SURVEYING THE RELATIONSHIP BETWEEN BETA, FIRM SIZE, AND IDIOSYNCRATIC VOLATILITY WITH STOCK RETURNS IN TEHRAN STOCK MARKET[1]

Jalal Jasour*

Sasan Shokri**

Omran Fatolhahzadeh***

Abstract

Capital asset pricing model is one of the most practical methods for anticipating the stock return. According to this model BETA as a systematic risk criterion, is the only variable capable to anticipating the return. Researches on the ability of this model for anticipating and its use of other variables in Iran and other countries lead to the interesting result indicated variables other than BETA which have better ability to anticipating the stock return. These variables are the firm size, stock liquidity and idiosyncratic volatility.In this research the relation between the BETA and other mentioned variables investigated in a period of five years since 2006 to 2010 in Tehran stock market.Using the Eviews software, the outcome information from the firms tested according to the multi variable regression model and under the (OLS) method, and showed that firm size and idiosyncratic volatility are of variables with the ability to anticipate the stock return in the firms accepted in Iran stock market too. And BETA variable in case of controlling the liquidity effect has the ability to explain the return. And also liquidity variable is shown to be in no significant relation with the average of return.

Key Words: BETA, firm size, liquidity, idiosyncratic volatility, stock return

[1] This Research paper was funded by grant from the Islamic Azad University Parsabad Moghan Branch submitted to the authors.

* Accounting Departments, Islamic Azad University, Parsabad Branch, Parsabad, Iran.

** Management Departments, Islamic Azad University, Parsabad Branch, Parsabad, Iran

*** Accounting Departments, Islamic Azad University, Germi Branch, Germi, Iran

INTRODUCTION

Traditional finance theory as represented by the CAPM (Sharpe 1964, Lintner, 1965) posits that an investor's required expectation of return on a risky asset in excess of the risk-free rate is determined as the product of that risky asset's beta (the covariance or its returns with market returns) with the expected return on the market in excess of the risk-free rate. The degree to which beta, capitalization, liquidity and idiosyncratic volatility may be a proxy for one or more of the other variables remains controversial. So also does the extent to which any one of these variables might be capturing an element of investor risk exposure (either diversifiable or non-diversifiable). In effect, no convincing theory has been advanced to explain the contribution of these variables.

The capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965a) and Black (1972)predicts that only systematic risk is priced in the stock returns. This is because investors areassumed to be able to diversify away idiosyncratic risk by holding well-diversified portfolios.

However, in practice investors may fail to hold diversified portfolios for various reasons (e.g.Malkiel&Xu, 2006). This would lead in less diversified investors demandinga risk premium for bearing idiosyncratic risk. Furthermore, Barberis and Huang (2001) showthat if investors are loss averse over individual stock fluctuations, expected premiums willdepend on prior performance and also total risk will be positively correlated with expectedreturns.

The role of idiosyncratic risk on asset pricing has been under intense academic debate sincean influential study by Campbell, Lettau, Malkiel, and Xu (2001). They explore the volatilityof U.S. stocks at the market, industry, and firm levels over the period from 1962 to 1997.

Campbell et al. (2001) find that while the market and industry level volatilities have remainedquite stable, the average firm-level volatility exhibits a strong positive deterministic trend,more than doubling over the period.

Malkiel and Xu (2006) provide empirical evidence to the under-diversification hypothesis andfind a positive relation between idiosyncratic risk and cross-sectional stock returns. Usingexponential generalized autoregressive conditional heteroskedasticity (EGARCH) model toestimate conditional idiosyncratic volatility, Spiegel and Wang (2005) and Fu (2009) also finda significantly positive relation between idiosyncratic risk and expected returns.

On the other hand, some authors have found a puzzling negative relation betweenidiosyncratic risk and cross-sectional stock returns. Using daily data to estimate idiosyncraticrisk, Ang et al. (2006, 2009) find that stocks with high idiosyncratic volatility have abysmallylow average returns

both in US and in other G7 countries. This negative cross-sectionalrelation contradicts the basic fundamental of finance that higher risk is compensated withhigher returns. Guo and Savickas (2006) argue that idiosyncratic risk can be a proxy fordispersion in opinion among investors. Their hypothesis is that an increase in idiosyncraticrisk leads the most optimistic investors to hold a particular stock, and thus we should find anegative relation between idiosyncratic risk and return.

