, where the standard deviation level is around 2%. Highly deviated and low level of this beta coefficient reflects the resistance of stock returns to volume trend. The minimum significant DV beta coefficient value is found to be -7% and the maximum value is %12.6, which another evidence of high deviation of this mean value. According to findings of the non-parametric distributions median is slightly bigger than the mean, 1.21%. Percentages of observations exceeding the lower and upper tails are 0.66% and 0.48%. Here the percentage of significant DV beta coefficients is remarkably low around 25%, which is consistent with to low level of mean beta coefficient for volume trend.

Table 4.27: Distribution information of regression coefficients for West Europe.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	0.02%	0.96%	4.20%	0.52%
Std. Deviation	2.51%	1.88%	6.38%	2.48%
Variance	0.06%	0.04%	0.01%	0.06%
Minimum	-10.79%	-7.73%	-50.86%	-14.59%
Maximum	14.03%	12.60%	78.68%	15.42%
1.Quarter	-1.68%	-0.27%	-0.08%	-1.17%
Median	-0.76%	1.21%	0.02%	0.95%
3.Quarter	1.94%	1.98%	0.00%	1.90%
% of Lower Tail	0.40%	0.66%	0.00%	0.48%
% of Upper Tail	0.77%	0.48%	0.07%	0.29%
% of Sig.Cases	28.08%	23.17%	35.74%	15.36%

The mean value of significant volume coefficients is 4.20%, and the standard deviation is around 6.4%. The minimum significant volume beta coefficient value is found to be -0.5 and the maximum value is 0.7. Number of observations exceeding the lower and upper tails are negligible.

For the volume trend impact variable the mean value of significant volume coefficients is close to 0.5%, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -14.6% and the maximum value is 15.4%, wider than the spread of the coefficients of volume trend. Number of observations exceeding the lower and upper tails are 0.5% and 0.3%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 8%, where the maximum R-square is calculated to be 95.4% and the minimum is close to zero. Adjusted R-square statistics mean falls to 4%.

Table 4.28: R-squared and adjusted r-squared distributions for West Europe.

	R-square	Adj.R-square
Mean	7.9%	3.7%
Stdev	6.4%	6.2%
Variance	0.4%	0.4%
Min	0.5%	0.0%
Max	95.4%	95.1%

For normality and independency Jarque-Berra, for autoregression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected.

Table 4.29: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for West Europe.

Jarque-Berra	2685
Lagrange-Multiplier	2207
Dickey-Fuller	2727

Test results suggest that, according to Jarque-Berra test 42 stocks out of 2727, have independently and normally distributed values, according to LM test 2207 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test none of the observations have unit root. The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend, as high as -75%, lower than the previous regions.

The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.30: Correlation between beta coefficients for West Europe.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	49%	-6%	-75%
Beta_DV	49%	100%	-13%	62%
Beta_V	-6%	-13%	100%	-6%
Beta_|DV|	-75%	62%	-6%	100%

Finally, the breakdown of all countries in the West Europe region is given below. General level of significant DV beta coefficients are remarkably lower than previous regions. Italy and Norway are the countries with the highest percentage of volume trend coefficients above 30%. Portugal, Greece and Belgium are following these countries with slightly below 30% of significant coefficients. Ireland has the lowest percentages with below 15%. On the other hand, according to mean coefficients of these countries Ireland has the highest mean coefficient above 2.5%. Rest of the countries are found between zero and 1.5%.

Table 4.31: Country-wise details of significant volume trend beta for West Europe.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Austria	41	17.07%	0.08%	2.59%
Belgium	77	28.57%	0.55%	1.70%
Denmark	116	24.14%	0.52%	1.51%
Finland	66	25.76%	0.74%	1.86%
France	349	18.91%	0.63%	2.25%
Greece	58	29.31%	1.49%	0.92%
Germany	336	26.49%	0.68%	1.68%
Ireland	27	14.81%	2.63%	2.44%
Italy	151	36.42%	1.45%	2.34%
Iceland	3	21.67%	0.58%	0.13%
UK	625	17.92%	0.73%	1.91%
Luxembourg	8	25.00%	-0.52%	0.09%
Malta	4	0.00%		
Netherlands	75	17.33%	1.34%	1.94%
Norway	152	32.89%	1.48%	1.95%
Portugal	31	29.03%	1.61%	0.61%
Spain	98	20.41%	1.74%	1.54%
Sweden	285	23.51%	1.31%	1.43%
Switzerland	182	24.18%	0.84%	1.79%
Grand Total	2684			

4.1.6 Details of Latin America results

Latin America region is consisting of 6 countries and 499 stocks being evaluated, which constitutes 7.7% of all countries and 3.4% of all stocks in this work. Here a brief summary of the details of findings on Latin American data will be given.

The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return. Standard deviations of return and volume trend values are close to 0 and 1%. Kurtosis for return and volume trend distributions deviate for normal distribution with 11 and 5 kurtosis values, where normal distribution has a kurtosis value of 3. Skewness values for return and volume trend distribution are -0.08 and 0.13.

Table 4.32: Details of the return and volume trend distributions for Latin America.

	Mean	Std.Deviation
Mean R	0.001	0.001
Mean DV	0.001	0.010
Median R	0.002	0.001
Median DV	-0.010	0.040
Kurtosis R	11.081	14.831
Kurtosis DV	5.001	4.011
Skewness R	-0.081	1.391
Skewness DV	0.130	0.450

For the Latin American stocks, the mean value of significant DV coefficients is close to 1.30%, which reflects a positive effect of volume trend on stock returns for the mean value, where the standard deviation level is around 1.60%. The minimum significant DV beta coefficient value is found to be -6.10% and the maximum value is around %7,4. According to findings of the non-parametric distributions median is close to mean with 1.3%. Number of observations exceeding the lower and upper tails are 1% and 0,80%. Here the percentage of significant DV beta coefficients is is below 40%. The mean value of significant volume coefficients is 1.1%, and the standard deviation is around 3.7%. The minimum significant volume beta coefficient value is found to be -2.40% and the maximum value is 31.9%. There is no observation exceeding the lower and upper tails.

Table 4.33: Distribution information of regression coefficients for Latin America.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	-0.4%	1.3%	1.1%	0.2%
Std. Deviation	2.3%	1.6%	3.7%	1.8%
Variance	0.1%	0.0%	0.0%	0.0%
Minimum	-5.1%	-6.1%	-2.4%	-4.5%
Maximum	9.0%	7.4%	31.9%	7.3%
1.Quarter	-2.1%	0.6%	0.0%	-1.0%
Median	-1.1%	1.2%	0.1%	-0.2%
3.Quarter	1.3%	2.0%	0.4%	1.3%
% of Lower Tail	0.2%	1.0%	0.0%	0.4%
% of UpperTail	0.6%	0.8%	0.0%	0.4%
% of Sig.Cases	28.5%	36.5%	41.7%	19.2%

For the volume trend impact variable the mean value of significant volume coefficients is close to zero, lower than the mean level of volume trend. The minimum significant volume beta coefficient is found to be -4.5% and the maximum value is 7.3%, similar to the values regarding the coefficients of volume trend. Percentage of observations exceeding the lower and upper tails are both 0.4%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 10.6%, where the maximum R-square is calculated to be 46.4% and the minimum is found 1.6%. Adjusted R-square statistics mean falls to 6.1%.

Table 4.34: R-squared and adjusted r-squared distributions for Latin America.

	R-square	Adj.R-square
Mean	10.6%	6.1%
Stdev	7.0%	7.0%
Variance	0.5%	0.5%
Min	1.6%	0.0%
Max	46.4%	44.3%

For normality and independency Jarque-Berra, for auto-regression Lagrange Multiplier and for the existence unit-root Dickey-Fuller test are made. Below is the number of stocks where the null hypothesis is being rejected. Test results suggest that, according to Jarque-Berra test 13 stocks out of 499, have independently and normally distributed values.

According to LM test 456 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test only one of the observations have unit root.

Table 4.35: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for Latin America.

Jarque-Berra	486
Lagrange-Multiplier	456
Dickey-Fuller	498

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between the constant term and absolute value of volume trend, as high as -65%, lower than the previous regions. The second remarkable correlation is between volume trend and absolute value of volume trend, as expected.

Table 4.36: Correlation between beta coefficients for Latin America.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	43%	-13%	-65%
Beta_DV	43%	100%	-36%	76%
Beta_V	-13%	-36%	100%	-28%
Beta_|DV|	-65%	76%	-28%	100%

Finally, the breakdown of all countries in the Latin American region is given below. Argentina has the highest percentage of volume trend coefficients above 60%. It is followed by Chile with 52% of significant coefficients. Jamaica and Mexico has the lowest percentages around 20%. According to mean coefficients of these countries Mexico, Peru and Argentina has the highest coefficients around 1.6%.

Table 4.37: Country-wise details of significant volume trend beta for Latin America.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Argentina	56	60.71%	1.60%	0.98%
Brazil	223	29.60%	1.25%	2.15%
Colombia	31	38.71%	1.13%	0.57%
Chile	73	52.05%	0.97%	0.69%
Jamaica	24	20.83%	0.18%	0.76%
Mexico	51	23.53%	1.67%	2.24%
Peru	33	42.42%	1.66%	1.10%
Grand Total	491			

4.1.7 Details of North American results

North American region is consisting of 4 countries and 2819 stocks being evaluated, which constitutes 5.1% of all countries and 19.3% of all stocks in this work. Here a brief summary of the details of findings on North American data will be given. The descriptive statistics of the most important variables, which are return and volume trend for this work, are given below. Mean of both return and volume trend values are close to zero as expected from the normality assumption of return.

Standard deviations of return and volume trend values are close to zero and 1%. Kurtosis for normal distribution is 3, however return and volume trend distributions deviate for normal distribution with 9.6 and 4.41 kurtosis values. Mean skewness values of return is negative with -0.43 and for volume trend positive with 0.30.

Table 4.38: Details of the return and volume trend distributions for North America.

	Mean	Std.Deviation
Mean R	0.001	0.001
Mean DV	0.001	0.010
Median R	0.002	0.001
Median DV	-0.024	0.032
Kurtosis R	9.621	9.061
Kurtosis DV	4.419	2.738
Skewness R	-0.432	0.911
Skewness DV	0.301	0.384

For the North American stocks, the mean value of significant DV coefficients is as low as 1.1%, where the standard deviation level is around 2.90%. Highly deviated and low level of this beta coefficient reflects the resistance of stock returns to volume trend. The minimum significant DV beta coefficient value is found to be -14% and the maximum value is around %11, which another evidence of high deviation of this mean value. According to findings of the non-parametric distributions median is bigger than the mean, 1.9%. Percentages of observations exceeding the lower and upper tails are both 0.4%. Here the percentage of significant DV beta coefficients is remarkably low around 25%, which is consistent with to low level of mean beta coefficient for volume trend. The mean value of significant volume coefficients is -0.1%, and the standard deviation is around 0.4%.

Table 4.39: Distribution information of regression coefficients for North America.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Mean	1.8%	1.1%	-0.1%	-0.5%
Std. Deviation	2.2%	2.9%	0.4%	3.3%
Variance	0.0%	0.1%	0.0%	0.1%
Minimum	-6.4%	-14.0%	-2.1%	-11.3%
Maximum	10.1%	11.8%	11.4%	10.6%
1.Quarter	1.2%	-1.5%	-0.2%	-2.7%
Median	2.0%	1.9%	0.0%	-1.7%
3.Quarter	2.9%	2.9%	0.6%	2.5%
% of Lower Tail	1.7%	0.4%	0.2%	0.2%
% of UpperTail	0.6%	0.4%	0.2%	0.4%
% of Sig.Cases	34.5%	25.2%	36.9%	16.3%

The minimum significant volume beta coefficient value is found to be -2.1% and the maximum value is 11.4%. Number of observations exceeding the lower and upper tails are both 0.2%. Here this findings also suggest the relatively lower effect of liquidity by means of volume level.

For the volume trend impact variable the mean value of significant volume coefficients is close to -0.5%, lower and in addition negative signed when compared with the mean level of volume trend. The minimum significant volume beta coefficient is found to be -11.3 % and the maximum value is 10.6%, similar to the values regarding the coefficients of volume trend. Number of observations exceeding the lower and upper tails are 0.2% and 0.4%.

R-square and Adjusted R-square statistics of the regressions made for each stock is given below. Mean R-square value for all regressions made is close to 8%, where the maximum R-square is calculated to be 55.6% and the minimum is found 1%. Adjusted R-square statistics mean falls to 3.6%.

Table 4.40: R-squared and adjusted r-squared distributions for North America.

	R-square	Adj.R-square
Mean	7.8%	3.6%
Stdev	5.7%	5.3%
Variance	0.3%	0.3%
Min	0.9%	0.0%
Max	55.6%	48.7%

Test results suggest that, according to Jarque-Berra test 79 stocks out of 2819, have independently and normally distributed values, according to LM test 2411 stocks are rejected to have autocorrelation in the residuals after the regression, and finally according to the Dickey-Fuller test none of the observations have unit root.

Table 4.41: Jarque-Berra, Lagrange Multiplier and Dickey-Fuller Test results for North America.

Jarque-Berra	2740
Lagrange-Multiplier	2411
Dickey-Fuller	2819

The correlation coefficients of the estimated beta coefficients for constant term, volume trend, volume level and absolute value of volume trend are given below. Here, the highest correlation is found between volume trend and absolute value of volume trend, as expected. The correlation between the constant term and absolute valur of volume trend is also -60%, similar to previous regions.

Table 4.42: Correlation between beta coefficients for North America.

	Beta_C	Beta_DV	Beta_V	Beta_|DV|
Beta_C	100%	41%	-26%	-60%
Beta_DV	41%	100%	-11%	82%
Beta_V	-26%	-11%	100%	-7%
Beta_|DV|	-60%	82%	-7%	100%

Finally, the breakdown of all countries in the North American region is given below. There are only two countries, with valid data to the evaluation; United States and Canada. Canada has higher percentage of volume trend coefficients around 34% and United States has 24% of significant coefficients. Canada's mean DV beta coefficient is 1.6%, and United States' DV beta coefficient is 1%, consistent with the relationship of significant beta coefficients' percentage.

Table 4.43: Country-wise details of significant volume trend beta for North America.

Country	No of Stocks	% of Sign.DV	Mean.of DV	Std.Dev.of DV
Canada	284	34.86%	1.64%	2.11%
United States	2535	24.06%	1.01%	3.03%
Grand Total	2819			

4.2 Robustness Test

Here new variables are introduced to the model, such as overall investor sentiment indicators, market indices of the corresponding country and GARCH volatilities for the return and volume trend series. The main goal is testing the robustness of the trading volume trend, via introducing some variable which might have explanatory effect on the return series of the corresponding equity. The first variable to add is the country indices and their corresponding volume data. As mentioned earlier, trading volume trend of a separate equity, cannot be evaluated regardless of the bulk volume information of the corresponding country index.

Therefore both return R_M and volume trend V_M series are introduced in the model below. In addition, GARCH volatility series are calculated and used for testing the robustness of the Volume Trend series.

Volume trend has a short memory, dating back just to the previous values on the corresponding variable. However GARCH volatilities have longer memories, as mentioned before. So an alternative and long memory way of representing the trading volume trend is using the GARCH volatility series σ_{DV} for indicating the overall level of volume trend deviation in the recent weeks.

Finally the composite sentiment index consisting of ten different zero correlated factor score series is introduced in the model($\sum_{m=1}^{10} \beta_m S_m$) for checking the sentiment explained by publicly available sentiment indices, given with details above. All in all, adding all the controlling variable, the previous model will be extended as shown below. Number of explanatory variables will rise from ten to twenty five. Below the effects of introducing new variable are given, with respect to their regions. On the left hand side of the tables the beta variables of the regression with newly introduced explanators are given with corresponding mean values, standard deviations, minimum, maximum, kurtosis, skewness values and total number of significant beta coefficients. On the right hand side, the beta coefficients of the former regression is given. Beta coefficients from ST1 to ST10 stand for factorized sentiment indices, IX_R and IX_DV stands for the return and volume trend of the corresponding index, and finally G_R and G_DV stand for GARCH(1,1) of return and volume trend of the corresponding stock.

4.2.1 Robustness test results of Africa and Middle East stocks

Table 4.44: Robustness test results for Africa and Middle East.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.02	0.12	-1.68	0.37	10.15	-7.50	340
DV	0.01	0.02	-0.05	0.13	4.45	0.74	783
V	0.00	0.00	0.00	0.00	62.76	24.22	923
|DV|	0.01	0.02	-0.07	0.09	2.81	0.17	365
R1	-0.15	0.17	-0.92	0.72	3.75	0.65	788
DV1	0.01	0.01	-0.05	0.06	2.95	-0.52	457
R2	-0.13	0.13	-0.80	0.28	3.51	0.38	515
DV2	0.01	0.01	-0.08	0.06	5.00	-0.79	377
R3	-0.07	0.16	-0.62	0.59	0.57	0.51	352
DV3	0.01	0.01	-0.04	0.06	3.36	-0.13	306
R4	-0.08	0.15	-0.64	0.32	0.02	0.37	351
DV4	0.00	0.01	-0.06	0.03	3.66	-1.09	241
ST1	0.00	0.01	-0.03	0.05	2.95	0.45	370
ST2	0.00	0.01	-0.03	0.05	3.33	0.82	259
ST3	0.00	0.01	-0.02	0.04	1.27	0.05	394
ST4	0.00	0.01	-0.08	0.04	14.41	-1.05	299
ST5	0.00	0.01	-0.03	0.08	20.40	2.84	283
ST6	0.00	0.01	-0.03	0.06	6.12	0.66	190
ST7	0.00	0.01	-0.08	0.02	8.93	-1.52	280
ST8	0.00	0.01	-0.03	0.04	2.22	0.57	276
ST9	0.00	0.01	-0.09	0.04	20.39	-1.93	228
ST10	0.00	0.01	-0.04	0.06	10.24	1.37	258
IX_R	0.77	0.69	-6.96	12.92	12.15	4.46	1745
IX_DV	0.07	1.09	-0.10	17.92	21.59	14.65	376
IX_R1	0.34	0.86	-1.55	14.93	72.75	12.11	670
IX_V1	0.02	0.58	-0.11	11.96	20.63	20.48	423
IX_R2	0.06	0.96	-12.61	1.33	12.62	-10.3	316
IX_V2	0.00	0.03	-0.11	0.12	0.80	0.61	283
IX_R3	0.13	0.30	-0.66	0.95	-0.22	-0.31	333
IX_V3	0.12	1.41	-0.10	19.29	14.73	12.36	291
IX_R4	0.12	1.17	-12.76	12.77	19.62	1.86	367
IX_V4	0.05	0.84	-0.10	12.81	23.40	15.20	232
G_R	-0.06	0.76	-5.07	2.27	6.95	-1.44	446
G_DV	-0.01	0.08	-0.44	0.77	28.37	2.47	295

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.02	0.02	-0.12	0.06	3.44	0.13	703
DV	0.02	0.02	-0.06	0.09	1.74	0.31	848
V	0.00	0.00	0.00	0.00	6.30	21.38	966
|DV|	0.01	0.02	-0.07	0.08	2.26	0.15	384
R1	-0.10	0.17	-0.77	0.66	0.46	0.60	699
DV1	0.01	0.01	-0.05	0.05	5.27	-0.64	512
R2	-0.05	0.15	-0.56	0.37	-0.74	0.30	394
DV2	0.01	0.01	-0.07	0.05	3.83	-0.72	359
R3	0.02	0.16	-0.41	0.35	-1.31	-0.17	337
DV3	0.01	0.01	-0.04	0.05	1.66	-0.17	307
R4	-0.04	0.15	-0.42	0.37	-1.01	0.32	304
DV4	0.00	0.01	-0.03	0.08	6.25	0.85	240

According to the table above findings, the number of significant cases for volume trend beta is seemingly persist, with only a limited fall of around 8% from 848 to 783. Volume level beta coefficient remains almost at the same number of significant cases. Beta for the market return is around 0.77 with 1745 significant values of all cases and beta for the market volume trend is around 0.07. Also lagged return beta coefficients fall significantly from 5 to 10 percent, and the number of significant beta coefficient rise.

