Joint Return and Volatility Timing in Exchange Traded Funds: Evidence from Tokyo Market

by

Xiaodan Gu

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Approved: Dr.F.Boabang

Faculty Advisor

Approved: Dr.F.Boabang

MFin Director

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Abstract

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This paper tests the existence of volatility timing skills in the Tokyo ETFs market. The historical daily data on sixty-two ETFs are collected covering the period July 1st, 2003 to July 16th, 2013 from Bloomberg. Two methods are used in this paper, which are OLS- and PLS- regression methods. Regression results are then analyzed to finger out the existence of volatility timing skills of fund managers. The first regression results show that 90% funds confirm the existence of volatility timing skills in the Tokyo ETFs market. The second and third show the same results as the first one. In detail, the efficiency of volatility timing skills on ETFs improved in the Tokyo ETFs market after t September 2008 financial crisis.

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Table of Contents

List of Table

Chapter 1: Introduction

1.1 Purpose of Study

As one of the fastest growing financial products, exchange-traded fund (ETF), has become a popular investment tool for investors all over the world's major securities markets over the past 15 years. ETFs are cheaper to acquire, and provid diversification and liquidity for investors. However, the most important factor of ETFs is that investors can get advantages of many financial products, such as the arbitrage opportunities of index futures and commodity futures. Therefore, ETFs could help the stock market to improve its turnover.

With the increasing numbers and styles of ETFs, investors have more options, but have more difficulty in choosing as well. Investors would like to focus on the performance of a fund manager, and volatility timing skill is an important component of manager's performance. That is, fund managers are encouraged to appropriately forecast the overall trend of market, and rebalance their holding portfolio to increase the return or decrease the risk. Moreover, a lot of concerns increased after financial subprime crisis because of the similar hedging strategy between the Collateralized Debt Obligations (CDOs) and ETFs. Rubino (2011) summarized that financial innovations were always faster than that of regulations. When market decides whether derivatives should be used as the tools of risk management, though fund managers' trading skills are the factors to cause potential financial crisis, such as ETFs, the whole chain is going to bankrupt when the primary point of system faulting.

This report will discuss the influence of volatility timing skills on excess return of ETFs traded in Tokyo stock markets. It will analyze the existence of timing skills of ETFs, get a performance of the current market situation and provide empirical suggestions to investors and financial regulators.

1.2 Background: ETFs and Tokyo Market

Since the first ETFs--SPDRs came out in the year 1993, founded by American Stock Exchange (AMEX) and State Street, ETFs became one of the most popular public investment tools. Until the end of July 2004, all products of ETFs in the world were valued at $246.4 billion. Indeed, ETFs combine the advantageous trading characteristics of closed-end fund and open-end fund, which can both be exchanged on the secondary market, and also can be purchased and redeemed. There are two ways to buy ETFs, by cash or using a package of stocks. However, when it was sold or redeemed, investors would get the basket of stocks but not cash.

Emerging from World War II in the late 60's, Japan has held the world's second economic position for more than forty years, and it is the only Asian country whose financial market is comparable with that in Europe and North American. As the largest metropolitan area capital city, Tokyo is one the biggest international financial centers and Tokyo stock market is the second largest stock market after New York. Additionally, there are 133 ETFs traded with a wide range of coverage in Tokyo market, which includes bond ETFs, currency funds, dividend ETFs, inverse funds, leveraged ETFs, small-, mid-, large-cap funds and more. According to Kennedy (n.d.), when it comes to ETFs, Tokyo market is a very segmented and targeted market. Therefore, it is much easier for people to investment Japanese ETFs instead of choosing a lot of index prices and multiple broker commissions.

1.3 Statement of Problems

This report will use quantitative analysis as main method and combine qualitative analysis, on the basis of all data and simulation constructed selected, to prove whether volatility timing skills exists in Japanese exchange market or not. At the same time, it is based on a wide range of relevant literatures into describe statistical characteristics of the excess return and volatility timing of ETFs, and verifies whether they have the same result as the analysis from Tokyo market. Then, from the perspective of performance attribution capacity, it measures whether volatility timing skills can bring better results to ETFs, and whether the results are statistically significantly in statistics test. The article will use quadratic, linear regression, correlation analysis and other measurement methods, to get a relatively complete explanation in combining excess return and volatility timing skills of ETFs together in Tokyo market.

Chapter Two is literature review section. The details of logic inside of ETFs will be introduced and the Modern Portfolio Theory (MPT) will be discussed; additionally, some models in the project topic and empirical researchs of volatility timing skills and market timing will be reviewed. Chapter Three will introduce the methodology and the data used in this report, as well as the underlying assumptions and suitable hypotheses. Chapter Four is outcome analysis, Using statistic software, such as Stata and Excel, to adjust and regress all sample data sets. From the results of the regression, it will show the relationship of return and volatility timing in the different time periods and forecast the optimal estimated investment. Chapter Five is conclusion of this report.

Chapter 2: Literature Review

2.1 Significance of ETFs

ETFs enrich security markets greatly, because they combine advantages of all index investments, such as lower cost, diversification, high efficiency, as well as some other characteristics during stocks trading, such as short selling and trading intraday. In addition, their unique system of redemption by using a package of stocks but not cash is helpful in decreasing transaction costs and increasing relative arbitrage activities, as well as decreasing difference of the over- or under- price trading on the secondary market. However, the performance in market is the most important point for an investment tool, but not just its merits, and only the better outcome could attract more investors and financial regulators.

Additionally, as a new investment tool in the financial market, the trading strategies of ETFs have been used in a wide range, such as swap, leverage and short selling. Rubino (2011) took out a question that whether ETFs will be the new CDOs, because some fund managers use credit default swaps (CDS) to hedge the risk of ETFs. In theory, this is an ideal trading plan to protect the benefit of the investors and investment companies, but in the real world, it is not "effective" enough to use. In fact, it is necessary to have a deep analysis on ETFs, such as their operation, the performance in the market and the demand on the financial environment.

2.2 Literatures of ETFs and Volatility Timing

There are some main aspects on ETFs and volatility timing skills. Firstly, the issue of ETFs increases pricing efficiency on the stock futures indexes and the underlying index pricing. Park and Switzer (1995) used the bank short-term interest rate as the risk-free rate, the end of futures date as the data date and used the daily transactions as well, they found that the pricing mistakes of S&P 500 futures indexes decreased to a certain degree after issuing SPDRs. Marsden and Lu (2000) used the GARCH (1,1) model to analyze the influence of ETFs on pricing of futures indexes, and got the same result as Switzer. Hsien and Chu (2002) considered transaction costs and the limitations of short selling in the real investment market, to test differences of the frequency of price deviation and arbitrage opportunities before and after SPDRs. The results showed that futures of the S&P 500 stock index have a close relationship with price of SPDRs. Moreover, Tian and Ackert (2001) discussed pricing efficiency on the S&P 500 index market before and after the exchanged of SPDRs by using put-call parity and boundary conditions theory, the performance showed that, without conditions of limitations of short selling and transaction costs, there was huge difference between real price and theoretical price. Erenburg and Tse (2002), Boehmer (2003) found out that after EFTs issued in the NYSE, transaction costs decreased and trading efficiency increased.