Financial distress has also been theorized to impact stock returns. The idea is that stocks offinancially distressed companies tend to move together so that their risk cannot be diversifiedaway (Chan,2003). Fama and French (1996) argue that financial distress is a drivingfactor behind the size and value effects. The covariation can exist if corporate failures arecorrelated with a measure not accounted in the standard CAPM, such as deterioratinginvestment opportunities or declines in unmeasured components of wealthsuch as human capital or debt securities (Ferguson & Shockley, 2003).

Several papers have studied the impact of financial distress on stock returns withcontradictory results. Griffin and Lemmon (2002) find supporting evidence to Fama andFrench (1996) and show that the value premium is most significant among firms with highprobability of financial distress. Vassalou and Xing (2004) also demonstrate that both the sizeand book-to-market effects are concentrated in high default risk firms.

There is an intuitive reason to believe that these two puzzles are related to each other.According to the Merton's (1974) model, corporate debt is a risk-free bond less a put optionon the value of the firm's assets, with strike price of the face value of the debt. Thus, a firmwith more volatile equity is more likely to reach the boundary condition of default. Based onthis argument, Campbell and Taksler (2003) show that idiosyncratic firm-level volatility canexplain an ignificant part of cross-sectional variation in corporate bond yields. This suggests apossibility that the idiosyncratic volatility-return relationship may be due to a distress-returnrelationship or vice versa.

Only two recent working papers explore this interaction. Following Ang et al. (2006), Song (2008) estimate idiosyncratic volatility using daily data from one month period and find thatwhile the volatility spread is -1.68% for the most distressed stocks; it is actually positive andsignificant at 0.61% per month for the least distressed ones. Similarly, Chen and Chollete (2006) find that after controlling for distress risk, stocks with high idiosyncratic volatility earnsignificantly low

returns only in the highest distress risk quintile. Both conclude that distressrisk has a more fundamental asset pricing impact than idiosyncratic volatility.

However, Fu (2009) argues that due to the time varying property of idiosyncratic volatility,lagged one month volatility may not be an appropriate proxy for the expected volatility thismonth. In order to capture the time varying property of idiosyncratic volatility, Fu suggest theuse of GARCH models. Therefore, it is of interest to study the interaction of idiosyncraticvolatility and financial distress using these more sophisticated models.

The propose of this study is surveying of Investigation of the relation between the BETA, firm size, liquidity and idiosyncratic volatility with stock return in Tehran stock market since 2006 to 2010.

METHODOLOGY

In this study all the statistical information of the companies accepted in Tehran stock market to calculate the distributive variables, we use TadbirPardazCompany's information bank and for the information about the companies we used interned cites of Tehran Stock Market Service Company. Also we used SPSS, E-view andexcel soft ware to analyze the data's, testing hypothesis and designing the diagrams.

Methodology introducing the model

We used the following model in order to investigate the effect of independent variables (systematic risk, company size, liquidity and price variability) on dependent variable (stock return)

$$R_{pt} = \alpha + b_{1t}\beta_{pt} + b_{2t}(ME_{pt}) + b_{3t}(LIQ_{pt}) + b_{4t}(IV_{pt}) + e_t$$

R_{pt} = P basket return in T period

β_{pt} = Systematic risk of P basket in T period

LIQ_{pt} = P basket liquidity in T period

e_t = Accidental error relating to regression equation

In this research we used the descriptive statistic of main indexes (mid and average) and distributive indexes (the largest and smallest amount of dates).

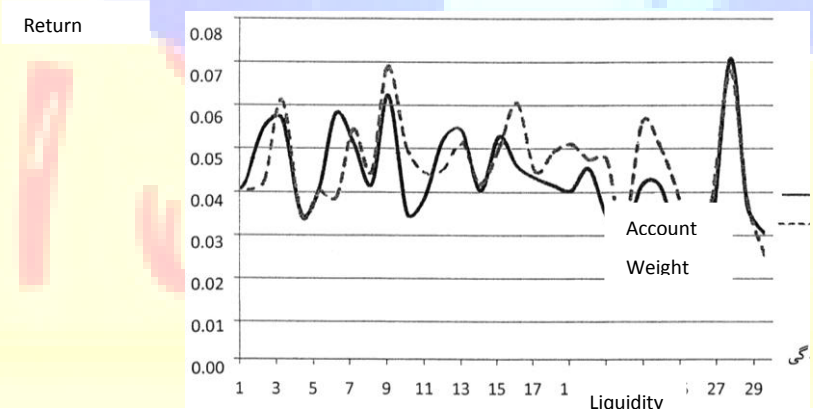
For example the following diagram shows the main indexes and distribution of independent and dependent variables of baskets in one dimension sorting according to every independent variable. Company size and liquidity, are rounded according to thousand billion Rials and thousand stocks.