4.2.2 Robustness test results of Developing Asian stocks

Table 4.45: Robustness test results for Developing Asia.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.00	0.94	-12.73	10.27	9.91	-2.01	393
DV	0.03	0.02	-0.07	0.13	2.25	0.58	1649
V	0.00	0.00	0.00	0.00	8.77	10.43	1483
|DV|	0.02	0.02	-0.09	0.13	6.53	-0.66	709
R1	-0.16	0.15	-1.02	0.49	4.25	0.22	945
DV1	0.02	0.02	-0.13	0.13	11.74	-0.86	757
R2	-0.13	0.19	-0.98	1.03	4.50	0.31	473
DV2	0.01	0.02	-0.09	0.11	6.40	-0.82	573
R3	-0.03	0.20	-0.64	0.74	0.62	0.14	382
DV3	0.01	0.02	-0.10	0.08	6.04	-1.41	392
R4	-0.06	0.17	-0.91	0.47	2.71	-0.18	349
DV4	0.01	0.02	-0.10	0.08	4.36	-1.09	353
ST1	0.00	0.01	-0.09	0.06	8.43	-0.83	340
ST2	0.00	0.01	-0.05	0.04	1.67	0.00	250
ST3	0.00	0.01	-0.06	0.07	5.55	-0.04	272
ST4	0.00	0.01	-0.05	0.04	3.67	-0.84	236
ST5	0.00	0.01	-0.04	0.06	4.33	1.08	322
ST6	0.01	0.01	-0.08	0.10	16.68	0.98	354
ST7	0.01	0.01	-0.06	0.06	5.97	-0.27	274
ST8	0.00	0.01	-0.04	0.07	7.40	0.37	252
ST9	-0.01	0.01	-0.06	0.07	14.21	0.76	335
ST10	0.00	0.01	-0.06	0.06	7.32	0.96	364
IX_R	0.99	0.34	0.13	3.54	5.40	1.12	2326
IX_DV	-0.04	0.02	-0.17	0.14	8.41	0.67	1220
IX_R1	0.28	0.25	-2.23	1.31	16.24	-1.46	749
IX_V1	-0.02	0.04	-0.25	0.19	10.41	0.99	495
IX_R2	0.18	0.37	-0.92	2.65	10.03	1.78	439
IX_V2	-0.01	0.05	-0.18	0.37	18.33	2.83	309
IX_R3	0.05	0.38	-1.74	2.70	13.17	1.37	333
IX_V3	0.00	0.04	-0.14	0.23	5.34	1.29	292
IX_R4	0.05	0.37	-1.64	3.19	14.31	1.76	362
IX_V4	-0.01	0.04	-0.20	0.25	6.98	0.21	261
G_R	0.07	2.16	-9.61	45.83	3.46	20.15	473
G_DV	0.10	0.20	-6.17	6.18	1.00	-19.77	391

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.03	0.02	-0.19	0.04	9.46	-1.21	1216
DV	0.03	0.02	-0.06	0.11	1.64	0.43	1765
V	0.00	0.00	0.00	0.00	1.38	10.36	1538
|DV|	0.02	0.02	-0.07	0.15	5.55	0.27	827
R1	-0.12	0.18	-0.70	0.59	0.48	0.39	897
DV1	0.02	0.02	-0.07	0.09	5.90	-0.53	815
R2	0.01	0.18	-0.61	0.43	-0.52	-0.67	454
DV2	0.01	0.02	-0.07	0.09	4.34	-0.69	516
R3	0.01	0.17	-0.49	0.31	-0.70	-0.64	393
DV3	0.01	0.02	-0.06	0.11	2.76	0.21	457
R4	-0.03	0.16	-0.52	0.27	-0.97	-0.16	299
DV4	0.01	0.02	-0.04	0.08	1.11	0.25	288

For the Developing Asian Stocks , the number of significant cases for volume trend beta is seemingly persist, too. Only a limited fall of around 8% from 1765 to 1649. Volume level beta coefficient also falls slightly parallel to volume trend coefficients. Beta for the market return is around 0.99 with 2326 significant values of all cases and beta for the market volume trend is around -0.04 with 1220 significant cases. Lagged return beta coefficients fall slightly. GARCH(1,1) coefficients mean value is 0.07 for return sigmas and 0.10 for volume trend sigmas.

4.2.3 Robustness test results of Developed Asian stocks

Table 4.46: Robustness test results for Developing Asia.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.00	0.56	-5.86	9.34	6.55	7.72	532
DV	0.03	0.02	-0.04	0.09	1.19	0.22	1672
V	0.00	0.00	0.00	0.00	1.14	10.50	1285
|DV|	0.02	0.02	-0.07	0.10	1.28	-0.59	875
R1	-0.16	0.11	-0.99	0.66	8.52	0.66	1210
DV1	0.02	0.01	-0.03	0.09	4.88	-0.59	845
R2	-0.11	0.13	-0.70	0.54	2.90	0.67	625
DV2	0.02	0.01	-0.04	0.08	4.08	-0.49	644
R3	-0.07	0.13	-0.46	0.49	0.76	1.04	515
DV3	0.01	0.01	-0.05	0.07	1.55	-1.03	492
R4	-0.07	0.13	-0.63	0.25	0.47	0.45	480
DV4	0.01	0.01	-0.06	0.07	2.59	-0.72	413
ST1	0.00	0.01	-0.03	0.05	1.27	0.57	491
ST2	0.00	0.01	-0.04	0.02	1.28	-0.51	277
ST3	0.00	0.01	-0.03	0.03	3.03	1.05	525
ST4	0.00	0.01	-0.04	0.07	8.93	0.90	415
ST5	0.00	0.01	-0.06	0.02	4.76	-1.04	310
ST6	0.00	0.01	-0.07	0.02	15.78	-2.61	333
ST7	0.00	0.01	-0.04	0.06	7.50	-0.78	351
ST8	0.00	0.01	-0.02	0.02	-0.82	0.15	378
ST9	0.00	0.01	-0.05	0.06	7.39	0.50	357
ST10	0.00	0.01	-0.03	0.06	6.03	1.35	376
IX_R	0.95	0.35	-0.90	5.95	17.17	1.48	2869
IX_DV	-0.03	0.02	-0.10	0.14	8.47	1.35	934
IX_R1	0.28	0.24	-0.93	2.22	10.21	0.66	1095
IX_V1	-0.01	0.04	-0.09	0.25	6.43	1.94	448
IX_R2	0.16	0.26	-1.09	1.04	2.53	-1.20	595
IX_V2	-0.01	0.04	-0.10	0.24	4.90	1.45	388
IX_R3	0.07	0.34	-2.37	1.12	11.94	-2.10	440
IX_V3	-0.01	0.04	-0.14	0.10	-0.57	0.21	357
IX_R4	0.03	0.30	-1.79	1.43	2.99	-0.43	482
IX_V4	0.00	0.04	-0.18	0.09	1.24	-0.23	339
G_R	0.00	1.46	-14.69	23.58	3.13	3.96	740
G_DV	-0.03	0.93	-12.72	8.44	4.00	-3.82	415

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.02	0.02	-0.08	0.11	4.02	1.07	1183
DV	0.03	0.02	-0.05	0.09	1.36	-0.33	1424
V	0.00	0.00	0.00	0.00	1.71	7.27	1253
|DV|	0.02	0.02	-0.06	0.09	1.75	-0.87	877
R1	-0.16	0.10	-0.59	0.60	6.21	1.04	1282
DV1	0.02	0.02	-0.05	0.07	3.24	-1.02	750
R2	0.01	0.15	-0.44	0.36	-1.01	-0.40	520
DV2	0.01	0.02	-0.05	0.05	1.27	-1.10	502
R3	-0.06	0.13	-0.35	0.26	-0.69	0.82	576
DV3	0.01	0.01	-0.04	0.05	3.42	-1.42	519
R4	-0.06	0.12	-0.47	0.28	-0.47	0.70	469
DV4	0.01	0.01	-0.04	0.04	-0.25	-0.80	343

Surprisingly the number of significant cases for volume trend beta rose from 1424 to 1672, just like volume level beta coefficient, which has risen from1253 to 1285. Beta for the market return is around 0.95 with 2863 significant values of all cases and beta for the market volume trend is around -0.03. The return GARCH(1,1) sigma series has 740 significant cases, which is just below the significant cases for absolute value of volume trend, 875.

4.2.4 Robustness test results of East European stocks

Table 4.47: Robustness test results for East Europe.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.01	0.31	-1.07	4.25	9.59	11.59	211
DV	0.02	0.02	-0.09	0.07	2.44	-0.77	613
V	0.00	0.00	0.00	0.00	9.31	8.88	662
|DV|	0.01	0.02	-0.12	0.08	7.35	-1.53	249
R1	-0.16	0.17	-0.77	0.37	1.27	0.53	474
DV1	0.01	0.03	-0.06	0.52	22.51	12.99	367
R2	-0.10	0.17	-0.61	0.44	0.23	0.51	321
DV2	0.01	0.01	-0.06	0.07	4.33	-0.90	282
R3	-0.03	0.17	-0.84	0.33	0.95	-0.34	218
DV3	0.01	0.03	-0.05	0.38	24.64	9.97	186
R4	-0.06	0.16	-0.70	0.26	0.14	0.10	197
DV4	0.00	0.01	-0.04	0.06	3.41	-0.21	163
ST1	0.00	0.01	-0.03	0.06	0.98	-0.02	184
ST2	0.01	0.05	-0.04	0.54	12.46	10.18	133
ST3	0.01	0.01	-0.08	0.03	16.28	-2.83	233
ST4	0.00	0.01	-0.09	0.05	15.71	-2.27	188
ST5	0.00	0.01	-0.04	0.05	2.89	-0.02	141
ST6	0.00	0.01	-0.04	0.03	0.14	-0.04	129
ST7	0.00	0.05	-0.59	0.05	14.92	-11.63	163
ST8	0.00	0.01	-0.04	0.04	2.21	0.35	149
ST9	0.00	0.01	-0.03	0.04	0.54	0.48	122
ST10	0.00	0.01	-0.07	0.08	7.61	0.71	211
IX_R	0.69	0.32	-2.15	1.92	7.90	-0.59	1062
IX_DV	-0.03	0.02	-0.07	0.06	4.12	1.19	423
IX_R1	0.31	0.27	-0.80	1.37	3.72	0.76	414
IX_V1	-0.01	0.02	-0.06	0.06	0.08	0.84	154
IX_R2	0.23	0.27	-1.06	1.12	4.21	-1.10	303
IX_V2	0.00	0.06	-0.12	0.60	68.72	6.79	154
IX_R3	0.16	0.27	-0.99	1.53	3.75	-0.40	214
IX_V3	0.00	0.07	-0.09	0.68	69.54	7.54	106
IX_R4	0.12	0.33	-1.80	1.64	5.68	-0.67	226
IX_V4	0.00	0.03	-0.06	0.08	-0.43	0.12	126
G_R	-0.32	3.82	-65.50	10.30	27.86	-15.88	315
G_DV	0.01	0.24	-0.36	3.03	38.08	11.13	173

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.02	0.02	-0.14	0.16	26.97	1.97	439
DV	0.02	0.02	-0.09	0.07	4.30	-0.99	582
V	0.00	0.00	0.00	0.00	14.07	9.08	711
|DV|	0.01	0.02	-0.11	0.06	4.11	-1.10	272
R1	-0.09	0.19	-0.74	0.43	-0.46	0.26	448
DV1	0.01	0.01	-0.06	0.05	6.27	-1.90	374
R2	0.03	0.17	-0.57	0.37	-0.43	-0.72	364
DV2	0.01	0.01	-0.05	0.09	5.60	-0.29	271
R3	0.04	0.16	-0.58	0.30	-0.39	-0.65	275
DV3	0.01	0.01	-0.04	0.04	1.78	-1.16	203
R4	0.06	0.14	-0.33	0.37	-0.60	-0.83	230
DV4	0.00	0.01	-0.03	0.07	3.04	0.57	157

For the East European stocks, the number of significant cases for volume trend beta in spite of being relatively low, persists to be significant after robustness test. On the other hand, volume level beta coefficient remains slightly falls. Mean of beta for the market return is around 0.69 with 1062 significant values of all cases and beta for the market volume trend is around -0.03.

4.2.5 Robustness test results of Latin American stocks

Table 4.48: Robustness test results for Latin America.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.05	0.47	-3.48	2.29	43.51	-3.42	84
DV	0.01	0.02	-0.07	0.09	5.68	0.20	175
V	0.00	0.00	0.00	0.00	31.11	5.14	211
|DV|	0.00	0.02	-0.06	0.07	2.27	-0.01	99
R1	-0.13	0.14	-0.71	0.32	3.19	0.43	193
DV1	0.01	0.02	-0.05	0.06	2.15	-0.65	132
R2	-0.11	0.13	-0.54	0.22	1.02	0.46	116
DV2	0.01	0.01	-0.04	0.04	1.07	-0.97	107
R3	-0.08	0.15	-0.45	0.21	-0.01	0.26	82
DV3	0.01	0.01	-0.03	0.06	3.64	0.54	80
R4	-0.03	0.15	-0.31	0.34	-1.16	0.42	80
DV4	0.00	0.01	-0.03	0.03	-0.68	-0.23	81
ST1	0.00	0.01	-0.02	0.04	1.14	0.79	84
ST2	0.00	0.01	-0.02	0.02	-0.70	-0.45	59
ST3	0.00	0.01	-0.01	0.04	4.78	0.63	76
ST4	0.00	0.01	-0.03	0.02	1.96	-1.21	78
ST5	0.00	0.01	-0.02	0.02	0.48	-0.78	62
ST6	0.00	0.01	-0.02	0.01	-0.92	-0.46	62
ST7	0.00	0.01	-0.01	0.02	-0.48	0.52	49
ST8	0.00	0.01	-0.01	0.02	-0.97	0.12	61
ST9	0.00	0.01	-0.02	0.02	1.18	0.85	67
ST10	-0.01	0.01	-0.02	0.02	6.37	1.76	89
IX_R	0.75	0.36	-1.35	2.71	5.64	0.71	455
IX_DV	-0.02	0.02	-0.09	0.05	1.29	-0.02	107
IX_R1	0.27	0.20	-0.33	1.08	2.94	0.35	219
IX_V1	-0.01	0.02	-0.06	0.05	-0.03	0.44	72
IX_R2	0.22	0.18	-0.49	0.65	2.65	-0.91	114
IX_V2	0.00	0.03	-0.06	0.08	-0.08	0.27	64
IX_R3	0.17	0.22	-0.39	1.38	7.93	0.84	106
IX_V3	-0.01	0.03	-0.10	0.05	1.85	-0.34	56
IX_R4	0.12	0.23	-0.41	0.53	-1.03	-0.40	102
IX_V4	-0.01	0.03	-0.09	0.04	-0.07	-0.45	66
G_R	0.77	5.81	-10.47	56.22	82.06	8.59	105
G_DV	-0.02	0.23	-1.91	0.14	63.92	-7.78	72

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.00	0.02	-0.05	0.09	0.92	0.70	141
DV	0.01	0.02	-0.06	0.07	4.57	0.10	181
V	0.00	0.00	0.00	0.00	33.36	5.24	207
|DV|	0.00	0.02	-0.04	0.07	2.78	0.67	95
R1	-0.09	0.16	-0.46	0.29	-0.24	0.81	204
DV1	0.01	0.01	-0.05	0.07	4.44	-0.55	140
R2	0.05	0.14	-0.33	0.32	-0.85	-0.69	109
DV2	0.01	0.01	-0.04	0.06	3.70	-0.48	122
R3	0.01	0.16	-0.67	0.26	1.18	-0.90	117
DV3	0.01	0.01	-0.02	0.05	5.50	0.24	72
R4	0.00	0.14	-0.34	0.30	-1.43	0.02	87
DV4	0.01	0.01	-0.02	0.03	-0.44	-0.29	64

Latin American stocks' significant cases for volume trend beta is seemingly persist, with only a slightly fall of around from 181 to 175. Volume level beta coefficient rises slightly. Beta for the market return is around 0.75 with 455 cases in the whole sample and significant values of all cases and beta for the market volume trend is around 0.07. GARCH(1,1) sigma series of return has a beta coefficient of 0.77 with 105 significant cases.