Additionally, there are some studies on volatility timing skills. The earliest evaluation on fund managers' volatility timing skills was put forward by Treynor and Mazuy (1966), which was the famous Treynor & Mazuy model (T-M model). They concluded that expected market return was an important factor of market timing. When expected return is high, investors should enter the market, and choose high-risk assets; when it is low, they should leave the market and invest in low- or no-risk assets. Meanwhile, they found out the timing ability could follow the non-linearity regression:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_1(R_{m,t} - R_{f,t)} + \beta_2\left(R_{m,t} - R_{f,t}\right)^2 + \varepsilon_{p,t}$$

[$\left(R_{m,t} - R_{f,t}\right)^2$ is used to measure market timing skills of fund managers.]

i. When β_2 is significantly positive, fund managers have good return timing skills.

ii. When β_2 is significantly negative, fund managers have poor return timing skills.

iii. When β_2 is equal to 0, there is no market timing activity.

After that, Henrikssin and Merton created the Henrikssin & Merton model (H-M model) in 1984, and introduced an option-pricing theory into volatility timing analysis at the same time. Meanwhile, they defined volatility timing skills as fund managers' capacity to forecast return of risk assets. The formula is:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{mp}(R_{m,t} - R_{f,t}) + \beta_{tp}\max(0, R_{f,t} - R_{m,t}) \quad + \varepsilon_{p,t}$$

i. When $(R_{p,t} - R_{f,t})$ is significantly positive, the market has a good performance; when $(R_{p,t} - R_{f,t})$ is significantly negative, the market has a poor performance.

ii. When β_{tp} is significantly positive, fund managers forecast that funds have a decreasing trend and asset allocation needs to be adjusted; when $(\beta_{mp} - \beta_{tp})$ is significantly negative, fund managers have arbitrage opportunities by short selling.

They chose 116 12-year monthly open-end funds data to do the analysis and got an insignificant result. Therefore, they failed to prove the existence of market timing.

Moreover, Chang and Lewellen (1984) improved the H-M model in 1984 by using monthly data, and took out the regression model:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_1 \min(0, R_{m,t} - R_{f,t}) + \beta_2 \max(0, R_{m,t} - R_{f,t}) \quad + \varepsilon_{p,t}$$

Where, β_1 is beta of bearish market, and β_2 is beta of bullish market.

i. When $(\beta_1 - \beta_2)$ is significantly positive, fund managers have good volatility timing skills.

ii. When $(\beta_1 - \beta_2)$ is significantly negative, fund managers have poor volatility timing skills.

They used 67 U.S monthly mutual funds data, but the outcomes still could not prove the existence of market timing. Otherwise, the Chang & Lewellen model (C-L model) improved studies on market timing skills. After that and for a long period, all researchers could not get a significant outcome on the analysis of market timing.

2.3 Recent Researches on Market Volatility Timing

Since the1990s, researchers began to focus on analyzing volatility timing skills, which was another method to measure expected market return volatility and similar to dynamics of market timing. Chou, Kroner and Bollerslev (1992) summarized that fund managers could forecast expected market volatility based on historical data, because they did forecast research and found out market volatility had two characteristics, which were persistence and high volatility. On the other hand, forecasting volatility timing is more realistic and viable compared with market timing, because it uses more econometrical models to forecast market return.

Ostdiek, Fleming and Korby (2000) used the short-term volatility valuation of S&P 500 futures index to analyze the value of volatility timing on an economic level. The report got the conclusion that the short-term volatility valuation had a good manifestation to be used as signal of volatility timing tactics. Cao (2011) based on CSIDM hedge fund index to test hedge funds managers' volatility timing skills in emerging markets through the Busee model. However his results showed that hedge funds managers were poor at using volatility timing trading methods because of all insignificant indicators.

2.4 Objectives

According to previous analyses, it is obvious that market timing has a deep relationship with volatility timing, but volatility timing skills cannot be discussed by traditional models from the power of forecasting and the perspective of valuation windows. Furthermore, most former research chose hedge funds and mutual funds as the object of study, but ETFs were little used. Meanwhile, volatility timing skills are used widely to measure a performance of fund managers, but most data were from U.S market. Therefore, in order to know the whole investment market well and get good investment performance, it is necessary to have a deep analysis on volatility timing skills for ETFs managers. At the same time, the Japanese market holds an important financial position in the world. All in all, the main objective of this report is to find out whether there is volatility timing in the Tokyo market based on excess return of ETFs, especially the results in different time periods will be showed.

Chapter 3: Data and Methodology

3.1 Modern Portfolio Theory and Capital Asset Pricing Model

Mitchell (2010) discussed the Modern Portfolio Theory (MPT) that was built by Harry Markowitz in the year 1952, its core principal is that investors should choose and rebalance the uncorrelated investments to decrease the investment risk. There are three foundational points in this theory. The first one is asset allocations, which choose the optimized portfolio and suitable risk level. The second is called mean variance analysis, which developed by a quantitative process and it helps investors to find out the most complementary asset for a portfolio. It is more objective when analysts estimate the future returns, standard deviations and correlations of the portfolio components, then combining them to get an optimal return in same level of risk. The last one is that Markowitz used the concept of optimized portfolio, which investors should find out the best point of return and risk in a given investing environment, financial circumstance and risk tolerance.

William Sharpe, John Lintner and Jan Mossin (1964) improved MPT into Capital Asset Pricing Model (CAPM), whose core is to measure the relationship between risk and expected return. CAPM is used widely even until now, for example firms use it to estimate the cost of capital and to test the performance of investment portfolios. The reasons are its powerfully simple logic and intuitively predictions ability. Unfortunately, there are still limitations existing because of its unrealistic hypothesis, such as all investors have the same expected return, same correlation coefficient; there are not transaction costs and no friction in capital market, which means all information and capital are liquidity free and only risk-free rate could be used. Therefore, whatever MPT or CAMP, these methods are hard to measure fund managers' timing skills well in real markets.