Table1. Arithmeticreturnvaluesdescriptive statisticsbasedon thesortof independentvariables

Dependent variable	Sorted by	Mean	Standard deviation	Probabilit y	Elongation	Minimum	Maximum
Arithmeticret urn	Beta	0.046	0.028	2.958	6.958	0.021	0.132
	Size	0.044	0.012	0.672	0.283	0.027	0.072
	Liqu	0.044	0.011	0.612	-0.266	0.031	0.71
	ldio	0.043	0.037	2.512	7.703	0.011	0.179

The relation between independent variables with average weight return and account return has determined using one dimensioned diagrams. And achieved results have been written just according to investigations and decisive and final results determined after doing regression and necessary tests.

Diagram1, shows the relation between weight return and account return average liquidity.

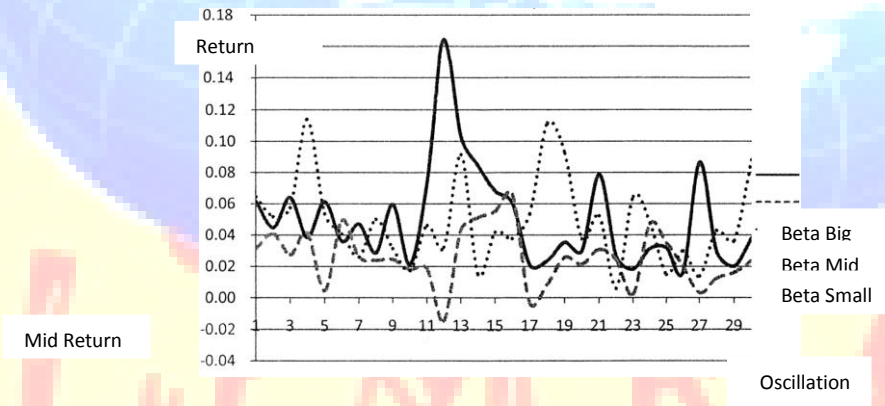


In this diagram baskets are sorted according to regressive liquidity average, namely basket number1 has the most amount of liquidity and basket number30 has the least amount of liquidity. The most return is in basket 28 and the least return is in basket 30. There is a weak negative relation between return and liquidity, but there is no definite and decisive procedure to study them. Because of the importance that stock liquidity has for the stock holder, and they prefer the

stocks with high rate of liquidity to other stocks. Itcannot be recommended anything to stock holders,regarding the relation between return and liquidity in diagram 1.

Finally, we used two-dimensional diagram in this research, because two –dimensional sorting of variables provide the possibility of controlling the effect of one variable and examining the other variables effect on stock return. Using the four independent variables (beta, companysize,liquidity, price variability) we investigated all six possible pairs. For each variable we formed 30 baskets regressively. Company basket according to levels first variable categorized to three (high – mid – low) which every level contains 10 baskets. In every level, we investigated second variables 30 baskets and in every case account return average of the baskets in specified period of time was calculated. We formed the correlation matrix for discussed variables and for each of the levels correlation amount and meaningfulness of every variable was calculated. Correlation quotient is a means to determine the linear relation between two variables.

Diagram2. Arithmetic different levels of efficiency compared to the beta oscillation sort by Best Price



For example the above diagram shows the relation between beta and basket price variability with the return. As you can see with decrease in basket price variability, there is a negative procedure in the return.

Table2- VariablescorrelationqualityBetaandpricesfluctuatewithArithmeticreturn

Sorted by	Two-dimensional surface Number	Statistics	Liquidity	Size	Beta	Variability
Beta - Varia	1	Correlation value	0.18	0.26	0.79	0.78

		Probabilityvalue	0.40	0.21	0.0	0.0
	2	Correlation value	0.28	0.24	-0.08	0.41
		Probabilityvalue	0.20	0.28	0.72	0.07
	3	Correlation value	-0.06	0.12	-0.16	0.40
		Probabilityvalue	0.90	0.59	0.52	0.07

Table2 shows that for large amount of beta with reliability degree of 95 percent, beta and price variability has a 78, 79 percent relation with the return and for medium and small amount if beta there is nearly 40 percent relation between price variability with the return with the same degree of reliability. It can be resulted that for large amount of beta positive linear relation between beta and basket result is approved. So there is enough reason to reject Akdeniz and et al (2000) research which say there is no meaningful relation between beta and return. Also with controlling the beta effect stock basket with high price variability shows higher returns. As Schpigel and Wang (2005) concluded that price reliability has meaningful relation with stock return, also in this research the important role of price variability was identified and meaningful relation between stock price variability and return with controlling the beta effect was approved.