4.2.6 Robustness Test Results of North American Stocks

Table 4.49: Robustness test results for North America.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.02	0.15	-1.57	0.75	9.56	-3.35	322
DV	0.02	0.02	-0.12	0.13	3.44	-0.80	839
V	0.00	0.00	0.00	0.00	6.19	11.45	968
|DV|	-0.01	0.03	-0.09	0.13	1.16	0.83	531
R1	-0.12	0.14	-0.59	0.50	2.02	1.02	822
DV1	0.02	0.02	-0.09	0.10	2.01	-0.83	563
R2	-0.10	0.13	-0.66	0.39	1.72	0.79	632
DV2	0.02	0.02	-0.07	0.09	1.06	-0.71	446
R3	0.00	0.16	-0.46	0.76	-0.18	0.17	465
DV3	0.01	0.02	-0.08	0.08	0.44	-0.69	357
R4	-0.05	0.15	-0.60	0.41	-0.35	0.28	485
DV4	0.01	0.02	-0.06	0.07	0.94	-0.74	320
ST1	0.01	0.01	-0.12	0.08	12.22	-1.34	1141
ST2	0.00	0.01	-0.03	0.03	-0.80	-0.04	683
ST3	0.01	0.01	-0.02	0.04	0.53	-0.28	529
ST4	0.00	0.01	-0.04	0.03	1.53	0.00	347
ST5	0.00	0.01	-0.03	0.02	0.04	-0.04	340
ST6	0.00	0.01	-0.02	0.03	-0.06	0.16	314
ST7	-0.01	0.01	-0.04	0.03	2.87	0.58	491
ST8	0.00	0.01	-0.03	0.03	1.09	0.49	500
ST9	0.00	0.01	-0.03	0.02	0.57	-0.50	418
ST10	0.00	0.01	-0.03	0.03	-0.23	-0.03	549
IX_R	1.09	0.60	-4.56	5.46	10.99	0.19	2536
IX_DV	0.00	0.04	-0.13	0.11	-0.51	-0.17	505
IX_R1	0.32	0.31	-0.57	1.76	2.51	0.23	878
IX_V1	0.00	0.05	-0.28	0.10	1.17	-0.56	570
IX_R2	0.29	0.32	-1.02	1.58	2.74	-0.20	832
IX_V2	0.01	0.05	-0.16	0.14	-0.34	-0.48	511
IX_R3	0.12	0.35	-0.87	1.23	-0.40	-0.12	526
IX_V3	0.00	0.05	-0.18	0.16	0.11	-0.03	521
IX_R4	0.16	0.35	-0.69	1.92	0.94	0.27	536
IX_V4	0.00	0.04	-0.26	0.16	3.68	-0.62	420
G_R	0.30	0.82	-5.12	10.90	1.92	4.90	642
G_DV	0.02	0.27	-1.26	3.14	6.43	4.44	309

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.02	0.02	-0.06	0.10	2.18	-0.75	973
DV	0.01	0.03	-0.14	0.12	0.98	-0.32	709
V	0.00	0.00	0.00	0.00	5.63	21.82	1040
|DV|	-0.01	0.03	-0.11	0.11	-0.10	0.36	460
R1	-0.13	0.11	-0.61	0.25	2.48	0.97	970
DV1	0.01	0.03	-0.16	0.10	2.17	-0.67	455
R2	-0.01	0.15	-0.52	0.29	-1.09	-0.13	523
DV2	0.00	0.03	-0.07	0.11	-0.37	0.21	357
R3	-0.10	0.12	-0.48	0.30	0.75	1.17	862
DV3	0.00	0.02	-0.08	0.07	-0.42	-0.23	331
R4	-0.04	0.13	-0.32	0.38	-1.07	0.59	490
DV4	0.01	0.02	-0.06	0.07	0.07	-0.43	278

Here the number of significant volume trend beta coefficients rise from 709 to 839 remarkably. Volume level beta coefficient falls slightly. Beta for the market return is around 1.09 with 2536 significant values of all. For the North American stocks, the first factor of sentiment index has a explanatory power with a number of significant cases as high as 1141 observations.

4.2.7 Robustness test results of West European stocks

Table 4.50: Robustness test results for West Europe.

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	-0.01	0.25	-0.45	3.93	3.62	12.71	332
DV	0.01	0.02	-0.06	0.20	14.94	1.17	784
V	0.00	0.00	0.00	0.00	10.42	21.36	911
|DV|	0.00	0.02	-0.11	0.07	2.35	-0.58	410
R1	-0.15	0.16	-1.10	1.02	6.85	0.50	894
DV1	0.01	0.02	-0.14	0.07	9.61	-1.40	521
R2	-0.11	0.14	-0.82	0.43	2.59	0.66	571
DV2	0.01	0.02	-0.24	0.08	43.91	-4.30	421
R3	-0.01	0.16	-0.56	0.53	-0.70	0.07	436
DV3	0.00	0.02	-0.16	0.08	12.40	-2.26	327
R4	-0.03	0.15	-0.50	0.49	-0.81	0.37	411
DV4	0.01	0.02	-0.10	0.12	9.09	-0.41	289
ST1	0.01	0.01	-0.04	0.06	1.55	-0.47	828
ST2	0.00	0.01	-0.04	0.03	0.86	-0.04	442
ST3	0.00	0.01	-0.06	0.07	17.96	-0.65	535
ST4	0.00	0.01	-0.03	0.04	1.58	0.20	424
ST5	0.00	0.01	-0.05	0.04	4.50	-0.35	354
ST6	0.00	0.01	-0.07	0.04	8.50	-1.69	344
ST7	0.00	0.01	-0.03	0.03	2.79	1.11	384
ST8	0.00	0.01	-0.04	0.04	3.11	0.45	468
ST9	0.00	0.01	-0.05	0.07	10.22	1.49	364
ST10	0.00	0.01	-0.03	0.14	9.99	7.90	478
IX_R	0.73	0.39	-2.27	2.89	7.45	0.14	2286
IX_DV	-0.02	0.04	-0.21	0.37	29.91	2.87	461
IX_R1	0.28	0.24	-1.60	1.87	11.91	0.15	1092
IX_V1	-0.01	0.03	-0.10	0.14	5.55	1.70	408
IX_R2	0.24	0.22	-0.73	2.03	8.85	0.11	840
IX_V2	0.00	0.04	-0.26	0.23	10.63	-0.28	355
IX_R3	0.19	0.33	-2.13	4.68	58.45	3.41	642
IX_V3	0.00	0.03	-0.13	0.17	3.27	0.59	351
IX_R4	0.13	0.27	-1.05	1.66	3.76	-0.09	522
IX_V4	0.00	0.04	-0.12	0.19	5.48	0.71	300
G_R	0.19	0.70	-1.73	4.74	8.67	1.76	492
G_DV	0.46	7.91	-0.63	2.79	4.76	18.01	326

	Mean	St.Dev.	Min	Max	Kurtosis	Skewness	Sig.Cases
C	0.00	0.03	-0.11	0.14	1.66	0.22	765
DV	0.01	0.02	-0.08	0.13	3.13	-0.16	631
V	0.00	0.00	0.00	0.00	7.89	22.24	974
|DV|	0.01	0.02	-0.15	0.15	5.84	-0.18	418
R1	-0.11	0.15	-0.60	0.58	0.93	0.85	821
DV1	0.00	0.02	-0.09	0.07	1.71	-0.59	422
R2	0.03	0.15	-0.34	0.42	-1.13	-0.44	525
DV2	0.00	0.02	-0.14	0.05	8.84	-1.62	362
R3	-0.02	0.15	-0.43	0.34	-1.40	0.26	501
DV3	0.00	0.02	-0.09	0.07	3.13	-0.62	305
R4	-0.03	0.15	-0.77	0.42	0.16	0.09	432
DV4	0.01	0.02	-0.09	0.07	5.80	-1.13	321

Here the number of significant volume trend beta coefficients rise from 631 to 784 remarkably. Significant volume level beta coefficient number falls slightly from 974 to 911. Beta for the market return is around 0.73 with 2286 significant values of all. Just like North American stocks, the first factor of sentiment index has a explanatory power with a number of significant cases as high as 828 observations for the West European stocks.

4.3 Cross Section Analysis of the Volume Trend Beta Coefficients

The beta coefficients calculated in the first part of the result section are being evaluated according to different characteristics such as, regions, sectors, free floating percentages, market capitalizations, frequently used financial ratios, market betas, alphas, growth etc. The highlighted beta coefficients are the volume trend coefficient as mentioned earlier. Below is the histogram of volume trend coefficients.

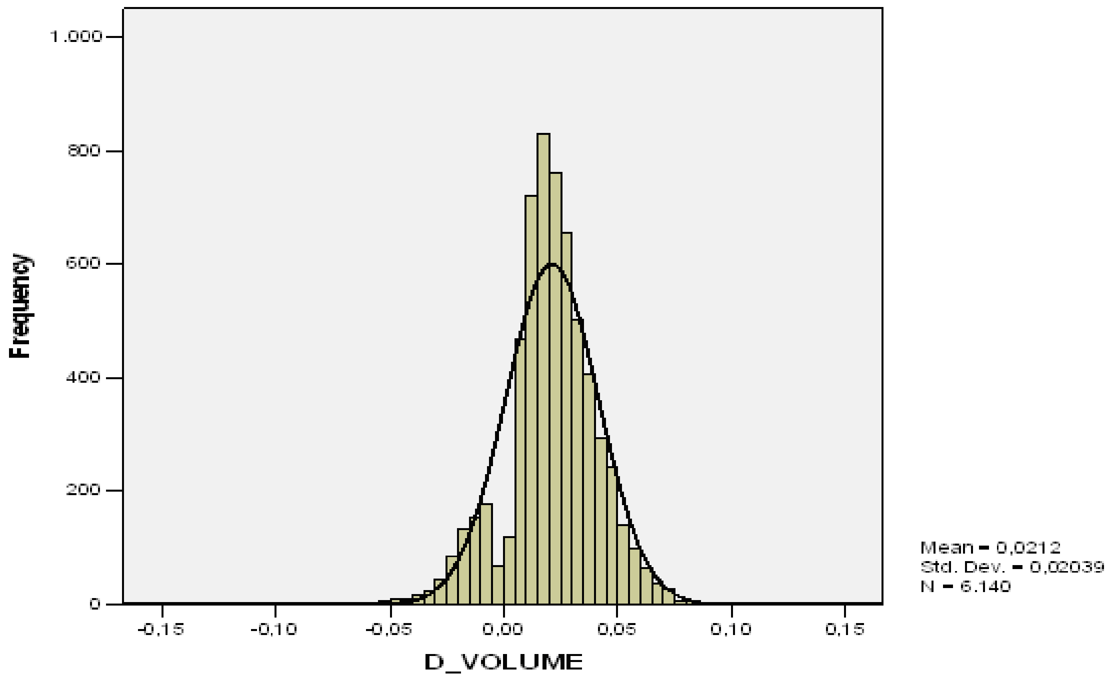

Figure 4.1: Distribution of significant volume trend betas with normal curve.

As seen in the histogram graph, significant volume trend coefficients are mostly positive signed. Around zero there are less observations, and around mean there are more observations than expected. The distribution roughly resembles normal distribution, except the violations mentioned before.

Table 4.51: Case processing summary for volume trend betas.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
D_VOLUME	6140	42.0%	8494	58.0%	14634	100.0%

According to the Case Processing Summary, only 6140 observations are found to be significant among the population of 14634 observations. This makes 42% of all observations, which is a quite high proportion. Below is also the details of the descriptive statistics regarding the significant volume trend values. Mean of the volume trend betas population is around 2.12% with a 0.00026 standard error. Due to the skewness level close to zero, median also very close to mean, which is another characteristic of normal distribution. The minimum and maximum observations in the population are -0.14 and 0.13. Finally Kurtosis is around 2.3, reflecting the steepness of the distribution when compared with a normal distribution.

Table 4.52: Descriptive statistics for volume trend betas.

			Statistic	Std. Error
D_VOLUME	Mean		.0212	.00026
	95% Confidence Interval for Mean	Lower Bound	.0207	
		Upper Bound	.0217	
	5% Trimmed Mean		.0215	
	Median		.0211	
	Variance		.000	
	Std. Deviation		.02039	
	Minimum		-.14	
	Maximum		.13	
	Range		.27	
	Interquartile Range		.02	
	Skewness		-.388	.031
	Kurtosis		2.332	.062

4.3.1 Cross section analysis on region

As mentioned earlier, there are eleven sectors in this work according to the classification of Bloomberg, which are Africa & Middle East (1), Developed Asia(2), Developing Asia(3), East Europe(4), Latin America(5), North America(6) and West Europe(7). Here there are 12269 valid observations of volume trend betas. Descriptive statistics of each cluster is given below, where the mean of both Developing and Developed Asia is remarkably higher than rest of the groups with 0.0302 and 0.0273. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.53: Descriptive statistics for volume trend according to regions.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1.00	848	.0151	.01567	.00054	.0140	.0162	-.06	.09
2.00	1424	.0273	.01721	.00046	.0264	.0282	-.05	.09
3.00	1765	.0302	.01650	.00039	.0294	.0309	-.06	.11
4.00	582	.0153	.01610	.00067	.0140	.0166	-.09	.07
5.00	181	.0128	.01572	.00117	.0105	.0151	-.06	.07
6.00	709	.0110	.02925	.00110	.0089	.0132	-.14	.12
7.00	631	.0096	.01883	.00075	.0082	.0111	-.08	.13
Total	6140	.0212	.02039	.00026	.0207	.0217	-.14	.13

Table 4.54: Test of homogeneity of variances for volume trend according to regions.

Levene Statistic	df1	df2	Sig.
103.258	6	6133	.000

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.55: Analysis of variance for volume trend according to regions.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.418	6	.070	199.996	.000
Within Groups	2.134	6133	.000		
Total	2.552	6139			

As seen in multiple comparison table in Appendix, the effect of volume trend, in other words investor sentiment is significantly higher in Developing and Developed Asian Stocks for about 2 to 3 percent differences. Rest of the regions mostly have volume trend means around 1% to 1.5%.

Findings suggest that region plays a more important role than development because as given in the Data and Methodology section, Developed Asian countries like Japan and South Korea have similar development level with Europe and North America, however their mean volume trend betas are close to Developing Asia. Belonging to different development levels, North and Latin America do not differ remarkably according to the impact of volume trend.

4.3.2 Cross section analysis on sector

There are seven regions in this work according to the classification of Bloomberg, which are Basic Materials(0), Communications(1), Consumer Cyclical(2), Consumer Non-cyclical(3), Diversified(4), Energy(5), Financial(6), Funds(7), Industrial(8), Technology(9), Utilities(10). Here there are 6140 valid observations. Descriptive statistics of each cluster is given below, where the mean of cluster 7 (Funds) is below zero. The mean for Financial and Utilities are below 2%, and the rest is above 2%. The highest coefficient belongs to Technology stocks with 2.87%. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.56: Descriptive statistics for volume trend according to sectors.

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Min	Max
					Lower Bound	Upper Bound		
.00	654	.0253	.01926	.00075	.0238	.0268	-.06	.10
1.00	383	.0247	.02093	.00107	.0226	.0268	-.04	.13
2.00	814	.0221	.01833	.00064	.0208	.0233	-.05	.08
3.00	935	.0207	.01899	.00062	.0195	.0219	-.09	.09
4.00	87	.0228	.01945	.00209	.0186	.0269	-.02	.07
5.00	234	.0198	.02450	.00160	.0166	.0230	-.05	.10
6.00	1001	.0159	.02000	.00063	.0146	.0171	-.06	.08
7.00	208	-.0039	.02606	.00181	-.0075	-.0003	-.14	.12
8.00	1325	.0246	.01779	.00049	.0237	.0256	-.05	.11
9.00	334	.0287	.01850	.00101	.0268	.0307	-.03	.10
10.00	165	.0168	.02091	.00163	.0135	.0200	-.06	.07
Total	6140	.0212	.02039	.00026	.0207	.0217	-.14	.13

Table 4.57: Test of homogeneity of variances for volume trend according to sectors.

Levene Statistic	df1	df2	Sig.
4.632	10	6129	.000

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.58: Analysis of variance for volume trend according to sectors.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.214	10	.021	56.213	.000
Within Groups	2.337	6129	.000		
Total	2.552	6139			

As seen in the descriptive statistics table in Appendix, the mean of cluster 7 (Funds) is the only cluster below zero. The mean for Financial and Utilities are below 2%, and the rest is above 2%. The highest coefficient belongs to Technology stocks with 2.87%. Technology and Utilities are only significantly indifferent from the Energy and Diversified sectors. Consisting of equities and bond as majority, funds are the most liquid sector among all eleven listed sectors, which has the lowest impact of volume trend accordingly. This is because of the close relationship of investor sentiment and liquidity. Financial sector such as Banking and Insurance companies are not as liquid as funds, but their resources are also allocated on relatively liquid assets, when compared with for example Industry and Utilities sectors.

4.3.3 Cross section analysis on market capitalization

Market capitalization is the total dollar market value of all of a company's outstanding shares. Market capitalization is calculated by multiplying a company's shares outstanding by the current market price of one share. The investment community uses this figure to determining a company's size, as opposed to sales or total asset figures. Depending on the high dimension of data within this work, some of the companies from developing countries have relatively low levels of market capitalization, on the other hand some of the companies from developed countries have relatively high levels of market capitalization. However the difference among these companies change exponentially. For example, a company from Africa have market capitalization figures around 10 million Dollars, however another company from North America may exceed 100 billion Dollars, which makes a logarithmic transformation indispensible. So the market capitalization values are shown in the histogram below after logarithmic transformation, where the values on the x-axis stand for the number of zeros in the market capitalization value.