3.2 Model

Busse (1999) used the data of mutual funds' daily return to find out the relationship between volatility timing and excess return. The results showed that volatility timing skills could raise the adjusted outcome ration by a certain level of return effectively, as well as decrease exposure in the market, at the same time, alpha and abnormal return increased significantly. However, there are some restrictions in his model: firstly, the beta in a portfolio could be changed when the market condition changes, but the influence time periods are artificially adjusted. Therefore, the real result would be biased when bate is fixed during the volatility timing tested. Secondly, it is not clarified enough in this model for volatility timing and market timing. The last one is that uncertain portfolio risk is existent, such as the changes in financial policy, the relevant events, and interest risk-- even they just come from market. This report will use the modified model built by Busse in 1999:

$$R_{pt} = \alpha_p + \beta_{1mp} R_{mt} + \gamma_{mp} R_{mt}(\sigma_{mt} - \bar{\sigma}_m) + \beta_{2mp} R_{mt}^2 + \varepsilon_{pt} \quad \text{---(1)}$$

Where,

- R_{pt} is fund daily excess return at the *t* time period. It is calculated by daily return of fund subtracting the matched daily return of risk-free rate.
- α_p is fund abnormal return and it is a constant. Expected return could get by using CAMP, but the degree of accuracy is based on the different level of market exposure. Actually, real performance of fund always has a certain distance with theoretical results. Fund has a negative abnormal return when the valuation is lower than real market return, and vice versa. Hence, α_p could be used to measure performance of fund.
- β_{1mp} is the beta of ETFs. It describes the relationship between market and portfolio, and shows the sensitivity degree of fund performance in market.
- R_{mt} is daily excess return of market index at the *t* time period. It equals to daily market return deducting daily risk-free rate.
- σ_{mt} is market return volatility at the *t* time period. It uses market return standard deviation of pervious workday. This report will use three groups of short-term valuation time periods: Volatility_10day, Volatility_30day and Volatility_60day.
- $\overline{\sigma}_m$ is average volatility of market return. It is used as the benchmark market return and explains the level of average market return volatility in short-term valuation time period that same as σ_{mt} using. In addition, when σ_{mt} is less than $\overline{\sigma}_m$, market is in a low volatility period, a good fund manager should invest higher volatility market and short sell low volatility market.

- γ_{mp} is volatility timing factor. It is the most important indicator to measure whether volatility timing exists in market. Statistic testes of the characters of γ_{mp} can be used to explain the existence of volatility timing skills. When it is significantly negative, fund managers have volatility timing skills, and large absolute value of γ_{mp} means stronger ability.
- β_{2mp} is market timing factor. It also can measure fund managers' volatility timing skills, but it is different with γ_{mp}. When β_{2mp} is significantly positive, fund managers have high capacity.
- ε_{pt} is the error term.

3.3 Data Source

Some ETFs in Japanese market are shown on table A.1. This report will use 10-year (from 2003-7-1 to 2013-7-16) daily returns, and 62 of 133 ETFs in the Tokyo market are chosen, because other ETFs were issued less than 4 years. All data is from Bloomberg. In addition, Nikkei-225 is the benchmark index and its average 10-year daily return is used as market return (R_m). Nikkei-225 is widely used in Japan market, which is made up by the price-weighted average of 225 tops rated companies in Japan, which listed in the Tokyo stock market.

3.4 Regression Methods

This report will use two methods to do the regression, Ordinary Least Square

(OLS) and Partial Least Square (PLS), and they have own advantages and shortcomings.

OLS is one of the most widely used method in multivariate analysis, the reason is that OLS recognized that there could be error terms between explanatory variables and dependent variables. OLS method is always chosen when the relevance between explanatory variables and dependent variables needs to be tested and parameters are unknown. The multi-collinearity problem should be concerned, because the regression of OLS is linear, at the same time, if the underlying model is not correct, OLS could not provide true estimates.

On the other hand, PLS is a recent put forward regression method, which combines and generalizes multiple regression and the characteristics of component analysis. Its core is to analyze and forecast a set of dependent variables from a set of predictors or independent variables (Abdi). Indeed, this forecasting is reached through latent that is the predictors a set of orthogonal items, which have the most powerful predictive ability. When researchers want to forecast a set of dependent variables from a huge set of independent variables, PLS regression method is extremely useful with a high degree of accuracy. It is true that, combining PLS and OLS regression method is a good way to do regression analysis in this report.

3.5 Hypotheses of Test

The whole data will be used to do regression at the first step, and find out whether there is existence volatility marking skills in the Tokyo ETFs market. After that, all data would be separated into two parts, which is based on the data—September 2008, and two testes will be regressed, which regressed the same way as the first step. Besides, the reason why September 2008 is used to be the boundary of two tests is that, a world widely financial crisis reached a critical step during the first week in September 2008. This subprime mortgage crisis had a deep influence in the global credit market, such as investment bank and Stock Exchanges. As one of the biggest international financial centers, the Tokyo market could not exit from this financial disaster successfully. Therefore, September 2008 is the separate time period since its huge impact.

In details, the P-value of all regressions is an important factor to show the quality of volatility timing skills. The whole historical data of ETFs would be used in the first testing:

- H_0: Volatility timing skills exist in the Tokyo ETFs market.
- H_1: Volatility timing skills do not exist in the Tokyo ETFs market.

After the first regression, all data are separated into two parts: data before September 2008, and data after September 2008. Another two regressions will be showed, by using the same methods as the first regression.

- $H_0^{'}$: Volatility timing skills exist in the Tokyo ETFs market before September 2008
- $H_1^{'}$: Volatility timing skills do not exist in the Tokyo ETFs market before September 2008.
- $H_0^{''}$: Volatility timing skills exist in the Tokyo ETFs market after September 2008.
- $H_1^{''}$: Volatility timing skills do not exist in the Tokyo ETFs market after September 2008.