As the baskets were sorted according to four independent variables and average weight return and average account return were calculated for every medium set, so eight regression test was performed which one of these tests is explained as an example in Table3.

Table2- Regressionresults oftestsperformedandthe modelis sorted byfirm size(returns Arithmetic)

Dependent Variable: **Arithmeticreturn**				
Method: Least Squares				
Sample: 126				
Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.345	0.0036	9.59	0
Liquidity	-.7E0.18	-.7E1.05	-0.1714	0.8588

Company size	-.13E2.27	-.13E1.01	2.2475	0.0341
Beta	0.0018	0.0049	0.3913	0.6924
Cost Variability	0.2589	0.1189	2.1818	0.0387
R-squared	0.3714	F-statistic		2.9649
Adjusted R- squared	0.2132	Prob (F- statistic)		0.0462
Normality Test				
Jarque- Bera	1.7289			
Probability	0.4212			
White Heteroskedasticity Test:				
F-statistic	1.0457	Probability		0.4410
Obs* R- squared	8.5463	Probability		0.382
Ramsey RESET Test:				
F- statistic	4.2863	Probability		0.262
Log likelihood ratio	9.5036	Probability		0.861
Breusch – Godfrey Serial Correlation LM Test:				
F- statistic	1.209	Probability		0.4123
Obs* R- Squared	2.8538	Probability		0.2401

According to above diagram it is necessary to explain that:

1- The QuartileProbability Amount is (0/4212). So the distribution of the remaining sentences is normal and is not rejected.
2- The WhiteProbability amount is (0/4410). So there is no variance heterogeneity
3- Self correlation test possibilityamount in remaining sentences is (0/4123), so there is no self correlation in this model.
4- According to the analysis outputs of above diagram, the amount of the above statistics for self correlation test is near 2 which showthere is no self correlation in this model.
5- The amount of possibility in F statistics is equal to (0/0462), so this is less than (0/05).This means that zero assumption is rejected in 95percent level and the model can be accepted in 95percent reliability level.
6- The amount of determined quotient is equal to (0/37) which shows 37 percent of return changes is expressed.

7- The amount of statistic possibility of T for liquidity beta is bigger than (0/05) , so these variables are not meaningful and their relation with basket return as an independent variable are rejected .only company size and price variability variables which their T statistic amount is less than (0/05)are meaningful and show that in 95 percent level of reliability , these variables are in relation with basket returns as a dependent variable .

DATA ANALYSIS

For examining the hypothesis of the research , the stocks of 126 companies in financial period of April 2006 to October 2010 was selected from Tehran stock market .in this research ,to investigate the relation among the different data's ,firstly the stocks of selected companies ranked separately according to every variables of beta ,company size, liquidity and price variability .the selected companies information was calculated separately in all months and are sorted according to one of the variables for every month regressively . In this stage we formed 30 baskets for every month and average account return, weightreturn, beta, companysize, liquidity and price variability was calculated for every basket. After that every different month's basket was gathered and for available same baskets the average was taken .and then we calculated the averages of account and weight return, beta,company size,liquidity and price variability for every 30 new baskets. In the next stage we sorted the baskets with two-dimensional diagrams, so that all of possible pairs from these four variables were regarded. Doing so and assuming 2 of 4 compositions we gained six pairs of variables. In this stage sorting 30 of 30 of baskets is done and then for optimal resulting from them, the variable which its effect should to be controlled is leveled. So that first 10 baskets in first level(the baskets having the most amount of beta) and second and third 10 baskets in level two and three(baskets having the medium and low amount of beta) in two dimensional sorting of 3 in 30 for all 90 baskets are formed and their average weight and account return ,beta ,company size ,liquidity and price variability calculated .using diagrams and correlation quotient of independent variables the relation between them and account return was discussed. The Analyzing results are relating to beta, company size, liquidity and price variability with average account return.

1-Analyzing the results from controlling the systematic risk effect.

The amount of R^2Quotient determination becameequal to 88 percent, it means that 88 percent of changes in account return are expressed by independent variables, and because the amount of T

statistics in independent variables was too little, there was linearitypossibility in this model.Using matrix quotient determinant and calculating it , existing of linearity was determined and for solving this problem , beta variable with square quotient was inserted to the model .in the next stage beta variable eliminated and investigating different tests , it was considered that if the beta variable effect was controlled , the company size variable became meaningful and in case of removing beta from the model , size would have negative relation with the return, which is the same as Benx and Ringanam (1981)findings .