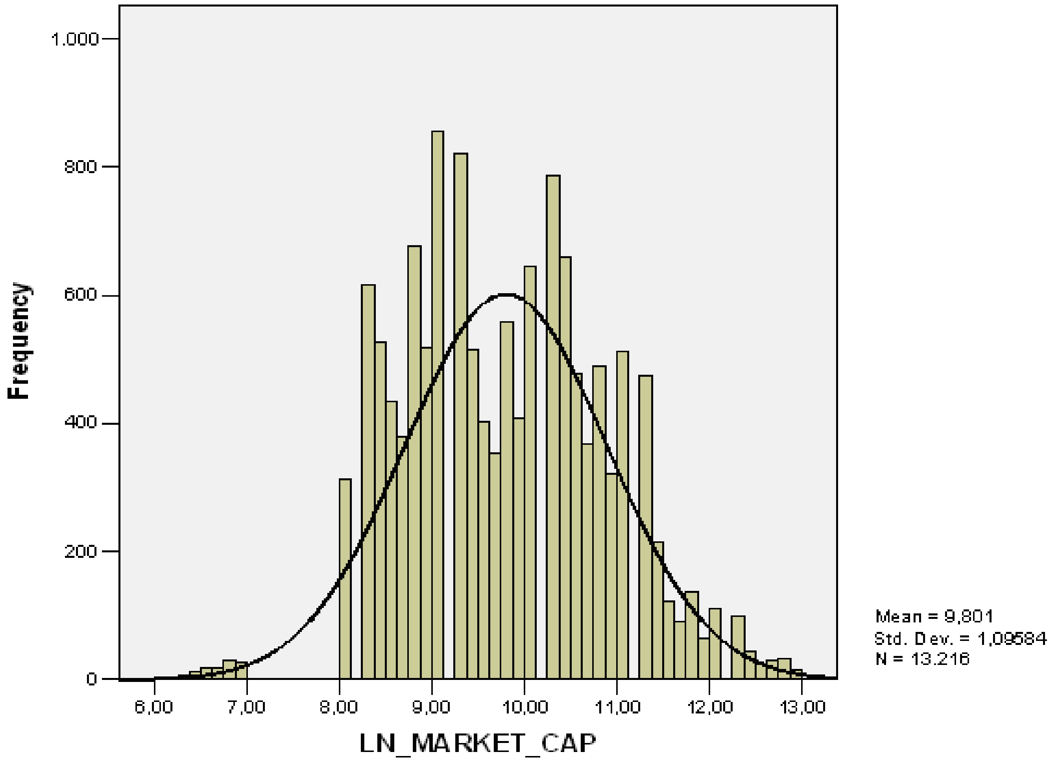

Figure 4.2: Logtransformed market capitalization with normal curve

Table 4.59: Final cluster centers for volume trend according to market capitalization.

	Cluster			
	1	2	3	4
LN_MARKET_CAP	6.68	10.37	11.71	8.88

Four groups are classified with cluster means around; 6.68, 8.88, 10.37 and 11.71, where the number of each cluster members are 120, 5574, 1463 and 6059. These mean values are reflecting all of the shares' market capitalization within the cluster. The companies from the fourth cluster are approximately 100 times bigger than the companies in the first cluster, by means of cluster averages.

Table 4.60: Number of Cases in each Cluster for volume trend according to market capitalization.

Cluster	1	120.000
	2	5574.000
	3	1463.000
	4	6059.000
Valid		13216.000
Missing		1418.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.61: Descriptive statistics for volume trend according to market capitalizations.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	69	.0146	.01443	.00174	.0111	.0181	-.04	.05
2	2871	.0260	.01977	.00037	.0253	.0267	-.06	.11
3	662	.0233	.01822	.00071	.0219	.0247	-.06	.10
4	1857	.0155	.02093	.00049	.0145	.0164	-.14	.13
Total	5459	.0219	.02053	.00028	.0214	.0225	-.14	.13

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal.

Table 4.62: Test of homogeneity of variances for volume trend according to market capitalization.

Levene Statistic	df1	df2	Sig.
5.463	3	5455	.001

According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.63: Analysis of variance for volume trend according to market capitalization.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.130	3	.043	109.351	.000
Within Groups	2.169	5455	.000		
Total	2.299	5458			

According to the findings of Dunnett T3 test, all groups except first and fourth groups are found to be significantly different. As clearly seen from the below table, relatively bigger companies of second and third clusters which have log-transformed cluster averages such as 10.3 and 11.7, have approximately 1% higher beta coefficients when compared with first and fourth clusters which have logtransformed cluster averages such as 6.7 and 8.9.

Table 4.64: Post-hoc test results for volume trend according to market capitalization.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.01141(*)	.00178	.000	-.0162	-.0066
	3	-.00874(*)	.00188	.000	-.0138	-.0037
	4	-.00086	.00180	.997	-.0057	.0040
2	1	.01141(*)	.00178	.000	.0066	.0162
	3	.00266(*)	.00080	.005	.0006	.0048
	4	.01054(*)	.00061	.000	.0089	.0122
3	1	.00874(*)	.00188	.000	.0037	.0138
	2	-.00266(*)	.00080	.005	-.0048	-.0006
	4	.00788(*)	.00086	.000	.0056	.0101
4	1	.00086	.00180	.997	-.0040	.0057
	2	-.01054(*)	.00061	.000	-.0122	-.0089
	3	-.00788(*)	.00086	.000	-.0101	-.0056

* The mean difference is significant at the .05 level.

Log-transformed market capitalizations are distributed around 10, in other words mean market capitalization level is close to 10 Billion Dollars. If we compare companies below and above 10 Billion Dollars, there is a remarkable difference. Companies with higher market capitalizations tend to have 1% higher volume trend impact when compared with relatively small companies. Companies with higher market capitalizations attract more investors and higher volumes accordingly, which might lead this stock to be more vulnerable to volume trend.

4.3.4 Cross section analysis on free floating percentage

The free float of a company is the proportion of shares that are held by investors who are likely to be willing trade. It is a measure of how many shares are reasonably liquid. It therefore excludes those shares held by strategic shareholders. Free float tends to be an important issue for smaller companies by means of sentiment and liquidity. Here there are 12269 valid observations of free floating percentage data. Percentages can be classified into four groups, where the higher the percentage, the lower the liquidity of a company as the underlying of that share.

Table 4.65: Final cluster centers for volume trend according to free floating percentage.

	Cluster			
	1	2	3	4
FREE_FLOAT	68.52	95.52	44.52	21.24

Four groups are classified with cluster means around; 20%, 45%, 70% and 95%, where the number of each cluster members are 2016, 3067, 2666 and 4520 with respect to the order of percentages. These mean values are reflecting the percentages of all the shares' free floating percentages within the cluster.

Table 4.66: Number of Cases in each Cluster for volume trend according to free floating percentages.

Cluster	1	2666.000
	2	4520.000
	3	3067.000
	4	2016.000
Valid		12269.000
Missing		2374.000

Descriptive statistics of each cluster is given below, where the mean of the second cluster is remarkably low than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.67: Descriptive statistics for volume trend according to free floating percentages.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	1257	.0271	.01856	.00052	.0261	.0281	-.05	.11
2	1226	.0128	.02527	.00072	.0114	.0142	-.14	.12
3	1619	.0243	.01771	.00044	.0234	.0251	-.05	.13
4	972	.0203	.01799	.00058	.0192	.0214	-.06	.07
Total	5074	.0214	.02074	.00029	.0209	.0220	-.14	.13

Table 4.68: Test of homogeneity of variances for volume trend according to free floating percentages.

Levene Statistic	df1	df2	Sig.
5.893	3	5747	.001

Above is the Levene's Test for Equality of Variances which shows whether the variability of each group is approximately equal or not. Here the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.69: Analysis of variance for volume trend according to free floating percentages.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.042	3	.014	34.602	.000
Within Groups	2.300	5747	.000		
Total	2.341	5750			

In order to investigate detailed information among groups, Dunnett’ T3 test is given below, which is useful for groups with different variances. Finding’s suggest that each group has significantly different means.

Table 4.70: Post-hoc test results for volume trend according to free floating percentages.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	.01427(*)	.00089	.000	.0119	.0166
	3	.00281(*)	.00068	.000	.0010	.0046
	4	.00679(*)	.00078	.000	.0047	.0088
2	1	-.01427(*)	.00089	.000	-.0166	-.0119
	3	-.01146(*)	.00085	.000	-.0137	-.0092
	4	-.00749(*)	.00092	.000	-.0099	-.0051
3	1	-.00281(*)	.00068	.000	-.0046	-.0010
	2	.01146(*)	.00085	.000	.0092	.0137
	4	.00398(*)	.00073	.000	.0021	.0059
4	1	-.00679(*)	.00078	.000	-.0088	-.0047
	2	.00749(*)	.00092	.000	.0051	.0099
	3	-.00398(*)	.00073	.000	-.0059	-.0021

* The mean difference is significant at the .05 level.

As seen before multiple comparison, the higher the free floating percentage, the lower the effect of volume trend, in other words investor sentiment. This finding is expected by means of liquidity as well as sentiment because, higher percentages of free float disables the irrational traders to effect the price of the stock. On the other hand, falling percentages do not have the same effect on the volume trend effect on the stock. For example, fourth group with around 20% means of free floating percentages do not have the highest mean when compared with other groups.

4.3.5 Cross section analysis on geometric growth

Companies generate positive or negative cash flows or earnings, which increase at significantly faster rates than the overall economy. Here the companies overall geometric growth values are being evaluated by means of their relation to investor sentiment. There is a wide range of companies with highly negative to highly positive geometric growth ratios as seen below.

Table 4.71: Final cluster centers for volume trend according to geometric growth.

	Cluster			
	1	2	3	4
GROWTH	-18.49	32.16	-1.72	11.99

Four groups are classified with cluster means around; -18.5, -1.7, 12 and 32, where the number of each cluster members are 655, 1447, 2921 and 3011. These mean values are reflecting the all of the shares’ growth ratios within the cluster.

Table 4.72: Number of cases in each cluster for volume trend according to geometric growth.

Cluster	1	655.000
	2	1447.000
	3	2921.000
	4	3011.000
Valid		8034.000
Missing		6600.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.73: Descriptive statistics for volume trend according to geometric growth.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	266	.0184	.01806	.00111	.0163	.0206	-.05	.07
2	821	.0268	.01652	.00058	.0256	.0279	-.05	.07
3	886	.0152	.01996	.00067	.0139	.0165	-.05	.08
4	1182	.0195	.01781	.00052	.0184	.0205	-.06	.07
Total	3155	.0201	.01865	.00033	.0194	.0207	-.06	.08

Table 4.74: Test of homogeneity of variances for volume trend according to geometric growth.

Levene Statistic	df1	df2	Sig.
5.767	3	3151	.001

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.75: Analysis of variance for volume trend according to geometric growth.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.059	3	.020	59.884	.000
Within Groups	1.038	3151	.000		
Total	1.097	3154			

In order to investigate detailed information among groups, Dunnett' T3 test is given below, which is useful for groups with different variances. Finding's suggest that each group has significantly different means.

Table 4.76: Post-hoc test results for volume trend according to geometric growth.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00104	.00103	.894	-.0038	.0017
	3	-.00204	.00083	.079	-.0042	.0001
	4	-.00357(*)	.00083	.000	-.0057	-.0014
2	1	.00104	.00103	.894	-.0017	.0038
	3	-.00100	.00097	.885	-.0036	.0016
	4	-.00252	.00097	.055	-.0051	.0000
3	1	.00204	.00083	.079	-.0001	.0042
	2	.00100	.00097	.885	-.0016	.0036
	4	-.00152	.00075	.229	-.0035	.0005
4	1	.00357(*)	.00083	.000	.0014	.0057
	2	.00252	.00097	.055	.0000	.0051
	3	.00152	.00075	.229	-.0005	.0035

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, the second cluster, which has 1447 observations and a higher geometric average growth value such as 32%, has a remarkably high beta coefficient than rest of the clusters, around 1%. This shows that the companies with higher growth rates are subject to higher effects of investor sentiment when compared with the moderately growing and losing companies. Finally, none of the other clusters have significantly different average beta coefficients. This is consistent with the fact that, upward trends are more likely to be related with volume trend impact then downward trends, because winning stocks attract more attention of investors than loser stocks, which leads higher volume patterns and more investor sentiment impact accordingly.

4.3.6 Cross section analysis on price to earnings ratio

P/E ratio is a valuation ratio of a company's current share price compared to its per-share earnings. In order to calculate this ratio, total market value of the company is divided by the earnings in the corresponding period. The higher the P/E ratios, the higher the investors' expectations higher earnings growth in the future.

Table 4.77: Final cluster centers for volume trend according to P/E ratios.

	Cluster			
	1	2	3	4
P_E	22.79	75.60	44.39	10.14

Four groups are classified with cluster means around; 10, 22, 44 and 75, where the number of each cluster members are 3025, 373, 950 and 5950. These mean values are reflecting the all of the shares' quick ratios within the cluster. Obviously higher quick ratios stand for better financial stability of the company. So the companies in the second cluster have a higher financial stability than those in the fourth cluster.

Table 4.78: Number of Cases in each Cluster for volume trend according to P/E ratios.

Cluster	1	3025.000
	2	373.000
	3	950.000
	4	5950.000
Valid		10298.000
Missing		4336.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.79: Descriptive statistics for volume trend according to P/E ratios.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	1161	.0209	.01870	.00055	.0198	.0220	-.06	.08
2	202	.0304	.01683	.00118	.0280	.0327	-.02	.07
3	500	.0274	.01804	.00081	.0258	.0290	-.05	.08
4	2443	.0201	.01939	.00039	.0194	.0209	-.06	.11
Total	4306	.0217	.01917	.00029	.0211	.0222	-.06	.11

Table 4.80: Test of homogeneity of variances for volume trend according to P/E ratios.

Levene Statistic	df1	df2	Sig.
.445	3	4302	.721

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster cannot be rejected. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. The variance equality assumption of ANOVA holds for the P/E earnings classification of volume trend betas.

Table 4.81: Analysis of variance for volume trend according to P/E ratios.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.038	3	.013	35.536	.000
Within Groups	1.544	4302	.000		
Total	1.582	4305			

In order to investigate detailed information among groups, Bonferroni test is given below, which is useful for groups with equal variances. Finding's suggest that some groups have significantly different means.

Table 4.82: Post-hoc test results for volume trend according to P/E ratios.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00945(*)	.00144	.000	-.0133	-.0056
	3	-.00649(*)	.00101	.000	-.0092	-.0038
	4	.00079	.00068	1.000	-.0010	.0026
2	1	.00945(*)	.00144	.000	.0056	.0133
	3	.00296	.00158	.368	-.0012	.0071
	4	.01024(*)	.00139	.000	.0066	.0139
3	1	.00649(*)	.00101	.000	.0038	.0092
	2	-.00296	.00158	.368	-.0071	.0012
	4	.00729(*)	.00093	.000	.0048	.0097
4	1	-.00079	.00068	1.000	-.0026	.0010
	2	-.01024(*)	.00139	.000	-.0139	-.0066
	3	-.00729(*)	.00093	.000	-.0097	-.0048

* The mean difference is significant at the .05 level.

According to the findings of Bonferroni test, all groups except first and fourth groups are found to be significantly different. As clearly seen from the below table, companies with higher P/E ratios, in other words companies with lower earnings are relatively more vulnerable to the effects of investor sentiment. Here for example second and third clusters have higher P/E ratios like 75 and 44, and their mean beta coefficient is 1% higher than the rest of the clusters with 10 and 22 P/E ratios.

4.3.7 Cross section analysis on dividend yield

The dividend yield ratio measures a company's dividend payments relative to its current stock price. If the capital gains are omitted, dividends yield is the return on investment for a stock. Dividend yield ratio is calculated by dividing annual dividends per share with current price per share. This ratio gives information about the profitability and the dividend policy of the companies being evaluated.

Table 4.83: Final cluster centers for volume trend according to dividend yield.

	Cluster			
	1	2	3	4
D_YIELD	2.08	.19	7.27	4.24

Four groups are classified with cluster means around; 0.2, 2, 4.2 and 7.27, where the number of each cluster members are 2227, 4022, 334 and 1000. These mean values are reflecting the all of the shares' dividend yield ratios within the cluster. Higher dividend ratios stand for higher cash flow generated for each dollar investors invested to the company.

Table 4.84: Number of Cases in each Cluster for volume trend according to dividend yield.

Cluster	1	2227.000
	2	4022.000
	3	334.000
	4	1000.000
Valid		7583.000
Missing		7052.000

Descriptive statistics of each cluster is given below, where all of the clusters are remarkably different than each other. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.85: Descriptive statistics for volume trend according to dividend yield.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	807	.0207	.01850	.00065	.0194	.0220	-.05	.07
2	2008	.0280	.01935	.00043	.0272	.0289	-.06	.11
3	103	.0074	.02073	.00204	.0033	.0114	-.03	.07
4	325	.0128	.01893	.00105	.0107	.0149	-.05	.07
Total	3243	.0240	.02001	.00035	.0233	.0247	-.06	.11

Table 4.86: Test of homogeneity of variances for volume trend according to dividend yield.

Levene Statistic	df1	df2	Sig.
1.558	3	3239	.197

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster cannot be rejected. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. The variance equality assumption of ANOVA holds for the dividend yiled classification of volume trend betas.

Table 4.87: Analysis of variance for volume trend according to dividend yield.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.111	3	.037	100.519	.000
Within Groups	1.187	3239	.000		
Total	1.298	3242			

In order to investigate detailed information among groups, Bonferroni test is given below, which is useful for groups with equal variances. Finding's suggest that some groups have significantly different means.

Table 4.88: Post-hoc test results for volume trend according to dividend yield.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00731(*)	.00080	.000	-.0094	-.0052
	3	.01336(*)	.00200	.000	.0081	.0186
	4	.00791(*)	.00126	.000	.0046	.0112
2	1	.00731(*)	.00080	.000	.0052	.0094
	3	.02067(*)	.00193	.000	.0156	.0258
	4	.01523(*)	.00114	.000	.0122	.0182
3	1	-.01336(*)	.00200	.000	-.0186	-.0081
	2	-.02067(*)	.00193	.000	-.0258	-.0156
	4	-.00544	.00216	.072	-.0112	.0003
4	1	-.00791(*)	.00126	.000	-.0112	-.0046
	2	-.01523(*)	.00114	.000	-.0182	-.0122
	3	.00544	.00216	.072	-.0003	.0112

* The mean difference is significant at the .05 level.

According to the findings of Bonferroni test, all clusters except third and fourth are significantly different from each other and all clusters are ranked in a descending order when compared by dividend yields. The highest mean beta coefficient emerged in the lowest dividend yield cluster and the lowest mean beta coefficient emerged in the highest dividend yield group. Especially the average volume trend beta coefficient for the companies with dividend yields close to zero, volume trend value is close to 3%, where the high yield companies on the other hand has a beta coefficient average slightly below one percent. Dividend yield is also related with the profitability of a company. On the other hand, dividend yields closed to zero reflects lower levels of profit, if not loss, which is in other words financial distress on a company. Related with previous work of Baker and Wurgler (2006) companies with financial distress are more likely to be effected by investor sentiment. Therefore, this work's findings are consistent with those of Baker and Wurgler's.