Chapter 4: Results Analysis

4.1 Data Overview

All original data are from Bloomberg as tables in Excel. The fixed data come out by using different formulas, such as excess return (exr) and R square (r^2). After that, all original and fixed data are posted in Stata, which would be used to do OLS- and PLS- regression and get tested results. Most useful tables are shown following:

Table 4.1: Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
date	73211	40137.75	968.6143	37628	41474
id	73211	23.09172	15.55196	2	62
exr	71881	-.0000393	.0169571	-.266306	.282174
rm	73200	.0003431	.0170818	-.104651	.119617
r2	73200	.0002919	.0008684	0	.0143082
k10d	58192	-2.61e-06	.0026207	-.0797953	.0792242
k30d	54643	3.08e-06	.0020277	-.0760101	.075818
k60d	52914	6.53e-06	.0013775	-.0355017	.0289912

According to table 4.1, data summary, there are almost 73 thousand data points in the whole data set. It shows that both funds and market had good performance with positive mean of ETFs' return and market return during the collected time period, 0.3038% and 0.3231% respectively. Funds' excess return is negative that means its performance is worse than market's, meanwhile its standard deviation is a little bit less than market's, it describes ETFs have a lower volatility level compared with benchmark. To the contrary, the Min and Max (-26.6306% & 28.2174% and -10.4651% & 11.9617% separately) indicates that there might be volatility timing skills existing in ETFs in the Tokyo market. In following regression, the analysis will be based on the result of γ_{mp} that is the coefficient of $R_{mt}(\sigma_{mt} - \bar{\sigma}_{m})$. fund managers have volatility timing skills when it is significantly negative, and larger absolute value of γ_{mp} means stronger ability. At the same time, three valuation windows should be used to calculate market volatility timing, which named k_10d, k_30d and k_60d.

Table 4.2: Correlation

	date	id	exr	rm	r2	k10d	k30d	k60d
date	1.0000							
id	0.3835	1.0000						
exr	-0.0083	-0.0030	1.0000					
rm	0.0159	-0.0010	-0.2775	1.0000				
r2	-0.0001	0.0228	0.0202	-0.1170	1.0000			
k10d	0.0022	0.0038	0.3210	-0.1109	0.0002	1.0000		
k30d	0.0040	0.0048	0.2020	0.0792	-0.0298	0.7614	1.0000	
k60d	0.0041	0.0071	0.1092	0.2374	-0.0495	0.5761	0.8500	1.0000

Table 4.2 shows correlations of all variables from the whole data set, and most explanatory variables have low correlations, except of k_10d, k_30d and k_60d these three explanatory variables have a higher correlations, that because of their similar data characters. The largest correlation with excess return is K-10day 0.3210. Whatever which regression method is chosen, excess return of ETFs are always the dependent variable, and the other 3

explanatory variables are independent variables to explain it. When all explanatory variables have high absolute correlation with each other, the multi-collinearity issue would happen. The regression result might look good, but it dose make no sense in the real world when the correlations are closed to 1 or -1. However, when it happens, OLS regression method should be chosen, because it can make the error terms lower. Otherwise, it cannot explain excess return of ETFs well, and that is why this report will combine two methods together. Meanwhile, based on this table, 0.3210 is not big enough to cause multi-collinearity problem.

Additionally, respectively using the volatility factors, Volatility_10day, Volatility_30day and Volatility_60day to get the regression functions, therefore, there are four functions and Variance Inflation Factor (VIF). VIF function:

$$VIF = 1 / (1 - R^2)$$

VIF is always used to measure Multi-collinearity problems in a regression function. When it is higher than 10, it means nearly perfect Multi-collinearity; when it is lower than 5, then data can be regard as low collinearity relationship, which would not have serious influence on the result of regression. According to table 4.3, the three VIFs are 1.01, 1.03, 1.05, which are all lower than 1.5, therefore, Multi-collinearity is not a problem on all regressions.

Table 4.3: Multi-collinearity Diagnostics

Variable	VIF	1/VIF	
rm	1.02	0.983478	➔ Volatility_10day
r2	1.01	0.985463	
k10d	1.00	0.997937	
Mean VIF	1.01		

Variable	VIF	1/VIF	
rm	1.04	0.963258	
k30d	1.03	0.973208	➔ Volatility_30day
r2	1.01	0.987839	
Mean VIF	1.03		

Variable	VIF	1/VIF	
rm	1.08	0.928196	
k60d	1.07	0.938484	➔ Volatility_60day
r2	1.01	0.985929	
Mean VIF	1.05		

4.2 PLS & OLS Regression Results

4.2.1 PLS Regression

This report uses Busse model:

$$R_{pt} = \alpha_p + \beta_{1mp}R_{mt} + \gamma_{mp}R_{mt}(\sigma_{mt} - \overline{\sigma}_m) + \beta_{2mp}R_{mt}^2 \quad + \varepsilon_{pt}$$

According to table 4.4, PLS-Regression Results, γ_{mp} is equal to -0.209***, -0.243*** and -0.256*** respectively by using k_10D, k_30D and k_60D. The result shows that volatility timing significantly impacts excess return, and all of them are significantly negative at 1% critical level in the three volatility valuation windows. It is clearly that ETFs in the Tokyo market has a good volatility timing skill, because its negative influence on funds' excess return. Above all, most of funds managers have positive reactions on market changing. When market volatility increases, they should sell high-risk asset to decrease the risk of whole portfolio, and vice versa. Therefore, the PLS method regression test accept hypotheses H_0 that volatility timing skills do exist in the Tokyo ETFs market.

Table 4.4: PLS-Regression Results

	(1)	(2)	(3)
	r1	r2	r3
VARIABLES	exr	exr	exr
rm	-0.209***	-0.243***	-0.256***
	(-34.11)	(-40.23)	(-43.28)
r2	0.0238	-0.0920	-0.146
	(0.138)	(-0.458)	(-0.705)
k10d	1.413***		
	(19.96)		
k30d		1.365***	
		(13.19)	
k60d			1.641***
			(16.79)
Constant	-2.29e-05	1.07e-05	4.03e-05
	(-0.374)	(0.164)	(0.622)
Observations	57,498	53,978	52,061
R-squared	0.145	0.112	0.108

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2.2 OLS Regression

Every fund would be regressed one by one by using OLS method, compared with the former PLS method that regards all historical data as a whole data set, OLS could show the relationship between volatility timing and ETFs' performance individually. All regression results are showed on table A.2 to table A.4, which are on Appendix pages: they are the regression results under volatility 10-day, volatility 30-day, and volatility 60-day data set respectively.

Table 4.5: OLS-Regression Results Summery

	***1% -	**5% -	*10% -	Insignificantly -	Insignificantly +	Cumulative	Positive γ
Volatility-10d	46	3	2	5	3	59	3
Volatility-30d	45	3	2	4	1	55	1
Volatility-60d	39	4	3	2	2	50	3

Table 4.5, OLS-Regression Results Summery, is summarized according to table A.2 to table A.4. This table shows that 79.3% (130 to 164 in total) individual γ_{mp}, the coefficient of ETF, is significantly negative at 1% critical level, 89.6% is significantly negative at less or equal 10% critical level, just 10% special funds are not performance significant or have positive γ_{mp}. In details, most fund managers have volatility timing skills and take positive actions when investment market changes. Obviously, the results from OLS method have same conclusions as they from PLS method, which evident to accept hypotheses H_0 that volatility timing skills do exist in the Tokyo ETFs market.