In addition to this the effect of liquidity variable was controlled, beta and size variables became meaningful .so liquidity variable was removed from the model and we saw that when the effect of systematic risk was controlled basket price variability and account return show positive relation which approves Malkil and Jo (2006) theory which say there is positive relation between the return and price variability.

2- Analyzing the results from controlling the size:

The variable shows that in case of controlling the basket size effect, there is meaningful relation between size and price variability with account return. After investigating the results positive relation between company size and the return was appeared.

3-analyzing the results from controlling the effect of liquidity variable:

In case of controlling this effect there is meaningful relation only between beta and company size. So that company size has direct relation with the return that approves Famaand Franch(1992) theory which say there is negative relation between beta and the return.

4-analyzing the results from controlling the price variability variable:

In case of controlling this variable effect,only company size and price variability have meaningful relation with weight return regarding their quotient mark in the model, company size and return have positive relation .in this research the importance of price variability in explaining the weight return was discovered furthermore . So that basket price variability haspositive relation with the return. And also it approves the theory ofMalkiland Jo (2006) and Klaito and Demsey(2007).

CONCLUSION AND SUGGESTIONS

In this research we studied the relation between beta, company size,liquidity, price variability with basket return and using the results of the research it was determined that only company size and stock price variability are of those variables which can explain the stock basket return in Iran

and beta variable has a little capability to explain the return .and only in case of controlling the liquidity effect, its effect appears. For liquidity variable, only in two dimensional sorting of liquidity and price variability, the positive relation between the return and liquidity was appeared with controlling its effect for little amounts.

Regarding the findings of this research and approving the meaningful relation between accounting variables with stock return the following suggestions are presented;

1- For better decision making of the investors of stock market we suggest that stock market organization establish committee for ranking the companies from the risk, size and the variables point of view for the usage of investors .

2- We suggest to the investors and financial analyzers that only systematic risk as a variable to explain the return is not enough in analyzing the factors effective to stock return in Tehran stock market. The other variables like company size, liquidity and especially stock price variability should to be noticed.

REFERENCES

1. Anderson, D., Clarkson, P., Moran, S., 1997, the association between information, liquidity and two stock market anomalies: the size effect and seasonality in equity returns, Accounting Research Journal 10, 6-19.
2. Ang, A., Xing, R., Zhang, Y., 2006. The cross-section of volatility and expected returns. Journal of Finance 61, 259-299.
3. Ang, A., Xing, R., Zhang, Y., 2009. High Idiosyncratic Volatility and Low Returns: International and Further U.S. Evidence. Journal of Financial Economics 91(1),1-23.
4. Banz, R., 1981, the relationship between return and market value of common stocks, Journal of Financial Economics 9, 3-18.
5. Chan, H., Faff, R., 2003, An investigation into the role of liquidity in asset pricing: Australian Evidence, *Pacific-Basin Finance Journal 11*, 555-572.
6. Chen, J., Chollete, L. 2006. Financial distress and idiosyncratic volatility: An empirical investigation. Unpublished working paper. Norwegian School of Economics and Business.
7. Clayton, Louise., Michael Dempsey and MadhuVeeravaghavan., 2007, Are Beta,Firm size, Liquidity and ldiosyncratic Volatility, Related to Stock returns? Australian Evidence, working paper, Monash University.

8. Fama, E., French, K., 1996, Multifactor explanations of asset pricing anomalies, Journal of Finance 51, 55-84.
9. Ferguson, M. F., Shockley, R. L., 2003. Equilibrium "anomalies". Journal of Finance 58,2549-2580.
10. Lintner, J. (1965), The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, *Review of Economics and Statistics*, 13-37.
11. Lintner, J., 1965, The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics- 13- 37.
12. Malkiel, B., Xu, Y., 2006, Idiosyncratic risk and security Returns, Working paper, Princeton University.
13. Malkiel, B., Xu, Y., 2006, ldiosyncratic risk and security Returns, working paper, Princeton University.
14. Merton, R., 1973, A simple model of capital market equilibrium with incomplete information. *Journal of Finance 42*, 483-510.
15. Merton, R.,1987, A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483-510.
16. Rosenberg, B., Reid, K., Lanstein, R., 1985, Persuasive evidence of market inefficiency, Journal of Portfolio Management 11, 9-17.
17. Sharpe, W. (1964), Capital asset prices: a theory of market equilibrium under conditions of risk, *Journal of Finance19*, 425-442.
18. Sharpe, W., 1964, Capital asset prices: a theory of market equilibrium under conditions of risk, Journal of Finance 19, 425-442.
19. Vassalou, M.,Xing, Y., 2004. Default risk in equity returns. Journal of Finance 59, 831–868.