4.3.8 Cross section analysis on gross margin

Gross margin is the total sales revenue minus its cost of goods sold, divided by the total sales revenue, expressed as a percentage. The gross margin represents the percent of total sales revenue that the company retains after incurring the direct costs associated with producing the goods and services sold by a company. The higher the percentage, the more the company retains on each dollar of sales to service its other costs and obligations.

Table 4.89: Final cluster centers for volume trend according to gross margin.

	Cluster			
	1	2	3	4
G_MARGIN	-29.73	70.77	15.02	38.04

Four groups are classified with cluster means around; -29, 70, 15 and 38, where the number of each cluster members are 84, 1539, 4391 and 3184. These mean values are reflecting the all of the shares' gross margin within the cluster. As mentioned before, gross margin is a profitability indicator of the company. The higher the gross margin, the more profitable is the company.

Table 4.90: Number of cases in each cluster for volume trend according to gross margin.

Cluster	1	84.000
	2	1539.000
	3	4391.000
	4	3184.000
Valid		9198.000
Missing		5436.000

Descriptive statistics of each cluster is given below, where the first cluster is remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.91: Descriptive statistics for volume trend according to gross margin.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	52	.0301	.01331	.00185	.0263	.0338	.01	.06
2	548	.0206	.02013	.00086	.0189	.0223	-.09	.08
3	2256	.0253	.01860	.00039	.0246	.0261	-.05	.11
4	1256	.0215	.02045	.00058	.0204	.0226	-.06	.11
Total	4112	.0236	.01945	.00030	.0230	.0242	-.09	.11

Table 4.92: Test of homogeneity of variances for volume trend according to gross margin.

Levene Statistic	df1	df2	Sig.
3.237	3	4108	.021

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.93: Analysis of variance for volume trend according to gross margin.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.019	3	.006	17.265	.000
Within Groups	1.536	4108	.000		
Total	1.555	4111			

In order to investigate detailed information among groups, Dunnett’ T3 test is given below, which is useful for groups with different variances. Finding’s suggest that each group has significantly different means.

Table 4.94: Post-hoc test results for volume trend according to gross margin.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	.00942(*)	.00281	.005	.0020	.0168
	3	.00470	.00271	.497	-.0025	.0119
	4	.00854(*)	.00274	.011	.0013	.0158
2	1	-.00942(*)	.00281	.005	-.0168	-.0020
	3	-.00471(*)	.00092	.000	-.0071	-.0023
	4	-.00087	.00099	1.000	-.0035	.0017
3	1	-.00470	.00271	.497	-.0119	.0025
	2	.00471(*)	.00092	.000	.0023	.0071
	4	.00384(*)	.00068	.000	.0020	.0056
4	1	-.00854(*)	.00274	.011	-.0158	-.0013
	2	.00087	.00099	1.000	-.0017	.0035
	3	-.00384(*)	.00068	.000	-.0056	-.0020

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, the second cluster has no significant difference with the fourth cluster, and first has no significant difference with the third. On the other hand, these two cluster groups are significantly different from each other. As, seen from the descriptive statistics table first and third had relatively lower gross margin than others. So, the higher gross margin, the lower the effect of volume trend of the stock return.

4.3.9 Cross section analysis on return on assets ratio

Return on Assets is the net income, divided by the total assets, expressed as a percentage. ROA gives information on how efficiently the assets of a company is used for generating income. Annual earnings of the company is divided by total assets, which reflects in other words the return on investment. The higher this percentage, the more efficiently used total assets for generating income.

Table 4.95: Final cluster centers for volume trend according to ROA.

	Cluster			
	1	2	3	4
ROA	19.85	-51.26	-8.94	4.20

Four groups are classified with cluster means around; -51, -9, 4 and 20, where the number of each cluster members are 1636, 168, 1385 and 9917. These mean values are reflecting the all of the shares' return on assets values within the cluster.

Table 4.96: Number of cases in each cluster for volume trend according to ROA.

Cluster	1	1636.000
	2	168.000
	3	1385.000
	4	9917.000
Valid		13106.000
Missing		1528.000

Descriptive statistics of each cluster is given below, where the second cluster is remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.97: Descriptive statistics for volume trend according to ROA.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	742	.0225	.01800	.00066	.0212	.0238	-.09	.10
2	89	.0301	.02034	.00216	.0258	.0343	-.05	.07
3	703	.0239	.01903	.00072	.0224	.0253	-.05	.08
4	4144	.0217	.01958	.00030	.0211	.0223	-.06	.11
Total	5678	.0222	.01936	.00026	.0217	.0227	-.09	.11

Table 4.98: Test of homogeneity of variances for volume trend according to ROA.

Levene Statistic	df1	df2	Sig.
2.985	3	5674	.030

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.99: Analysis of variance for volume trend according to ROA.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.009	3	.003	7.713	.000
Within Groups	2.118	5674	.000		
Total	2.127	5677			

In order to investigate detailed information among groups, Dunnett’ T3 test is given below, which is useful for groups with different variances. Finding’s suggest that each group has significantly different means.

Table 4.100: Post-hoc test results for volume trend according to ROA.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00755(*)	.00225	.007	-.0136	-.0015
	3	-.00134	.00098	.671	-.0039	.0012
	4	.00084	.00073	.822	-.0011	.0028
2	1	.00755(*)	.00225	.007	.0015	.0136
	3	.00621(*)	.00227	.043	.0001	.0123
	4	.00839(*)	.00218	.001	.0025	.0142
3	1	.00134	.00098	.671	-.0012	.0039
	2	-.00621(*)	.00227	.043	-.0123	-.0001
	4	.00218(*)	.00078	.031	.0001	.0042
4	1	-.00084	.00073	.822	-.0028	.0011
	2	-.00839(*)	.00218	.001	-.0142	-.0025
	3	-.00218(*)	.00078	.031	-.0042	-.0001

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, the second cluster is the only cluster to be significantly different from other clusters. On the other hand, first cluster has no significant difference from other clusters except second one. Second cluster has a higher volume trend beta when compared with other clusters and second cluster has the lowest cluster average for return on assets, around -51%, which reflects the financial distress on these companies. Previous literature like Baker and Wurgler (2006) also suggest that financially distressed companies are more vulnerable to investor sentiment.

4.3.10 Cross section analysis on current ratio

Current ratio is a financial ratio which shows whether a firm is capable of paying its debts with available resources within one year period. This ratio is calculated by dividing current assets with current liabilities, where both of the numerator and denominator are by definition consists of the values within one year. The higher the current ration, the more capable the firm to pay its debt within one year but on the other hand the less external sources are being used.

Table 4.101: Final cluster centers for volume trend according to current ratio.

	Cluster			
	1	2	3	4
CURRENT	2.39	4.34	7.48	1.12

Four groups are classified with cluster means around; 1.1, 2.4, 4.34 and 7.48, where the number of each cluster members are 3119, 1008, 359 and 6573. These mean values are reflecting the all of the shares' current ratios within the cluster. Obviously higher current ratios stand for higher ability of debt payment. Therefore companies in the third cluster are far more capable of paying their debt within one year period than the fourth cluster companies.

Table 4.102: Number of cases in each cluster for volume trend according to current ratio.

Cluster	1	3119.000
	2	1008.000
	3	359.000
	4	6573.000
Valid		11059.000
Missing		3575.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.103: Descriptive statistics for volume trend according to current ratio.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	1313	.0222	.01866	.00052	.0212	.0232	-.05	.10
2	455	.0247	.01810	.00085	.0230	.0263	-.05	.11
3	180	.0276	.01786	.00133	.0250	.0302	-.06	.07
4	2970	.0231	.01941	.00036	.0224	.0238	-.09	.11
Total	4918	.0232	.01906	.00027	.0226	.0237	-.09	.11

Table 4.104: Test of homogeneity of variances for volume trend according to current ratio.

Levene Statistic	df1	df2	Sig.
2.319	3	4914	.073

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster cannot be rejected. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. The variance equality assumption of ANOVA holds for the current ratio classification of volume trend betas.

Table 4.105: Analysis of variance for volume trend according to current ratio.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.006	3	.002	5.282	.001
Within Groups	1.781	4914	.000		
Total	1.787	4917			

In order to investigate detailed information among groups, Bonferroni test is given below, which is useful for groups with equal variances. Finding's suggest that some groups have significantly different means.

Table 4.106: Post-hoc test results for volume trend according to current ratio.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00244	.00104	.110	-.0052	.0003
	3	-.00538(*)	.00151	.002	-.0094	-.0014
	4	-.00089	.00063	.955	-.0026	.0008
2	1	.00244	.00104	.110	-.0003	.0052
	3	-.00294	.00168	.480	-.0074	.0015
	4	.00156	.00096	.628	-.0010	.0041
3	1	.00538(*)	.00151	.002	.0014	.0094
	2	.00294	.00168	.480	-.0015	.0074
	4	.00449(*)	.00146	.013	.0006	.0083
4	1	.00089	.00063	.955	-.0008	.0026
	2	-.00156	.00096	.628	-.0041	.0010
	3	-.00449(*)	.00146	.013	-.0083	-.0006

* The mean difference is significant at the .05 level.

According to the findings of Bonferroni test, all clusters except third cluster, are found to be significantly indifferent. The current ratio is an indication of a firm's market liquidity and ability to meet creditor's demands. Acceptable current ratios vary from industry to industry. If a company's current ratio is in this range, then it is generally considered to have good short-term financial strength. However the difference among the clusters are seemingly very close to each other, when compared with other cross section variables. So as a financial indicator, current ratio does not play a distinctive role between stocks.

4.3.11 Cross section analysis on quick ratio

The quick ratio measures a company's ability to meet its short-term obligations with its most liquid assets. The higher the quick ratio, the better the position of the company. Mathematically speaking, quick ratio is the division of current assets minus inventories by current liabilities. Quick ratio is a very important indicator of financial stability, therefore here we use this value for proxying the financial stability and test the effect of financial stability and its effect on investor sentiment.

Table 4.107: Final cluster centers for volume trend according to quick ratio.

	Cluster			
	1	2	3	4
QUICK	1.13	1.67	.71	.28

Four groups are classified with cluster means around; 0.28, 0.71, 1.13 and 1.67, where the number of each cluster members are 2149, 1330, 3122 and 2682. These mean values are reflecting the all of the shares' quick ratios within the cluster. Obviously higher quick ratios stand for better financial stability of the company. So the companies in the second cluster have a higher financial stability than those in the fourth cluster.

Table 4.108: Number of cases in each cluster for volume trend according to quick ratio.

Cluster	1	2149.000
	2	1330.000
	3	3122.000
	4	2682.000
Valid		9283.000
Missing		5351.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.109: Descriptive statistics for volume trend according to quick ratio.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	902	.0208	.01903	.00063	.0196	.0221	-.09	.10
2	518	.0219	.01851	.00081	.0203	.0235	-.05	.10
3	1411	.0229	.01994	.00053	.0218	.0239	-.05	.11
4	1289	.0244	.01903	.00053	.0233	.0254	-.05	.10
Total	4120	.0228	.01932	.00030	.0222	.0233	-.09	.11

Table 4.110: Test of homogeneity of variances for volume trend according to quick ratio.

Levene Statistic	df1	df2	Sig.
2.959	3	4116	.031

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.111: Analysis of variance for volume trend according to quick ratio.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.007	3	.002	6.487	.000
Within Groups	1.530	4116	.000		
Total	1.538	4119			

In order to investigate detailed information among groups, Dunnett' T3 test is given below, which is useful for groups with different variances. Finding's suggest that each group has significantly different means. According to the findings of Dunnett T3 test, only first and fourth groups are found to be significantly different, with a slightly higher volume trend beta. Quick ratio is an indication of a firm's market liquidity but a tighter indicator than current ratio, because of the exclusion of inventories from the current assets.However, comparing all groups the findings suggest that quick ratio is not a good indicator for identifying the financial stability of a firm in order to investigate the effect of investor sentiment.

Table 4.112: Post-hoc test results for volume trend according to quick ratio.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00104	.00103	.894	-.0038	.0017
	3	-.00204	.00083	.079	-.0042	.0001
	4	-.00357(*)	.00083	.000	-.0057	-.0014
2	1	.00104	.00103	.894	-.0017	.0038
	3	-.00100	.00097	.885	-.0036	.0016
	4	-.00252	.00097	.055	-.0051	.0000
3	1	.00204	.00083	.079	-.0001	.0042
	2	.00100	.00097	.885	-.0016	.0036
	4	-.00152	.00075	.229	-.0035	.0005
4	1	.00357(*)	.00083	.000	.0014	.0057
	2	.00252	.00097	.055	.0000	.0051
	3	.00152	.00075	.229	-.0005	.0035

* The mean difference is significant at the .05 level.

4.3.12 Cross section analysis on long term debt ratio

Below is the evaluation of volume trend betas according to the ratio of long term debt to total capital. The higher the ratio of the long term debt, the better the financial state of a firm. Because longer duration of debt enables the company to roll over its debts easier.

Table 4.113: Final cluster centers for volume trend according to long term debt ratio.

	Cluster			
	1	2	3	4
LT_DEBT_TO_TOT_CAP	3.03	22.83	43.99	69.41

Four groups are classified with cluster means around; 3, 23, 44 and 70, where the number of each cluster members are 6562, 3568, 2134 and 760. These mean values are reflecting the all of the shares' long term debt ratios to the total capital within the cluster. First group has the riskiest position because, only around three percent of the capital is constituted by long term debt. Second cluster is moderately risky group. Rest of the groups are les risky than the first and second groups.

Table 4.114: Number of cases in each cluster for volume trend according to long term debt ratio.

Cluster	1	6562.000
	2	3568.000
	3	2134.000
	4	760.000
Valid		13024.000
Missing		1610.000

Descriptive statistics of each cluster is given below, where none of the clusters are remarkably different than rest of the groups. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.115: Descriptive statistics for volume trend according to long term debt ratio.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	3257	.0243	.01800	.00032	.0237	.0249	-.06	.11
2	1419	.0206	.01928	.00051	.0196	.0217	-.06	.10
3	735	.0176	.02193	.00081	.0161	.0192	-.09	.11
4	269	.0179	.02409	.00147	.0150	.0208	-.05	.08
Total	5680	.0222	.01936	.00026	.0217	.0227	-.09	.11

Table 4.116: Test of homogeneity of variances for volume trend according to long term debt ratio.

Levene Statistic	df1	df2	Sig.
17.051	3	5676	.000

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.117: Analysis of variance for volume trend according to long term debt ratio.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.038	3	.013	34.750	.000
Within Groups	2.090	5676	.000		
Total	2.129	5679			

In order to investigate detailed information among groups, Dunnett' T3 test is given below, which is useful for groups with different variances. Finding's suggest that each group has significantly different means.

Table 4.118: Post-hoc test results for volume trend according to long term debt ratio.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	.00368(*)	.00060	.000	.0021	.0053
	3	.00669(*)	.00087	.000	.0044	.0090
	4	.00643(*)	.00150	.000	.0025	.0104
2	1	-.00368(*)	.00060	.000	-.0053	-.0021
	3	.00301(*)	.00096	.010	.0005	.0055
	4	.00276	.00156	.381	-.0014	.0069
3	1	-.00669(*)	.00087	.000	-.0090	-.0044
	2	-.00301(*)	.00096	.010	-.0055	-.0005
	4	-.00025	.00168	1.000	-.0047	.0042
4	1	-.00643(*)	.00150	.000	-.0104	-.0025
	2	-.00276	.00156	.381	-.0069	.0014
	3	.00025	.00168	1.000	-.0042	.0047

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, first cluster is significantly different than rest of the groups. As mentioned before this group has a lower level of long term debt, which makes this cluster relative risky by means for financial outfow. Rest of the clusters do not significantly differ from others. This value computes the proportion of a company's long-term debt compared to its available capital. This ratio is also a good indicator for analyzing the company's risk exposure. Generally, companies that finance a greater portion of their capital via debt are considered riskier than those with lower leverage ratios. However log term debt, stands for longer duration of money outflow, which enables the company to manage the cash flow easier. So the higher the long term debt, the better the financial stability and vice versa. So companies with lower long term debt are mostly financially distressed companies which are more vulnerable to investor sentiment, consistent with previous works.

4.3.13 Cross section analysis on weighted average cost of capital

WACC is the weighted average cost of capital which is calculated by averaging cost of capital resources of a company such as stocks, preferred stocks, loans etc. WACC level reflects the financial stability of a company. WACC is also an indicator of the companies ability to find capital resourses with reasonable costs. It is obvious that financially distressed companies need to pay a higher risk premium than financially stabile companies, therefore higher WACC level is an indicator of financial instability.

Table 4.119: Final cluster centers for volume trend according to WACC.

	Cluster			
	1	2	3	4
WACC	5.86	18.29	9.76	13.26

Four groups are classified with cluster means around; 6, 10, 13 and 18, where the number of each cluster members are 3923, 920, 5097 and 3430. These mean values are reflecting the all of the shares' WACC levels within the cluster.

Table 4.120: Number of cases in each cluster for volume trend according to WACC.

Cluster	1	3923.000
	2	920.000
	3	5097.000
	4	3430.000
Valid		13370.000
Missing		1273.000

Descriptive statistics of each cluster is given below, where first and third clusters are seemingly lower than secand and fourth clusters, by means of volume trend betas. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.121: Descriptive statistics for volume trend according to WACC.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	1615	.0184	.01908	.00047	.0175	.0194	-.14	.10
2	458	.0247	.01906	.00089	.0230	.0265	-.06	.09
3	2041	.0208	.02137	.00047	.0198	.0217	-.10	.10
4	1637	.0250	.01938	.00048	.0241	.0260	-.06	.11
Total	5751	.0216	.02018	.00027	.0211	.0222	-.14	.11

Table 4.122: Test of homogeneity of variances for volume trend according to WACC.