4.3 PLS Regression Result before and after September 2008

As the report talked before, all data sets are separated into two parts: before and after the global subprime crisis in September 2008. Using PLS regression method to regress the data before and after the date September 2008, two results are showing on table 4.6 and table 4.7.

Table 4.6: PLS-Regression Results before September 2008

VARIABLES	(1) r1 exr	(2) r2 exr	(3) r3 exr
rm	-0.966***	-1.183***	-1.145***
	(-9.301)	(-11.66)	(-10.22)
r2	1.714***	1.885***	1.973***
	(22.87)	(24.83)	(20.79)
key10m	-2.581***		
	(-6.268)		
key30m		-2.590***	
		(-5.339)	
key60m			-4.174***
			(-4.678)
Constant	-0.000505***	-0.000486***	0.000419**
	(-6.597)	(-6.224)	(-5.543)
Observations	41,736	39,025	37,707
R-squared	0.014	0.016	0.012

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.7: PLS-Regression Results after September 2008

VARIABLES	(1) r1 exr	(2) r2 exr	(3) r3 exr
rm	-2.652***	-1.984***	-1.676***
	(-8.737)	(-6.634)	(-5.422)
r2	4.029***	3.601***	3.481***
	(19.59)	(17.80)	(15.90)
key10m	-25.77***		
	(-10.05)		
key30m		-29.27***	
		(-9.636)	
key60m			-22.69***
			(-6.294)
Constant	-0.000388***	-0.000352***	0.000403**
	(-4.165)	(-3.861)	(-4.540)
Observations	15,762	14,953	14,354
R-squared	0.024	0.022	0.018

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

According to the two tables, all γ_{mp}s are significantly negative at 1% critical level in the three volatility valuation windows in the two groups. All outcomes show that the Hypotheses H0’ and H0’ ’ is accepted, which means volatility timing skills do exist in the Tokyo ETFs market before and after September 2008. On the other hand, the absolutely value of γ_{mp} after September 2008 is larger than it is before September 2008, it speaks volume that volatility timing skills of fund managers improved after the separated date--September 2008, because larger absolutely value of γ_{mp} stands for powerful influence on excess return.

Chapter 5: Conclusion

As a new investment tool recent years, ETFs play an increasingly important role in financial market. Due to the occurrence of financial subprime crisis and the similarity between ETFs and CDOs in hedging strategy, this paper focuses on volatility timing skills of fund managers.

This report separates the whole data set into two parts to study the volatility timing before and after September 2008 in ETFs. In addition, three different valuation windows are employed into regression models, which are Volatility_10day, Volatility_30day and Volatility_60day. The regression results show that 90% funds in all data sets have a statistically significant coefficient to prove the existence of volatility timing skills. When regressions are undertaken in two separated data sets, the some results come out. Volatility timing skill is a good factor to measure quality of funds, and numerous methods and factors could make further studies on ETFs.

All in all, from all regression results, this report shows that volatility timing skills do exist in the Tokyo ETFs market based on the chosen data sets. At the same time, fund managers' skills improved after the separated date--September 2008

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Appendix A:

Table A.1: ETFs in Japan

Symbol	Name	Country	Type	Industry/Objective
1624:JP	**Nomura Next Funds Topix-17 Machinery Etf**	Japan	ETF	Sector Fund-Undefined Equity
1648:JP	**Daiwa Etf Topix-17 Banks**	Japan	ETF	Sector Fund-Financial Service
9D312135:JP	**Simplex Nikkei225 Bear -1X Etf**	Japan	ETF	Contrarian
1613:JP	**Nomura Topix Electric Appliances Exchange Traded Fund**	Japan	ETF	Sector Fund-Undefined Equity
1554:JP	**Nikko Listed Index Fund World Equity Msci Acwi Ex Japan**	Japan	ETF	International Equity
1636:JP	**Daiwa Etf Topix-17 Construction & Materials**	Japan	ETF	Sector Fund-Utility
1320:JP	**Daiwa Etf - Nikkei 225**	Japan	ETF	Growth-Large Cap
1649:JP	**Daiwa Etf Topix-17 Financials**	Japan	ETF	Sector Fund-Financial Service
1555:JP	**Nikko Listed Index Fund Australian Reit S&P/Asx200 A-Reit**	Japan	ETF	Country Fund-Australia
1638:JP	**Daiwa Etf Topix-17 Pharmaceutical**	Japan	ETF	Sector Fund-Health & Biotech
1317:JP	**Nikko Listed Index Fund Topix Mid400 Japan Mid Cap Equity**	Japan	ETF	Growth-Mid Cap
9D31111C:JP	**Simplex Nikkei 225 Covered Call Etf**	Japan	ETF	Country Fund-Japan
1626:JP	**Nomura Next Funds Topix-17 It & Services Others Etf**	Japan	ETF	Sector Fund-Internet & Telecom
1551:JP	**Simplex Jasdaq Top 20 Exchange Traded Fund**	Japan	ETF	Country Fund-Japan
1610:JP	**Daiwa Etf - Topix Electric Appliances**	Japan	ETF	Sector Fund-Undefined Equity
1623:JP	**Nomura Next Funds Topix-17 Steel & Nonferrous Etf**	Japan	ETF	Sector Fund-Undefined Equity
1635:JP	**Daiwa Etf Topix-17 Energy Sources**	Japan	ETF	Sector Fund-Energy