Levene Statistic	df1	df2	Sig.
5.893	3	5747	.001

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.123: Analysis of variance for volume trend according to WACC.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.042	3	.014	34.602	.000
Within Groups	2.300	5747	.000		
Total	2.341	5750			

In order to investigate detailed information among groups, Dunnett' T3 test is given below, which is useful for groups with different variances. Finding's suggest that each group has significantly different means.

Table 4.124: Post-hoc test results for volume trend according to WACC.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00631(*)	.00101	.000	-.0090	-.0036
	3	-.00233(*)	.00067	.003	-.0041	-.0006
	4	-.00661(*)	.00067	.000	-.0084	-.0048
2	1	.00631(*)	.00101	.000	.0036	.0090
	3	.00397(*)	.00101	.001	.0013	.0066
	4	-.00030	.00101	1.000	-.0030	.0024
3	1	.00233(*)	.00067	.003	.0006	.0041
	2	-.00397(*)	.00101	.001	-.0066	-.0013
	4	-.00428(*)	.00067	.000	-.0060	-.0025
4	1	.00661(*)	.00067	.000	.0048	.0084
	2	.00030	.00101	1.000	-.0024	.0030
	3	.00428(*)	.00067	.000	.0025	.0060

* The mean difference is significant at the .05 level.

The WACC is the minimum return that a company must earn on an existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere. So the higher this value, the harder it is for the company to be profitable. This value also reflects financial stability of a company, by means of riskiness. Risky companies tend to have higher WACC values.

According to the findings of Dunnett T3 test, all clusters except second and fourth clusters are significantly different from each other. Both of the second and fourth clusters have significantly higher WACC levels such as 13% and 18% and their average volume trend betas are around 2.5%. On the other hand, first and third clusters have relatively lower WACC level and their average volume trend betas are around 2%. All in all, WACC level as a financial stability proxy, shows that stabile stock are less vulnerable to investor sentiment.

4.3.14 Cross section analysis on stock beta

Stock beta is an important indicator for the systemic risk on investing the corresponding stock, and on the other hand beta shows the relation of a single stock with the entire market. Companies are mostly classified into low beta, moderate beta and high beta groups, which can be easily difined as beta values below 1, close to 1 and above 1. As mentioned earlier the higher the beta, the higher the sistemic risk on that stock.

Table 4.125: Final cluster centers for volume trend according to stock beta.

	Cluster		
	1	2	3
BETA	1.33	.82	.37

As mentioned earlier, depending on the earlier literature on stock beta, stocks can divided into high, low and moderate beta groups, so three groups are classified with cluster means around; -1.33, 0.82 and 0.37 where the number of each cluster members are 4551, 7869 and 1307 These mean values are reflecting the all of the shares' stock betas within the cluster. First cluster is the high beta, second cluster is the moderate beta and the third cluster is the low beta clusters.

Table 4.126: Number of cases in each cluster for volume trend according to stock beta.

Cluster	1	4551.000
	2	7869.000
	3	1307.000
Valid		13727.000
Missing		908.000

Descriptive statistics of each cluster is given below, where all of the clusters are remarkably different from each other in a descending order with respect to stock betas. For mutual comparison, post-hoc tests will be given by the end of this section

Table 4.127: Descriptive statistics for volume trend according to stock beta.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	2117	.0273	.02117	.00046	.0264	.0282	-.14	.13
2	3283	.0183	.01819	.00032	.0176	.0189	-.06	.08
3	423	.0121	.01826	.00089	.0103	.0138	-.06	.12
Total	5823	.0211	.01995	.00026	.0206	.0216	-.14	.13

Table 4.128: Test of homogeneity of variances for volume trend according to stock beta.

Levene Statistic	df1	df2	Sig.
5.213	2	5820	.005

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different. This significance should be interpreted carefully because, Levene's Test warns one of the assumptions of ANOVA is violated.

Table 4.129: Analysis of variance for volume trend according to stock beta.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.141	2	.071	188.915	.000
Within Groups	2.176	5820	.000		
Total	2.317	5822			

In order to investigate detailed information among groups, Dunnett' T3 test is given below, which is useful for groups with different variances. Finding's suggest that each group has significantly different means.

Table 4.130: Post-hoc test results for volume trend according to stock beta.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	.00899(*)	.00056	.000	.0077	.0103
	3	.01519(*)	.00100	.000	.0128	.0176
2	1	-.00899(*)	.00056	.000	-.0103	-.0077
	3	.00620(*)	.00094	.000	.0039	.0085
3	1	-.01519(*)	.00100	.000	-.0176	-.0128
	2	-.00620(*)	.00094	.000	-.0085	-.0039

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, all clusters are significantly different from each other and all clusters are ranked in a descending order when compared by stock betas. The highest mean beta coefficient emerged in the highest stock beta cluster and the lowest mean beta coefficient emerged in the lowest stock beta group. Especially the average volume trend beta coefficient for the companies with high stock betas, volume trend beta value is just below 3%, where the low beta companies on the other hand has a volume trend beta coefficient average slightly above one percent. An asset has a Beta of zero if its returns change independently of changes in the market's returns. A positive beta means that the asset's returns generally follow the market's returns, in the sense that they both tend to be above their respective averages together, or both tend to be below their respective averages together. A negative beta means that the asset's returns generally move opposite the market's returns: one will tend to be above its average when the other is below its average. Therefore stock beta represents the systematic riskiness of a stock according to market returns. Stock with higher betas have higher systematic risk as well as investor sentiment and vice versa.

4.3.15 Cross section analysis on stock alpha

Alpha represents the stock's excessive return after controlling for known risk factors. In other words, alpha is the part of return or loss, which is unable to shown by market betas. So the higher the alpha, the better the excessive return of the corresponding stock after controlling for market beta. Just like market betas, alpha values are classified into three groups such as high, low and moderate alphas.

Table 4.131: Final cluster centers for volume trend according to stock alpha.

	Cluster		
	1	2	3
ALPHA	.88	-.60	.10

Stocks are divided into high, low and moderate alpha groups, so three groups are classified with cluster means around; 0.9, -0.6 and 0.1 where the number of each cluster members are 3649, 2034 and 8820. These mean values are reflecting the all of the shares' alpha values within the cluster. First cluster is the high alpha, second cluster is the low alpha and the third cluster is the moderate alpha clusters.

Table 4.132: Number of cases in each cluster for volume trend according to stock alpha.

Cluster	1	3649.000
	2	2034.000
	3	8820.000
Valid		14503.000
Missing		132.000

Descriptive statistics of each cluster is given below, where third cluster is remarkably low than others. For mutual comparison, post-hoc tests will be given by the end of this section.

Table 4.133: Descriptive statistics for volume trend according to stock alpha.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	1750	.0228	.01861	.00044	.0219	.0237	-.05	.13
2	1042	.0252	.01828	.00057	.0241	.0264	-.07	.12
3	3274	.0190	.02147	.00038	.0183	.0197	-.14	.11
Total	6066	.0212	.02030	.00026	.0207	.0217	-.14	.13

Table 4.134: Test of homogeneity of variances for volume trend according to stock alpha.

Levene Statistic	df1	df2	Sig.
18.927	2	6063	.000

According to the Levene's Test for Equality of Variances the null hypothesis and the variability of each cluster is rejected to be equal. According to the ANOVA test, which assumes the equality of variances, among groups at least one has a significantly different mean. This significance should be interpreted carefully because, Levene’s Test warns one of the assumptions of ANOVA is violated.

Table 4.135: Analysis of variance for volume trend according to stock alpha.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.037	2	.019	46.157	.000
Within Groups	2.463	6063	.000		
Total	2.500	6065			

In order to investigate detailed information among groups, Dunnett’ T3 test is given below, which is useful for groups with different variances. Findings suggest that each group has significantly different means.

Table 4.136: Post-hoc test results for volume trend according to stock alpha.

(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1	2	-.00242(*)	.00072	.002	-.0041	-.0007
	3	.00382(*)	.00058	.000	.0024	.0052
2	1	.00242(*)	.00072	.002	.0007	.0041
	3	.00624(*)	.00068	.000	.0046	.0079
3	1	-.00382(*)	.00058	.000	-.0052	-.0024
	2	-.00624(*)	.00068	.000	-.0079	-.0046

* The mean difference is significant at the .05 level.

According to the findings of Dunnett T3 test, all clusters are significantly different from each other, but the most remarkable cluster is the moderate alpha cluster. Moderate alpha clusters' volume trend beta coefficients are higher than rest of the clusters form 0.006 to 0.004. Alpha is a risk-adjusted measure of the so-called active return on an investment. It is the return in excess of the compensation for the risk borne, and thus commonly used to assess active managers' performances. Often, the return of a benchmark is subtracted in order to consider relative performance, which yields Jensen's alpha. If Jensen's alpha is calculated for a unique stock portfolio, then it reflects the corresponding stocks performance relative to market. Findings suggest that stocks, whose performances are close to the market, tend to have less impact from investor sentiment.

5. CONCLUSION

The information in past and present trading volume in the context of investor sentiment is used as a sentiment proxy, and its ability on predicting stock returns is investigated. A sentiment measure based on the trend of a trading volume series is constructed, which is called the trading volume trend. Trading volume trend is the percentage change in volume within consecutive weeks. The trading volume trend has a persistent left skewed distribution of beta coefficients and significant relation with expected stock returns, even after robustness tests for stock market return, stock market volume trend, return and volume trend GARCH volatilities and public sentiment indices. These results are consistent with the trading volume trend as a measure of investor sentiment, and investor sentiment affects cross-sectional stock returns. Further analyses are made for the cross section of stock and its effect on the investor sentiment, by means of volume trend betas.

Within the cross section analysis; regions, sectors, market capitalizations, free floating percentages, geometric growth levels, price to earning ratios, dividend yields, gross margins, return on asset ratios, current ratios, quick ratios, long term debt ratios, weighted average cost of capital levels, stock betas and alphas are being investigated.

First, the effect of volume trend is investigated, whether it differs among regions of this work. As mentioned before, there are seven regions within the research; Africa and Middle East, Developed Asia, Developing Asia, East Europe, West Europe, North America and Latin America. Due to the nature of different development levels according to regions, a difference among regions is expected in advance. Especially North America, Developed Asia and West Europe is consisting of highly developed countries such as USA, Canada, Germany, UK, France, Japan, South Korea etc. Here findings suggest that, investor sentiment is significantly higher in Developing and Developed Asian Stocks for about 2 to 3 percent differences. Rest of the regions mostly have volume trend means around 1% to 1.5%. Asian stocks have relatively higher sentiment levels, when compared with other regions. Unexpectedly the reason among regions does not seem to the level of development, because Developing Asia is not consisting of developed countries, however it has the higher impact of volume trend with Developed Asian stocks. Their common point is belonging to the same continent, so the reason of high level of relation with volume trend and price movements is regional rather than level of development.

Another important factor for characteristics of an equity is the sector. Depending on the nature of different capital structure of different sectors, volume trend is also expected to differ among different sectors. For example; funds, finances and utilities are sectors with less dependence on initial capital needs, when compared with industry and energy sectors. The average level of Funds sector is the only cluster below zero, which reflects the negative effect of investor sentiment for funds. On the other hand, the mean for Financial and Utilities are below 2%, and the rest is above 2%. The highest coefficient belongs to Technology stocks with 2.87%. Technology and Utilities are only significantly indifferent from the Energy and Diversified sectors. These findings suggest that, sectors with relatively high turnover of initial investment are seemingly less vulnerable to volume trend when compared with sectors, which require long term investments.

Market capitalization reflects the size of a firm, so the higher the market capitalization, the larger the company. From the market capitalization classification of the volume trend beta coefficients, relatively bigger companies of second and third clusters which have log-transformed cluster averages such as 10.3 and 11.7, have approximately 1% higher beta coefficients when compared with first and fourth clusters which have log-transformed cluster averages such as 6.7 and 8.9. This is an unexpected result, because stocks of companies with higher market capitalizations are mostly liquid stocks and liquidity is a concept closely related with sentiment. Liquid stocks are expected to be less vulnerable to sentiment effect. Therefore, companies with higher market capitalization should be more stabile to sentiment shocks. Here the findings show that, this relation does not hold for market capitalization.

Next is the free floating percentages which is the value of the publicly traded shares with total market value of a company. Results suggest that the higher the free floating percentage, the lower the effect of volume trend, in other words investor sentiment. This finding is expected by means of liquidity as well as sentiment because, higher percentages of free float disables the irrational traders to effect the price of the stock. On the other hand, falling percentages do not have the same effect on the volume trend effect on the stock. This is an expected result because stocks of companies with higher free floating percentage are mostly liquid stocks, where the effect of an increasing volume due to sentiment would have a limited effect on stocks. This is because the stocks of the companies with about 95% of free floating percentage have approximately 1% less volume trend beta impact, than the rest of the companies.

Geometric growth of a company is also a distinguishing feature of a stock, which has 1447 observations and a higher geometric average growth value such as 32%, has a remarkably high beta coefficient than rest of the clusters, around 1%. This shows that the companies with higher growth rates are subject to higher effects of investor sentiment when compared with the moderately growing and losing companies. Growth is an indicator of better financial status for a company. Which attracts both rational and irrational investors, and cause an increasing effect on average level of volume. Therefore the marginal effect of changes in volume due to irrational investors have a limited price impact.

Moreover, companies with higher P/E ratios, in other words companies with lower earnings are found to be relatively more vulnerable to the effects of investor sentiment. Here for example companies which have higher P/E ratios like 75 and 44, also have mean beta coefficient is 1% higher than the rest of the clusters with 10 and 22 P/E ratios. As mentioned before, high levels of P/E ratio stand for relatively lower levels of earnings for a company. Earning also has an information value for the operational effectiveness of a company. The higher the earnings, the better the operational effectiveness of a company. Just like growth level, earnings have a similar effect on stocks vulnerability to volume impacts by attracting both rational and irrational investors, and cause an increasing effect on average level of volume.

The highest mean beta coefficient emerged in the lowest dividend yield cluster and the lowest mean beta coefficient emerged in the highest dividend yield group. Especially the average volume trend beta coefficient for the companies with dividend yields close to zero, volume trend value is close to 3%, where the high yield companies on the other hand has a beta coefficient average slightly below one percent. As another indicator of the profitability of a company, also companies with higher gross margin, have lower effect of volume trend of the stock return. Dividend yield is one of the most significant cross section values to distinguish stocks according to their volume trend beta coefficients. The mechanism behind the effect of dividend yield is close to those of P/E ratios in an inverse way. The higher the dividend yield, the better the profit of a company of a company, which triggers the same process, by attracting both rational and irrational investors, and cause an increasing effect on average level of volume.

Also for return on asset ratios, companies around -51%, which reflects the financial distress on these companies have the highest volume trend beta coefficients. Previous literature also suggest that financially distressed companies are more vulnerable to investor sentiment. Being a profitability ratio ROA has also similar effect on volume trend. The higher the ROA value, the better the profit of a company of a company, and vice verse. Therefore companies with negative ROA do not attract irrational investors, which in turn causes high vulnerability to sentiment effects.

Comparing all groups, findings suggest that quick ratio is the worst proxy for identifying the financial stability of a firm in order to investigate the effect of investor sentiment, just like current ratio.

WACC also represents the financial stability of a company, where higher levels of WACC reflects higher debt burden. According to the findings of this work, the companies with higher WACC levels such as 13% and 18% and their average volume trend betas are around 2.5%. On the other hand companies with lower WACC levels, have average volume trend betas around 2%.

Stock beta and alpha are also belonging to the important characteristics of an equity. The highest mean beta coefficient emerged in the highest stock beta cluster and the lowest mean beta coefficient emerged in the lowest stock beta group. Especially the average volume trend beta coefficient for the companies with high stock betas, volume trend beta value is just below 3%, where the low beta companies on the other hand has a volume trend beta coefficient average slightly above one percent. Finally the so-called moderate alpha cluster, which have alpha values around 0.1, volume trend beta coefficients are higher than rest of the clusters from 0.006 to 0.004.

All in all, in this work the effect of different properties of stocks on past trading volume in other words investor sentiment is investigated. Most of the earlier studies examining the relation between investor sentiment and stock returns use sentiment measures at the market level. The reason may be the fact that there is no sentiment measure for individual stocks with reasonable justification. Therefore, within the framework of this thesis, volume trend beta coefficients are resorted to proxy investor sentiment with weekly frequency.

This work aims to make a contribution to the investor sentiment literature through cross-section analysis of stock volume trends according to characteristic features. Previous works on the volume trend effects on returns (Lei, 2005) mostly concentrate on longer observation period such as months or years, where the findings represent the sentiment of the whole months or year. However sentiment is a rapidly changing phenomena, which might change day by day, even in the same day. This work brings an alternative point of view to the sentiment concept with weekly observations.

This work concentrates on the effect of regions, sectors, market capitalizations, free floating percentages, geometric growth levels, price to earning ratios, dividend yields, gross margins, return on asset ratios, current ratios, quick ratios, long term debt ratios, weighted average cost of capital levels, stock betas and alphas on the investor sentiment, by means of trading volume trend, in explaining the variance in the returns of a stock. These findings complement several studies that explore the relations between trading volume and expected stock returns, and investor sentiment and expected stock returns.

One of the most distinctive parts of this work is the extent of the data being evaluated. Totally 14637 shares are being evaluated from 78 countries of 7 regions which constitute a big sample for about 50000 numbers of stock population available in Bloomberg terminal. This size of data enables comparison of investor sentiment not only on share characteristics but also on regional effects.

Due to computational limits, intraday data could not be evaluated, however it is expected to have significant contribution on sentiment context. Especially, market herding, which stands for the comovement of investors on their trading decisions, has remarkable similarities with investor sentiment. On the other hand, within the market micro structure methodology, distribution statistics of the stock volume has also very important implications to the sentiment.

Survivorship bias is one of the most important sources of mistake in financial studies. It is unfortunately ignored in this work, because of the limits of data provider, which does not track the data of merged or bankrupted companies.

For further research, the behavior of the volume trend during bullish and bearish periods and also the possible difference of effectiveness of volume trend in downward and upward weeks should be investigated. Moreover, this relation should be extended in both lower and higher frequency data, such as daily and monthly returns. In order to cancel out the survivorship bias, some merged or bankrupted stocks within the evaluation period should be added to the existing sample.