Data Source:
http://www.bloomberg.com/markets/symbolsearch?query=Japan+ETF

Table A.2: OLS-Regression based on Volatility_10day (the whole data set)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	id 2	id 3	id 4	id 5	id 6	id 7	id 8	id 9	id 10	id 11	id 12	id 13
VARIABLES	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
rm	-0.0632***	-0.230***	-0.0666***	-0.0581***	-0.0134	-0.458***	-0.458***	-0.00542**	-0.568***	-0.123***	-0.282***	-0.0892***
	(-6.026)	(-8.794)	(-7.033)	(-6.134)	(-1.490)	(-8.401)	(-8.401)	(-1.964)	(-10.58)	(-6.147)	(-4.436)	(-2.591)
r2	-0.0331	0.176	-0.0833	-0.153	-0.222	-1.981*	-1.981*	-0.0621	-1.580	0.541	0.308	0.656
	(-0.0734)	(0.236)	(-0.177)	(-0.300)	(-0.641)	(-1.837)	(-1.837)	(-0.867)	(-1.221)	(0.504)	(0.199)	(0.899)
k10d	1.168***	2.457***	1.229***	1.443***	1.742***	1.207***	1.207***	2.348***	0.749*	1.702***	1.142**	2.280***
	(4.871)	(10.31)	(4.513)	(5.182)	(4.650)	(3.358)	(3.358)	(7.857)	(1.858)	(4.336)	(2.558)	(3.954)
Constant	-1.50e-05	-6.31e-05	-1.69e-05	1.47e-05	5.72e-05	0.000940**	0.000940**	2.22e-05	0.000830**	-0.000129	-0.000409	-0.000385
	(-0.125)	(-0.215)	(-0.137)	(0.111)	(0.650)	(2.081)	(2.081)	(0.578)	(2.059)	(-0.472)	(-0.643)	(-1.397)
Observations	2,587	2,587	2,587	2,587	2,587	1,176	1,176	2,587	1,158	2,262	1,212	1,107
R-squared	0.187	0.090	0.200	0.193	0.123	0.304	0.304	0.088	0.384	0.165	0.078	0.190
Robust t-statistics	in parentheses											
*** p<0.01,	** p<0.05,	* p<0.1										

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
id 14	id 15	id 16	id 17	id 18	id 19	id 20	id 21	id 22	id 23	id 24	id 25	id 26	id 27
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.327***	-0.711***	-0.327***	-0.134***	-0.333***	-0.0991***	-0.329***	-0.305***	-0.165***	-0.293***	-0.315***	-0.263***	-0.509***	-0.542***
(-11.10)	(-15.85)	(-7.185)	(-5.422)	(-5.505)	(-5.020)	(-7.190)	(-4.191)	(-6.538)	(-9.305)	(-7.301)	(-3.670)	(-9.158)	(-6.582)
0.286	-0.987	1.491	0.591	0.300	-0.739	0.212	0.967	0.403	-0.279	0.0761	-0.487	-0.0457	1.413
(0.299)	(-0.919)	(1.519)	(0.775)	(0.222)	(-0.616)	(0.188)	(0.590)	(0.514)	(-0.425)	(0.0681)	(-0.323)	(-0.0396)	(0.476)
1.005***	0.200	2.393***	1.613***	1.121***	1.644***	1.196***	2.244***	1.996***	1.634***	2.073***	2.169***	0.767***	1.536*
(3.716)	(0.907)	(8.325)	(4.677)	(4.687)	(3.568)	(3.451)	(3.917)	(8.189)	(6.372)	(9.304)	(5.400)	(3.464)	(1.688)
-4.54e-05	0.000646	-0.000400	-0.000216	0.000222	0.000213	-0.000324	-0.000533	-9.26e-05	-0.000701	0.000127	-0.000101	-0.000267	-0.000661
(-0.133)	(1.546)	(-0.746)	(-0.802)	(0.326)	(0.749)	(-0.616)	(-0.772)	(-0.312)	(-1.513)	(0.251)	(-0.204)	(-0.512)	(-0.449)
2,083	1,448	1,372	1,848	870	1,989	1,285	608	2,135	1,399	1,211	1,168	1,249	233
0.183	0.474	0.113	0.136	0.245	0.244	0.139	0.247	0.083	0.129	0.189	0.103	0.330	0.166

(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)
id 28	id 29	id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38	id 39	id 40	id 41	id 42
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.142*	-0.445***	-0.0838	-0.448***	-0.259***	-0.327***	-0.229***	-0.0550	-0.148***	-0.203***	-0.265***	-0.151***	-0.769***	-0.178***	-0.483***
(-1.934)	(-3.357)	(-1.563)	(-7.466)	(-7.506)	(-5.027)	(-6.055)	(-1.517)	(-3.651)	(-4.936)	(-4.737)	(-3.610)	(-4.218)	(-5.186)	(-6.369)
-0.798	1.320	1.945*	-0.719	-1.777***	-2.242	-0.102	-0.652	2.284**	0.971	0.662	-0.414	-5.204**	0.572	0.608
(-0.519)	(0.407)	(1.941)	(-0.757)	(-3.223)	(-1.302)	(-0.125)	(-0.648)	(2.115)	(0.849)	(0.517)	(-0.377)	(-2.361)	(1.005)	(0.351)
1.373***	1.501	1.898***	0.129	0.572*	2.636***	0.997***	1.279***	2.009***	1.668***	1.250**	1.298***	3.747***	0.963***	0.904
(3.678)	(1.256)	(5.654)	(0.376)	(1.858)	(3.423)	(4.004)	(3.038)	(4.198)	(5.732)	(2.433)	(4.075)	(3.266)	(4.848)	(1.440)
0.000512	0.000454	-0.000542	0.000321	0.000306	0.000906	2.33e-05	6.07e-05	-0.000184	-7.50e-05	0.000395	-6.33e-05	0.00287	-0.000102	-0.000223
(0.882)	(0.231)	(-1.124)	(0.928)	(0.864)	(1.434)	(0.0695)	(0.160)	(-0.379)	(-0.183)	(0.888)	(-0.131)	(1.115)	(-0.281)	(-0.424)
1,184	146	1,059	1,220	550	308	1,399	1,033	657	1,136	591	1,280	113	763	361
0.035	0.089	0.128	0.431	0.301	0.384	0.254	0.058	0.126	0.122	0.323	0.048	0.143	0.277	0.430

(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)	(59)
id 43	id 44	id 45	id 46	id 47	id 48	id 49	id 50	id 51	id 52	id 53	id 56	id 57	id 58	id 59	id 60	id 61	id 62
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.236***	-0.394***	-0.241***	-0.706***	-0.303***	-0.410***	-0.345**	-0.339**	-0.293***	-0.429***	0.545	-1.514***	0.0563	0.0563	-0.231	-0.603***	-0.164	-1.274*
(-3.927)	(-5.963)	(-3.098)	(-7.307)	(-3.825)	(-5.946)	(-2.207)	(-2.580)	(-3.713)	(-5.288)	(0.483)	(-3.374)	(0.293)	(0.293)	(-1.539)	(-2.830)	(-0.451)	(-2.710)
1.052	-1.569	-0.126	-4.732	3.369***	-1.308	-1.796	2.972	-3.923	-2.764	-27.95	-6.876***	3.973	3.973	6.379	0.639	18.14	13.96
(1.158)	(-0.892)	(-0.109)	(-1.377)	(2.956)	(-0.716)	(-0.463)	(1.573)	(-1.004)	(-1.453)	(-0.797)	(-3.051)	(1.307)	(1.307)	(1.558)	(0.0685)	(1.587)	(0.542)
2.729***	3.481***	4.311***	1.783**	1.639**	1.211**	0.900*	0.918	1.987**	1.882***	8.247	6.718**	-3.042	-3.042	0.0279	2.223**	-3.362	-4.612
(7.693)	(5.336)	(5.006)	(2.393)	(2.386)	(2.377)	(1.694)	(0.790)	(2.208)	(3.240)	(1.226)	(2.356)	(-0.794)	(-0.794)	(0.0199)	(2.655)	(-1.364)	(-1.828)
-0.000571	-0.000111	8.38e-05	0.000528	-0.00398**	0.000550	0.00197	-0.00395**	0.000557	-0.000384	0.00148	0.00835*	-0.00400	-0.00400	-0.00260	0.00334	-0.00434	-0.0181
(-1.195)	(-0.140)	(0.0586)	(0.402)	(-2.240)	(1.206)	(0.834)	(-2.276)	(0.397)	(-0.224)	(0.379)	(1.692)	(-1.572)	(-1.572)	(-0.776)	(1.406)	(-0.746)	(-0.971)
879	306	115	345	150	620	108	126	125	151	8	44	45	45	56	28	29	7
0.130	0.163	0.294	0.104	0.169	0.440	0.054	0.199	0.226	0.169	0.600	0.377	0.118	0.118	0.090	0.443	0.374	0.656