REFERENCES

Amihud, Y. and Mendelson, H., 1986a. Asset Pricing and the Bid-Ask Spread, *Journal of Financial Economics* **17**, 223-249.

Amihud, Y., 2002. Illiquidity and Stock Returns: Cross-Section and Time-Series Effects, *Journal of Financial Markets* **5**, 31-56.

Antoniou, C., Doukas J.A., and Subrahmanyam, A., 2010. Sentiment and momentum, Working paper, UCLA. Retrieved at April 18, 2011 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1479197.

Baker, M., and Stein J., 2004. Market Liquidity as a Sentiment Indicator, *Journal of Financial Markets* **7**, 271-299.

Baker, M., and Wurgler J., 2006. Investor Sentiment and the Cross-Section of Stock Returns, NBER Working Paper #10449. Retrieved March 12, 2011 from http://ideas.repec.org/a/bla/jfinan/v61y2006i4p1645-1680.html.

Baker M. & Wurgler J., 2007. Investor Sentiment in the Stock Market, NBER, Working Papers 13189, National Bureau of Economic Research, Inc. Retrieved February 19, 2011 from http://ideas.repec.org/a/aea/jecper/v21y2007i2p129-152.html.

Bekaert, G., Campbell R. H., and Lundblad C., 2003. Liquidity and Expected Returns: Lessons from Emerging Markets, Working paper, Columbia University. Retrieved April 19, 2011 from http://faculty.fuqua.duke.edu/~charvey/Research/Working_Papers/W67_Liquidity_and_expected.pdf.

Ben-Raphael, A., Kandel, S., and Wohl A.. 2008. The Price Pressure of Aggregate Mutual Fund Flows, Working paper. Retrieved April 19, 2011 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1295986.

Berry, T. D., and Howe, K.M., 1994. Public Information Arrival, *Journal of Finance* **49**, 1331-1346.

Bessembinder, H., 2003. Issues in Accessing Trade Execution Costs, *Journal of Financial Markets* **6**, 233-257.

Bird R. and Yeung D., 2010. How Do Investors React Under Uncertainty?, Working Paper Series 8, The Paul Woolley Centre for Capital Market Disfunctionality. Retrieved April 21, 2011 from http://www.business.uts.edu.au/qfrc/pwc/research/workingpapers/2010/wp8.pdf.

Brennan, M. J., and Subrahmanyam, A., 1995. Investment Analysis and Price Formation in Securities Markets, *Journal of Financial Economics* **38**, 361-381.

Brennan, M. J., and Subrahmanyam A., 1996. Market Microstructure and Asset Pricing: On the Compensation for Illiquidity in Stock Returns, *Journal of Financial Economics* **41**, 441-464.

Brennan, M. J., Chordia, T., and Subrahmanyam, A., 1998. Alternative Factor Specifications, Security Characteristics, and the Cross-Section of Expected Stock Returns, *Journal of Financial Economics* **49**, 345-373.

Brown, G. W., and Cliff, M. T., 2004. Investor Sentiment and the Near-Term Stock Market, *Journal of Empirical Finance* **11**, 1-27.

Brown, G. W., and Cliff M.T., 2005. Investor Sentiment and Asset Valuation, Journal of Businesse 78, Local and Global Sentiment Effects, and the Role of Legal, Trading and Information Environments, Working Paper Series. Retrieved April 19, 2011 from http://ideas.repec.org/a/ucp/jnlbus/v78y2005i2p405-440.html.

Chalmers, J. M. R., and Kadlec, G. B., 1998. An Empirical Examination of the Amortized Spread, *Journal of Financial Economics* **48**, 159-188.

Chen, N.-F., Kan R., and Miller H. M., 1993a. Are the Discounts on Closed-End Funds a Sentiment Index?, *Journal of Finance* **48**, 795-800.

Chen, N.-F., Kan R., and Miller H. M , 1993b. A Rejoinder, *Journal of Finance* **48**, 809-810.

Chordia, T., Roll R., and Subrahmanyam A., 2000. Commonality in Liquidity, *Journal of Financial Economics* **56**, 3-28.

Chordia, T., Subrahmanyam A., and Anshuman V.R., 2001. Trading Activity and Expected Stock Returns, *Journal of Financial Economics* **59**, 3-32.

Chung, S.-L. and Yeh, C.-Y., 2009. Investor Sentiment, Regimes and Stock Returns. Retrieved April 19, 2011 from Working Paper http://www.centerforpbbefr.rutgers.edu/TaipeiPBFR&D/01-16-09%20papers/2-4%20San-Lin%20Chung_regimesentiment.pdf.

Connor, G., and Korajczyk R. A., 1988. Risk and Return in an Equilibrium APT: Application of a New Test Methodology, *Journal of Financial Economics* **21**, 255-289.

Datar, V., Naik N.Y., and Radcliffe R., 1998. Liquidity and Stock Returns: An Alternative Test, *Journal of Financial Markets* **1**, 203-219.

De Long, J. B., .Shleifer, A., Summers L.H., and Waldmann R.J, 1990. Noise Trader Risk in Financial Markets, *Journal of Political Economy* **98**, 703-738.

Demsets, H., 1968. The Cost of Transacting, *Quarterly Journal of Economics* **82**, 33-53.

Easley, D., Kiefer, N. F.., and O'Hara, M., Paperman J., 1996. Liquidity, Information, and Infrequently Traded Stocks, *Journal of Finance*, **51**, 1405-1436.

Easley, D., Kiefer, N. F.., and O'Hara, M.,, 1997. One Day in the Life of a Very Common Stock, *Review of Financial Studies* **10**, 805-835.

Easley, D., Hvidkjaer, S., and O'Hara, M., 2002. Is Information Risk a Determinant of Asset Returns?, *Journal of Finance* **57,** 2185-2221.

Eleswarapu, V. R., and Reinganum M. R., 1993. The Seasonal Behavior of the Liquidity Premium in Asset Pricing, *Journal of Financial Economics* **34**, 373-386.

Eleswarapu, V. R., 1997. Cost of Transaction and Expected Returns in the NASDAQ Market, *Journal of Finance* **52**, 2113-2127.

Elton, E. J., Gruber M. J., and Busse J. A., 1998. Do Investors Care about Sentiment?, *Journal of Business* **71**, 477-500.

Fama, E. F., and French K. R., 1993. Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics* **33**, 3-56.

Finter, P., Niessen-Ruenzi, A and Ruenzi, S., 2010. The impact of investor sentiment on the German stock market, CFR Working Papers 10-03, University of Cologne, Centre for Financial Research (CFR)491.

Gai, P., and Vause, N., 2006. Measuring investors' risk appetite, *International Journal of Central Banking,* **2**, 167–188.

Glushkov, D., 2009. Sentiment beta. Working Paper, Retrieved April 12, 2011 from http://www.blackwellpublishing.com/pdf/Glushkov_JBFA_CMC.pdf.

Grant C., Gasbarro D, Monroe G. S., Zumwalt J. K., 2010. Investor Sentiment and the Performance of Mutual Funds Pursuing Momentum and Contrarian Trading Strategies, 23rd Australasian Finance and Banking Conference 2010 Paper.

Harris, M., and Raviv A., 1993. Differences of Opinion Make a Horse Race, *Review of Financial Studies* **6**, 473-506.

Hasbrouck, J., and Seppi D. J., 2001. Common Factors in Prices, Order flows, and Liquidity, *Journal of Financial Economics* **59**, 383-411.

Hengelbrock J., Theissen E., Westheide C., 2011. Market Response to Investor Sentiment, Center for Financial Studies Working Paper. Retrieved April 19, 2011 from Market Response to Investor.

Hong, Y.-G., Kim, Kang S.-H., Goo H., 2011. Tactical Asset Allocation Using Korean Investors' Sentiment, SSRN Working Paper Series # 1738946. Retrieved May 12, 2010 from http://papers.ssrn.com/sol3/papers.cfm ?abstract_id=1738946.

Huang, R. D., and Stoll H. R., 1996. Dealer versus Auction Markets: A Paired Comparison of Execution Costs on the NASDAQ and the NYSE, *Journal of Financial Economics* **41**, 313-357.

Hvidkjaer, S., 2008. Small Trades and the Cross-Section of Stock Returns, *Review of Financial Studies*, **21**, no. **3,** 1123–1151.

Jones, C. M., Kaul G., and Lipson, M.L, 1994. Transactions, Volume, and Volatility, *Review of Financial Studies* **7**, 631-651.

Judd, K. L., Kubler F., and Schmedders K., 2003. Asset Trading Volume with Dynamically Complete Markets and Heterogeneous Agents, *Journal of Finance* **58**, 2203-2217.

Karpoff, J. M., 1986. A Theory of Trading Volume, *Journal of Finance* **41**, 1069-10087.

Kim T.-H., Ha A., 2010. Investor Sentiment and Market Anomalies, *23rd Australasian Finance and Banking Conference 2010 Pape.*

Klein, R. F., Chow, K. V., 2010. Sentiment Effect and Market Portfolio Efficiency, Working Paper. Retrieved April 19, 2010 from http://ideas.repec.org /p/wvu/wpaper/10-08.html.

Kling, G. and Gao, L., 2008. Chinese Institutional Investors' Sentiment, *Journal of International Financial Markets*, Institutions and Money **18**, 374–87.

Koski, J. L, and Michaely R., 2000. Prices, Liquidity, and the Information Content of Trades, *Review of Financial Studies* **13**, 659-696.

Kumar, A., and Lee, C., 2006. Retail investor sentiment and return comovement, *Journal of Finance, American Finance Association* vol. **61(5)**, pages 2451-2486, October.

Kyle, A. S., 1985. Continuous Auctions and Insider Trading, *Econometrica* **53**, 1315-1335.

Lakonishok, J., and .Maberly E., 1990. The Weekend Effect: Trading Patterns of Individual and Institutional Investors, *Journal of Finance* **45**, 231-243.

Lee, C. M.C., Shleifer A., and Thaler R.H., 1991. Investor Sentiment and the Closed-End Fund Puzzle, *Journal of Finance* **46**, 75-109.

Lee, C. M. C., Mucklow B., and Ready, M.J., 1993. Spreads, Depths, and the Impact of Earnings Information: An Intraday Analysis, *Review of Financial Studies* **6**, 345-374.

Lee, C. M.C., and .Swaminathan B., 2000. Price Momentum and Trading Volume, *Journal of Finance* **55**, 2017-2069.

Lei, Y.-C., 2005. The trading volume trend, investor sentiment and stock returns, *PhD Thesis,* Louisiana State University, USA.

Lesmond, D. A., Ogden J.P., and Trzcinka C.A., 1999. A New Estimate of Transaction Costs, *Review of Financial Studies* **12**, 1113-1141.

Liao T.-L., Huang, C.-J, and Wu C.-Y., 2011. Do fund managers herd to counter investor sentiment?, *Journal of Business Research* **64**, Issue 2, 207-212.

Llorente, G., Michaely R., Sarr G., and Wang J., 2002. Dynamic Volume-Return Relation of Individual Stocks, *Review of Financial Studies* 15, 1005-1047.

Lo, A. W., and Wang J., 2000. Trading Volume: Definition, Data Analysis, and Implications of Portfolio Theory, *Review of Financial Studies* **13**, 257-300.

McInish, T. H., and Woods R. A., 1995. Hidden Limit Orders on the NYSE, *Journal of Portfolio Management* **21**, 19-26.

Merton, R. C., 1987. A Simple Model of Capital Market Equilibrium with Incomplete Information, *Journal of Finance* **42**, 483-510.

Miller, E. M., 1977. Risk, Uncertainty, and Divergence of Opinion, *Journal of Finance* **32**, 1151-1168.

Neal, R. and . Wheatley, S.M., 1998. Do Measures of Investor Sentiment Predict Returns?, *Journal of Financial and Quantitative Analysis* **33**, 523-547.

O'Hara, M., 1995. Market Microstructure Theory, Blackwell Publishers, Malden, MA.

O'Hara, M.,, 2003. Presidential Address: Liquidity and Price Discovery, *Journal of Finance* **58**, 1335-1354.

Otoo, M. W., 1999. Consumer sentiment and the stock market, Finance and Economics Discussion Series 1999-60, Board of Governors of the Federal Reserve System.

Pastor, L., and . Stambaugh R. F., 2003. Liquidity Risk and Expected Stock Returns, *Journal of Political Economy* **111**, 642-685.

Petersen, M. A., and Fialkowski D., 1994. Posted versus Effective Spreads: Good Prices or Bad Quotes?, *Journal of Financial Economics* **35**, 269-292.

Qiu, L., and Welch I., 2004. Investor Sentiment Measures, Working paper, Brown University. Retrieved April 19, 2010 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=589641.

Roll, R., 1984. A Simple Implicit Measure of the Effective Bid-Ask Spread in an Efficient Market, *Journal of Finance* **39**, 1127-1139.

Rouwenhorst, K, G., 1999. Local Return Factors and Turnover in Emerging Stock Markets, *Journal of Finance* **54,** 1439-1464.

Smidt, S., 1968. A New Look at the Random Walk Hypothesis, *Journal of Financial and Quantitative Analysis* **3**, 235-261.

Shleifer, A. and Vishny R.W., 1997. The Limits of Arbitrage, *Journal of Finance* **52**, 35-55.

Schmeling, M., 2009. Investor sentiment and stock returns: Some international evidence, *Journal of Empirical Finance*, Elsevier, **16(3),** pages 394-408.

Siriopoulos, C., and Fassas, A., 2010. An Investor Sentiment Barometer - Greek Implied Volatility Index, Working paper. Retrieved April 19, 2010 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1307680.

Stambaugh, R. F., Yu, J., and Yuan, Y., 2011. The Short of It: Investor Sentiment and Anomalies, NBER Working Paper No. 16898. Retrieved April 19, 2010 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id= 1567616.

Stoll, H. R., 1978a. The Supply of Dealer Services in Securities Markets, *Journal of Finance* **33**, 1133-1151.

Stoll, Hans R., 1978b. The Pricing of Security Dealer Services: An Empirical Study of NASDAQ Stocks, *Journal of Finance* **33**, 1153-1172.

Stoll, H. R., 2000. Friction, *Journal of Finance* **55**, 1479-1514.

Tkac, P. A, 1999. A Trading Volume Benchmark: Theory and Evidence, *Journal of Financial and Quantitative Analysis* **34**, 89-114.

Verma, R., and Soydemir, G., 2009. The impact of individual and institutional investor sentiment on the market price of risk, *The Quarterly Review of Economics and Finance*, Elsevier, **44**, pages 1129-1145.

Williams, C.D., 2009. Asymmetric Responses to Earnings News: A case od Ambiguity, Working Paper, University of North Carolina. Retrieved April 19, 2010 from http://gradworks.umi.com/33/66/3366461.html.

Wylie, S., 2005. Fund manager herding: a test of the accuracy of empirical results using U.K. data, *Journal of Business* 78 (1), pp. 381–403.

Yacob, N., 2010. The Emerging Markets' Investor Sentiment Composite Index: A Test on Bursa Malaysia, Working paper. Retrieved April 19, 2010 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1662800.

Yoshinaga, C., and Castro J., F. H. F., 2010. The Relationship between Market Sentiment Index and Brazilian Stock Rates of Return: a GMM Panel Data Analysis. In: *Second Annual Meeting of the Behavioral Finance & Economics.*

Yu, I.W., and Tam, C.S., 2007. Measuring market sentiment in Hong Kong's stock market, Hong Kong Monetary Authority Working Papers 0705. Retrieved April 19, 2010 from http://ideas.repec.org/p/hkg/wpaper/0705.html.

Zouaoui M., Nouyrigat G.J.M., and Beer, F., 2010. How Does Investor Sentiment Affect Stock Market Crises? Evidence from Panel Data, Working Paper Series. Retrieved April 19, 2010 from http://ideas.repec.org/p/dij/wpfarg/1110304.html.

Zweig, M. E., 1973. An Investor Expectations Stock Price Predictive Model Using Closed-End Fund Premiums, *Journal of Finance* **28**, 67-78.

APPENDICES

APPENDIX A:

Table A.1: Descriptive statistics for sentiment indicators

	Mean	Std. Deviation	Analysis N
AAIIBEAR	-.0014	.21971	309
AAIIBULL	.0011	.22494	309
AAIINEUT	-.0004	.23868	309
CMSEHGBR	.0000	.44740	309
CMSEHGBL	.0007	.49999	309
CMSECLBR	.0003	.42809	309
CMSECLBL	.0011	.48088	309
CMSECLNU	-.0016	.54094	309
CMSEGCBR	.0000	.68792	309
CMSEGCBL	-.0007	.36489	309
CMSEGCNU	.0043	.64737	309
NWHLSENY	.0003	.86509	309
NWHLSEAM	.0009	.74333	309
NWHLSEND	.0008	.82312	309
TRADSENI	.0004	.56754	309
ISESENT	.0012	.27298	309
SBRIN	.0015	.03538	309
TINSALLO	-.0059	.25578	309
TINSALNE	.0012	.11237	309
TINSALHI	.0055	.32308	309
CSFB	.0010	.06436	309
SMART	.0000	.02656	309
BPFCSTBU	.0030	.01758	309
DCIU3D	.0009	.01667	309

Table A.2: Communalities for sentiment indicators

	Initial	Extraction
AAIIBEAR	1.000	.914
AAIIBULL	1.000	.916
AAIINEUT	1.000	.720
CMSEHGBR	1.000	.847
CMSEHGBL	1.000	.848
CMSECLBR	1.000	.905
CMSECLBL	1.000	.832
CMSECLNU	1.000	.864
CMSEGCBR	1.000	.774
CMSEGCBL	1.000	.894
CMSEGCNU	1.000	.758
NWHLSENY	1.000	.786
NWHLSEAM	1.000	.697
NWHLSEND	1.000	.722
TRADSENI	1.000	.896
ISESENT	1.000	.485
SBRIN	1.000	.777
TINSALLO	1.000	.759
TINSALNE	1.000	.899
TINSALHI	1.000	.851
CSFB	1.000	.396
SMART	1.000	.674
BPFCSTBU	1.000	.620
DCIU3D	1.000	.584

Extraction Method: Principal Component Analysis.

Table A.3: Total explained variances for sentiment indicators

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.597	19.155	19.155	4.597	19.155	19.155
2	2.335	9.728	28.883	2.335	9.728	28.883
3	1.977	8.237	37.120	1.977	8.237	37.120
4	1.699	7.081	44.201	1.699	7.081	44.201
5	1.594	6.644	50.844	1.594	6.644	50.844
6	1.477	6.152	56.997	1.477	6.152	56.997
7	1.425	5.937	62.933	1.425	5.937	62.933
8	1.182	4.924	67.857	1.182	4.924	67.857
9	1.110	4.624	72.481	1.110	4.624	72.481
10	1.024	4.266	76.747	1.024	4.266	76.747
11	.926	3.858	80.605			
12	.855	3.563	84.168			
13	.749	3.123	87.290			
14	.690	2.875	90.165			
15	.629	2.621	92.786			
16	.364	1.518	94.304			
17	.283	1.180	95.484			
18	.249	1.037	96.521			
19	.212	.885	97.406			
20	.170	.708	98.115			
21	.157	.654	98.769			
22	.129	.536	99.305			
23	.100	.417	99.722			
24	.067	.278	100.000			

Extraction Method: Principal Component Analysis.

APPENDIX B:

Table B.1: Multiple comparisons according to regions

(I) REGION	(J) REGION	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
1.00	2.00	-.01219(*)	.00081	.000	-.0146	-.0097
	3.00	-.01507(*)	.00078	.000	-.0174	-.0127
	4.00	-.00023	.00100	1.000	-.0033	.0028
	5.00	.00229	.00153	1.000	-.0023	.0069
	6.00	.00409(*)	.00095	.000	.0012	.0070
	7.00	.00548(*)	.00098	.000	.0025	.0085
2.00	1.00	.01219(*)	.00081	.000	.0097	.0146
	3.00	-.00289(*)	.00066	.000	-.0049	-.0009
	4.00	.01195(*)	.00092	.000	.0092	.0147
	5.00	.01448(*)	.00147	.000	.0100	.0190
	6.00	.01628(*)	.00086	.000	.0137	.0189
	7.00	.01767(*)	.00089	.000	.0150	.0204
3.00	1.00	.01507(*)	.00078	.000	.0127	.0174
	2.00	.00289(*)	.00066	.000	.0009	.0049
	4.00	.01484(*)	.00089	.000	.0121	.0175
	5.00	.01737(*)	.00146	.000	.0129	.0218
	6.00	.01917(*)	.00083	.000	.0166	.0217
	7.00	.02055(*)	.00087	.000	.0179	.0232
4.00	1.00	.00023	.00100	1.000	-.0028	.0033
	2.00	-.01195(*)	.00092	.000	-.0147	-.0092
	3.00	-.01484(*)	.00089	.000	-.0175	-.0121
	5.00	.00253	.00159	1.000	-.0023	.0074
	6.00	.00433(*)	.00104	.001	.0012	.0075
	7.00	.00571(*)	.00107	.000	.0025	.0090
5.00	1.00	-.00229	.00153	1.000	-.0069	.0023
	2.00	-.01448(*)	.00147	.000	-.0190	-.0100
	3.00	-.01737(*)	.00146	.000	-.0218	-.0129
	4.00	-.00253	.00159	1.000	-.0074	.0023
	6.00	.00180	.00155	1.000	-.0029	.0065
	7.00	.00319	.00157	.900	-.0016	.0080
6.00	1.00	-.00409(*)	.00095	.000	-.0070	-.0012
	2.00	-.01628(*)	.00086	.000	-.0189	-.0137
	3.00	-.01917(*)	.00083	.000	-.0217	-.0166
	4.00	-.00433(*)	.00104	.001	-.0075	-.0012
	5.00	-.00180	.00155	1.000	-.0065	.0029
	7.00	.00139	.00102	1.000	-.0017	.0045
7.00	1.00	-.00548(*)	.00098	.000	-.0085	-.0025
	2.00	-.01767(*)	.00089	.000	-.0204	-.0150
	3.00	-.02055(*)	.00087	.000	-.0232	-.0179
	4.00	-.00571(*)	.00107	.000	-.0090	-.0025
	5.00	-.00319	.00157	.900	-.0080	.0016
	6.00	-.00139	.00102	1.000	-.0045	.0017

* The mean difference is significant at the .05 level.

Table B.2: Multiple comparisons according to sectors

(I) SECTOR	(J) SECTOR	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
.00	1.00	.00061	.00126	1.000	-.0036	.0048
	2.00	.00326	.00103	.083	-.0001	.0067
	3.00	.00461(*)	.00100	.000	.0013	.0079
	4.00	.00255	.00223	1.000	-.0049	.0099
	5.00	.00552(*)	.00149	.011	.0006	.0105
	6.00	.00944(*)	.00098	.000	.0062	.0127
	7.00	.02921(*)	.00155	.000	.0241	.0344
	8.00	.00070	.00093	1.000	-.0024	.0038
	9.00	-.00343	.00131	.502	-.0078	.0009
	10.00	.00856(*)	.00170	.000	.0029	.0142
1.00	.00	-.00061	.00126	1.000	-.0048	.0036
	2.00	.00265	.00121	1.000	-.0014	.0067
	3.00	.00400(*)	.00118	.041	.0001	.0079
	4.00	.00194	.00232	1.000	-.0058	.0096
	5.00	.00491	.00162	.134	-.0005	.0103
	6.00	.00883(*)	.00117	.000	.0049	.0127
	7.00	.02860(*)	.00168	.000	.0230	.0342
	8.00	.00009	.00113	1.000	-.0037	.0039
	9.00	-.00404	.00146	.318	-.0089	.0008
	10.00	.00795(*)	.00182	.001	.0019	.0140
2.00	.00	-.00326	.00103	.083	-.0067	.0001
	1.00	-.00265	.00121	1.000	-.0067	.0014
	3.00	.00135	.00094	1.000	-.0018	.0045
	4.00	-.00071	.00220	1.000	-.0080	.0066
	5.00	.00227	.00145	1.000	-.0025	.0071
	6.00	.00618(*)	.00092	.000	.0031	.0092
	7.00	.02596(*)	.00152	.000	.0209	.0310
	8.00	-.00255	.00087	.183	-.0054	.0003
	9.00	-.00668(*)	.00127	.000	-.0109	-.0025
	10.00	.00530	.00167	.081	-.0002	.0108
3.00	.00	-.00461(*)	.00100	.000	-.0079	-.0013
	1.00	-.00400(*)	.00118	.041	-.0079	-.0001
	2.00	-.00135	.00094	1.000	-.0045	.0018
	4.00	-.00206	.00219	1.000	-.0093	.0052
	5.00	.00091	.00143	1.000	-.0038	.0057
	6.00	.00483(*)	.00089	.000	.0019	.0078
	7.00	.02460(*)	.00150	.000	.0196	.0296
	8.00	-.00391(*)	.00083	.000	-.0067	-.0011
	9.00	-.00803(*)	.00124	.000	-.0122	-.0039
	10.00	.00395	.00165	.911	-.0015	.0094

Table B.2 (cont'd.): Multiple comparisons according to sectors

4.00	.00	-.00255	.00223	1.000	-.0099	.0049
	1.00	-.00194	.00232	1.000	-.0096	.0058
	2.00	.00071	.00220	1.000	-.0066	.0080
	3.00	.00206	.00219	1.000	-.0052	.0093
	5.00	.00298	.00245	1.000	-.0052	.0111
	6.00	.00689	.00218	.088	-.0004	.0141
	7.00	.02667(*)	.00249	.000	.0184	.0349
	8.00	-.00184	.00216	1.000	-.0090	.0053
	9.00	-.00597	.00235	.611	-.0138	.0018
	10.00	.00602	.00259	1.000	-.0026	.0146
5.00	.00	-.00552(*)	.00149	.011	-.0105	-.0006
	1.00	-.00491	.00162	.134	-.0103	.0005
	2.00	-.00227	.00145	1.000	-.0071	.0025
	3.00	-.00091	.00143	1.000	-.0057	.0038
	4.00	-.00298	.00245	1.000	-.0111	.0052
	6.00	.00392	.00142	.318	-.0008	.0086
	7.00	.02369(*)	.00186	.000	.0175	.0299
	8.00	-.00482(*)	.00138	.028	-.0094	-.0002
	9.00	-.00895(*)	.00166	.000	-.0145	-.0034
	10.00	.00304	.00199	1.000	-.0036	.0096
6.00	.00	-.00944(*)	.00098	.000	-.0127	-.0062
	1.00	-.00883(*)	.00117	.000	-.0127	-.0049
	2.00	-.00618(*)	.00092	.000	-.0092	-.0031
	3.00	-.00483(*)	.00089	.000	-.0078	-.0019
	4.00	-.00689	.00218	.088	-.0141	.0004
	5.00	-.00392	.00142	.318	-.0086	.0008
	7.00	.01977(*)	.00149	.000	.0148	.0247
	8.00	-.00874(*)	.00082	.000	-.0115	-.0060
	9.00	-.01286(*)	.00123	.000	-.0170	-.0088
	10.00	-.00088	.00164	1.000	-.0063	.0046
7.00	.00	-.02921(*)	.00155	.000	-.0344	-.0241
	1.00	-.02860(*)	.00168	.000	-.0342	-.0230
	2.00	-.02596(*)	.00152	.000	-.0310	-.0209
	3.00	-.02460(*)	.00150	.000	-.0296	-.0196
	4.00	-.02667(*)	.00249	.000	-.0349	-.0184
	5.00	-.02369(*)	.00186	.000	-.0299	-.0175
	6.00	-.01977(*)	.00149	.000	-.0247	-.0148
	8.00	-.02851(*)	.00146	.000	-.0333	-.0237
	9.00	-.03264(*)	.00172	.000	-.0384	-.0269
	10.00	-.02065(*)	.00204	.000	-.0274	-.0139

Table B.2 (cont'd.): Multiple comparisons according to sectors

8.00	.00	-.00070	.00093	1.000	-.0038	.0024
	1.00	-.00009	.00113	1.000	-.0039	.0037
	2.00	.00255	.00087	.183	-.0003	.0054
	3.00	.00391(*)	.00083	.000	.0011	.0067
	4.00	.00184	.00216	1.000	-.0053	.0090
	5.00	.00482(*)	.00138	.028	.0002	.0094
	6.00	.00874(*)	.00082	.000	.0060	.0115
	7.00	.02851(*)	.00146	.000	.0237	.0333
	9.00	-.00413(*)	.00120	.031	-.0081	-.0002
	10.00	.00786(*)	.00161	.000	.0025	.0132
9.00	.00	.00343	.00131	.502	-.0009	.0078
	1.00	.00404	.00146	.318	-.0008	.0089
	2.00	.00668(*)	.00127	.000	.0025	.0109
	3.00	.00803(*)	.00124	.000	.0039	.0122
	4.00	.00597	.00235	.611	-.0018	.0138
	5.00	.00895(*)	.00166	.000	.0034	.0145
	6.00	.01286(*)	.00123	.000	.0088	.0170
	7.00	.03264(*)	.00172	.000	.0269	.0384
	8.00	.00413(*)	.00120	.031	.0002	.0081
	10.00	.01199(*)	.00186	.000	.0058	.0182
10.00	.00	-.00856(*)	.00170	.000	-.0142	-.0029
	1.00	-.00795(*)	.00182	.001	-.0140	-.0019
	2.00	-.00530	.00167	.081	-.0108	.0002
	3.00	-.00395	.00165	.911	-.0094	.0015
	4.00	-.00602	.00259	1.000	-.0146	.0026
	5.00	-.00304	.00199	1.000	-.0096	.0036
	6.00	.00088	.00164	1.000	-.0046	.0063
	7.00	.02065(*)	.00204	.000	.0139	.0274
	8.00	-.00786(*)	.00161	.000	-.0132	-.0025
	9.00	-.01199(*)	.00186	.000	-.0182	-.0058

* The mean difference is significant at the .05 level.

APPENDIX C:

Table C.1: Mean and Standard Deviation Table of Cross Section Data

REGION		FREE_FLOAT	SECTOR	LN_MARKET_CAP	GROWTH	P_E	LT_DEBT_TO_TOT_CAP	G_MARGIN	ROA	QUICK	D_YIELD	BETA	ALPHA	WACC
Africa	Mean	58.54	5.20	8.94	7.51	15.75	16.59	29.94	2.45	0.71	2.32	0.88	0.06	9.03
	Std.Dev.	30.02	2.49	1.00	16.99	13.54	20.70	22.47	13.46	0.49	2.68	0.43	0.51	4.87
Dpd. Asia	Mean	61.47	4.69	10.97	4.03	16.78	12.27	25.91	3.16	0.88	1.78	0.92	0.11	10.89
	Std.Dev.	21.40	3.16	0.55	14.18	14.57	14.76	19.38	9.52	0.48	1.62	0.30	0.54	3.43
Dpg. Asia	Mean	43.86	4.70	10.50	20.83	22.07	17.93	27.02	7.11	0.75	0.97	1.02	0.23	10.99
	Std.Dev.	20.77	3.06	0.77	14.31	19.29	19.84	18.76	8.30	0.45	1.49	0.27	0.56	3.49
E.Europe	Mean	43.10	4.80	9.14	9.09	19.45	13.72	31.00	2.22	0.75	0.51	0.79	0.29	9.07
	Std.Dev.	25.04	3.07	1.01	14.95	15.99	17.09	27.58	10.39	0.47	1.44	0.26	0.59	3.10
L.America	Mean	50.83	4.59	9.99	12.91	15.99	20.81	33.35	5.99	0.88	3.12	0.81	0.35	13.80
	Std.Dev.	29.11	3.16	1.21	16.71	11.24	18.16	21.16	11.86	0.50	2.42	0.25	0.51	6.62
N.America	Mean	89.00	4.93	9.35	6.80	22.89	25.83	40.77	4.54	1.00	1.37	1.15	0.21	9.76
	Std.Dev.	17.45	2.86	0.56	13.41	15.58	22.81	22.91	11.12	0.47	1.99	0.42	0.46	2.50
W.Europe	Mean	67.71	5.16	9.00	6.08	18.54	25.43	39.84	3.21	0.75	2.43	0.84	0.27	9.11
	Std.Dev.	29.86	2.70	0.68	13.48	13.48	21.73	23.58	11.34	0.45	2.20	0.31	0.50	3.26
Total	Mean	64.70	4.90	9.80	8.15	19.39	19.04	31.91	4.06	0.82	1.59	0.95	0.20	10.10
	Std.Dev.	28.46	2.92	1.10	15.24	15.78	20.35	22.61	10.80	0.48	1.93	0.36	0.53	3.77

APPENDIX D:

Table D.1: R, R Square, Adj. R Square and Standard Error for Cross Section Data as Explanatory Variables of Volume Trend Betas

	R	R Square	Adj. R Square	Std. Error
FREE_FLOAT	0.130004351	0.016901131	0.016707303	0.020566546
LN_MARKET_CAP	0.182399821	0.033269695	0.033092541	0.020182804
GROWTH	0.209036213	0.043696138	0.043392839	0.018237964
P_E	0.130840893	0.017119339	0.016890975	0.019006196
LT_DEBT_TO_TOT_CAP	0.132034544	0.017433121	0.017260073	0.019193544
G_MARGIN	0.110508066	0.012212033	0.011971695	0.019331544
ROA	0.031897279	0.001017436	0.000841435	0.019348691
QUICK	0.055204043	0.003047486	0.00280539	0.019293691
D_YIELD	0.303788199	0.09228727	0.092007198	0.019065673
BETA	0.197662753	0.039070564	0.038905484	0.019556666
ALPHA	0.011989252	0.000143742	-2.11418E-05	0.02030387
WACC	0.125293892	0.015698559	0.015527347	0.020021193

Table D.2: Correlation Matrix of Explanatory Variables

	D_VOLUME	FREE_FLOAT	LN_MARKET_CAP	GROWTH	P_E	LT_DEBT_TO_TOT_CAP	G_MARGIN	ROA	QUICK	D_YIELD	BETA	ALPHA	WACC
D_VOLUME	1.00	-0.13	0.18	0.21	0.13	-0.13	-0.11	-0.03	-0.06	-0.30	0.20	-0.01	0.13
FREE_FLOAT	-0.13	1.00	-0.18	-0.11	0.03	0.12	0.11	-0.06	0.09	-0.02	0.18	-0.09	-0.06
MARKET_CAP	0.18	-0.18	1.00	0.07	-0.07	-0.07	-0.12	0.13	0.02	-0.02	0.06	-0.03	0.13
GROWTH	0.21	-0.11	0.07	1.00	0.12	0.04	-0.01	0.11	-0.08	-0.06	-0.01	0.14	0.03
P_E	0.13	0.03	-0.07	0.12	1.00	-0.02	0.08	-0.15	0.01	-0.15	0.07	0.07	0.01
LT_DEBT	-0.13	0.12	-0.07	0.04	-0.02	1.00	0.05	-0.13	-0.15	0.07	0.14	-0.02	-0.04
G_MARGIN	-0.11	0.11	-0.12	-0.01	0.08	0.05	1.00	0.20	0.11	0.04	-0.10	0.06	-0.03
ROA	-0.03	-0.06	0.13	0.11	-0.15	-0.13	0.20	1.00	0.17	0.16	-0.09	0.19	0.07
QUICK	-0.06	0.09	0.02	-0.08	0.01	-0.15	0.11	0.17	1.00	-0.02	0.05	0.06	0.03
D_YIELD	-0.30	-0.02	-0.02	-0.06	-0.15	0.07	0.04	0.16	-0.02	1.00	-0.25	0.00	0.01
BETA	0.20	0.18	0.06	-0.01	0.07	0.14	-0.10	-0.09	0.05	-0.25	1.00	-0.06	0.01
ALPHA	-0.01	-0.09	-0.03	0.14	0.07	-0.02	0.06	0.19	0.06	0.00	-0.06	1.00	0.03
WACC	0.13	-0.06	0.13	0.03	0.01	-0.04	-0.03	0.07	0.03	0.01	0.01	0.03	1.00

CURRICULUM VITAE

Candidate's full name:	Özgüç Akdağ
Place and date of birth:	Istanbul, 20.12.1980
Permanent Address:	Ankara Cd.133/12 Kordonboyu Mh. Kartal Istanbul
Universities and Colleges attended:	B.Sc. Ege University Textile Engineering 2003
	M.Sc. ITU Management Engineering 2006