Table A.3: OLS-Regression based on Volatility_30day (the whole data set)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	id 2	id 3	id 4	id 5	id 6	id 7	id 8	id 9	id 10	id 11	id 12	id 13	id 14
VARIABLES	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
rm	-0.0656***	-0.284***	-0.0694***	-0.0625***	-0.0140	-0.567***	-0.567***	-0.0105***	-0.583***	-0.141***	-0.309***	-0.117***	-0.358***
	(-6.090)	(-8.215)	(-7.296)	(-6.281)	(-1.489)	(-11.32)	(-11.32)	(-3.602)	(-12.43)	(-6.918)	(-5.239)	(-3.922)	(-12.08)
r2	0.0266	0.883	0.0317	0.00621	-0.147	-1.126	-1.126	-0.115	-1.956	0.428	1.637	0.433	0.158
	(0.0696)	(1.018)	(0.0838)	(0.0158)	(-0.467)	(-0.605)	(-0.605)	(-1.565)	(-1.596)	(0.426)	(1.152)	(0.462)	(0.156)
k30d	1.545***	2.495***	1.563***	1.858***	2.203***	1.269*	1.269*	3.259***	1.105*	1.906***	0.910***	3.131***	1.404***
	(4.913)	(6.775)	(4.898)	(5.494)	(3.986)	(1.891)	(1.891)	(5.804)	(1.910)	(3.548)	(2.788)	(3.359)	(2.859)
Constant	-3.17e-05	-0.000139	-3.67e-05	-2.41e-05	3.44e-05	0.000805	0.000805	4.20e-05	0.000896**	-0.000192	-0.000626	-0.000241	-1.49e-05
	(-0.290)	(-0.455)	(-0.336)	(-0.214)	(0.420)	(1.540)	(1.540)	(1.072)	(2.291)	(-0.741)	(-0.988)	(-0.814)	(-0.0415)
Observations	2,587	2,587	2,587	2,587	2,587	1,158	1,158	2,587	1,140	2,176	1,194	1,082	1,963
R-squared	0.168	0.046	0.179	0.163	0.075	0.326	0.326	0.045	0.366	0.134	0.043	0.143	0.167
Robust t-statistics	in parentheses												
*** p<0.01,	** p<0.05,	* p<0.1											

(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
id 15	id 16	id 17	id 18	id 19	id 20	id 21	id 22	id 23	id 24	id 25	id 26	id 27	id 28	id 29
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.785***	-0.402***	-0.173***	-0.384***	-0.118***	-0.429***	-0.381***	-0.213***	-0.388***	-0.421***	-0.259***	-0.518***	-0.586***	-0.240**	-0.746***
(-17.05)	(-6.525)	(-7.934)	(-6.153)	(-5.213)	(-9.000)	(-4.992)	(-4.668)	(-10.72)	(-11.54)	(-6.720)	(-9.660)	(-4.845)	(-2.234)	(-2.978)
-0.960	1.415	0.610	0.0800	-0.362	0.301	-0.242	0.107	-0.337	-0.524	-0.321	-0.0746	0.389	-0.695	-0.0536
(-0.840)	(1.062)	(0.745)	(0.0578)	(-0.331)	(0.300)	(-0.105)	(0.0939)	(-0.524)	(-0.547)	(-0.195)	(-0.0642)	(0.111)	(-0.461)	(-0.0107)
-0.330	2.208***	2.313***	1.300***	1.854***	1.278***	2.454**	2.685***	1.635***	2.675***	1.349**	1.050***	1.859	1.883***	2.697*
(-1.013)	(4.630)	(3.674)	(3.514)	(3.036)	(2.914)	(2.176)	(5.099)	(5.221)	(7.373)	(2.185)	(3.853)	(1.507)	(2.974)	(1.875)
0.000606	-0.000160	-0.000317	0.000115	0.000136	-0.000487	0.000167	-4.95e-05	-0.000565	0.000271	-0.000190	-0.000168	-0.000302	0.000483	-0.000978
(1.380)	(-0.250)	(-1.098)	(0.152)	(0.531)	(-0.988)	(0.207)	(-0.136)	(-1.214)	(0.550)	(-0.371)	(-0.320)	(-0.139)	(0.852)	(-0.312)
1,430	1,112	1,687	747	1,932	1,267	404	2,012	1,381	1,193	1,154	1,220	143	1,168	95
0.475	0.048	0.118	0.212	0.224	0.134	0.150	0.045	0.103	0.171	0.041	0.325	0.136	0.021	0.136

(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)
id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38	id 39	id 40	id 41	id 42	id 43
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.260**	-0.462***	-0.239***	-0.379***	-0.256***	-0.0791**	-0.162***	-0.234***	-0.241***	-0.267***	-0.593*	-0.209***	-0.486***	-0.326***
(-2.210)	(-7.007)	(-8.191)	(-5.096)	(-6.607)	(-2.542)	(-3.146)	(-5.813)	(-4.143)	(-6.015)	(-1.735)	(-4.617)	(-5.908)	(-4.849)
-2.157	-0.664	-0.292	-0.757	-0.0575	-1.700**	0.864	0.316	-1.044	-0.00894	-5.932**	0.745	-0.0905	0.0731
(-0.965)	(-0.688)	(-0.467)	(-0.453)	(-0.0700)	(-2.438)	(0.736)	(0.262)	(-0.599)	(-0.00991)	(-2.058)	(0.819)	(-0.0496)	(0.0545)
2.610***	-0.0139	1.599**	1.267	0.899***	1.780***	3.049***	1.460***	3.536***	2.636***	2.023	1.237***	2.056*	3.718***
(3.680)	(-0.0272)	(2.441)	(1.348)	(2.695)	(3.609)	(4.668)	(2.785)	(4.055)	(5.136)	(0.936)	(2.820)	(1.749)	(6.384)
0.000101	0.000273	8.10e-05	0.00104	4.41e-05	0.000262	-0.000521	1.72e-05	0.000702	-0.000101	0.00246	-0.000401	-0.000334	-0.000615
(0.157)	(0.793)	(0.234)	(1.383)	(0.130)	(0.784)	(-0.948)	(0.0412)	(1.410)	(-0.220)	(0.669)	(-0.878)	(-0.435)	(-1.145)
1,039	1,196	511	199	1,381	1,029	468	1,146	435	1,270	75	580	206	833
0.059	0.434	0.226	0.354	0.229	0.030	0.088	0.060	0.307	0.042	0.058	0.234	0.388	0.063

(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)
id 44	id 45	id 46	id 47	id 48	id 49	id 50	id 51	id 52	id 57	id 58	id 59	id 60
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.595***	-0.509***	-1.023***	-0.601*	-0.320***	-0.981***	-0.536***	-0.320***	-0.991***	-1.918	-1.918	-0.274	103.7
(-4.191)	(-3.676)	(-6.250)	(-1.818)	(-4.228)	(-4.006)	(-3.167)	(-4.054)	(-3.666)	(-1.503)	(-1.503)	(-1.217)	
-2.560	2.112*	-3.530	2.649	-2.429	-3.747	-1.471	-6.324	-9.219**	-9.112	-9.112	-0.208	670.8
(-0.679)	(1.735)	(-1.235)	(0.926)	(-1.642)	(-0.817)	(-0.759)	(-1.438)	(-2.361)	(-0.640)	(-0.640)	(-0.0385)	
9.024**	7.936***	3.408***	5.118	3.107***	5.619***	-1.034	2.854	8.232*	28.35	28.35	-3.062	-1,188
(2.494)	(3.558)	(3.164)	(1.307)	(3.197)	(3.243)	(-0.574)	(1.520)	(1.930)	(1.729)	(1.729)	(-1.248)	
0.000188	0.000645	-0.000475	-0.00524*	0.00120**	0.00310	-0.000369	0.00152	0.00173	0.000747	0.000747	0.000253	0.00348
(0.175)	(0.367)	(-0.285)	(-1.735)	(2.492)	(1.055)	(-0.159)	(1.012)	(0.428)	(0.0577)	(0.0577)	(0.0599)	
139	89	214	44	479	82	53	65	30	11	11	51	4
0.117	0.212	0.107	0.135	0.441	0.094	0.358	0.241	0.393	0.200	0.200	0.168	1.000

Table A.4: OLS-Regression based on Volatility_60day (the whole data set)

VARIABLES	(1) id 2 exr	(2) id 3 exr	(3) id 4 exr	(4) id 5 exr	(5) id 6 exr	(6) id 7 exr	(7) id 8 exr	(8) id 9 exr	(9) id 10 exr	(10) id 11 exr	(11) id 12 exr
rm	-0.0608***	-0.313***	-0.0653***	-0.0617***	-0.0141	-0.643***	-0.643***	-0.00942***	-0.623***	-0.165***	-0.356***
	(-5.273)	(-7.094)	(-6.221)	(-5.390)	(-1.372)	(-17.90)	(-17.90)	(-2.969)	(-13.02)	(-7.132)	(-5.758)
r2	0.0212	0.613	0.0354	0.0240	-0.130	-3.747***	-3.747***	-0.147**	-2.470	0.355	-1.166
	(0.0580)	(0.682)	(0.101)	(0.0672)	(-0.442)	(-2.731)	(-2.731)	(-1.999)	(-1.643)	(0.350)	(-0.581)
k60d	2.204***	2.839***	2.184***	2.488***	3.021***	0.502	0.502	3.840***	0.810	2.193***	1.098***
	(5.625)	(5.529)	(5.668)	(5.893)	(3.246)	(0.712)	(0.712)	(3.840)	(1.098)	(3.186)	(2.698)
Constant	-3.17e-05	-7.06e-05	-3.48e-05	-2.58e-05	2.57e-05	0.00128***	0.00128***	3.44e-05	0.000914**	-0.000171	0.000561
	(-0.296)	(-0.228)	(-0.330)	(-0.239)	(0.329)	(3.082)	(3.082)	(0.875)	(2.277)	(-0.646)	(0.914)
Observations	2,587	2,587	2,587	2,587	2,587	1,106	1,106	2,587	1,088	2,140	1,142
R-squared	0.162	0.026	0.174	0.153	0.058	0.372	0.372	0.022	0.395	0.125	0.040

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

(12) id 13 exr	(13) id 14 exr	(14) id 15 exr	(15) id 16 exr	(16) id 17 exr	(17) id 18 exr	(18) id 19 exr	(19) id 20 exr	(20) id 21 exr	(21) id 22 exr	(22) id 23 exr	(23) id 24 exr	(24) id 25 exr
-0.143***	-0.401***	-0.808***	-0.410***	-0.186***	-0.431***	-0.0971***	-0.530***	-0.384***	-0.274***	-0.441***	-0.486***	-0.200***
(-7.503)	(-11.16)	(-15.35)	(-3.954)	(-8.547)	(-7.077)	(-4.278)	(-10.26)	(-4.411)	(-4.791)	(-10.69)	(-13.04)	(-5.170)
-0.391	-0.190	-1.012	1.156	0.697	0.164	-0.336	0.462	1.061	0.353	-0.216	-1.557	0.220
(-0.639)	(-0.145)	(-0.898)	(0.803)	(0.711)	(0.117)	(-0.300)	(0.458)	(0.601)	(0.326)	(-0.329)	(-1.136)	(0.184)
2.687***	0.716	-0.757	1.961**	2.907**	1.903***	2.940***	2.589***	3.084	3.697***	1.818***	3.102***	1.747***
(3.126)	(1.096)	(-1.240)	(2.220)	(2.562)	(3.201)	(3.563)	(3.308)	(1.189)	(4.484)	(4.145)	(7.024)	(2.931)
-6.34e-05	9.94e-05	0.000571	-0.000525	-0.000361	-1.03e-05	4.94e-05	-0.000384	-9.32e-05	-0.000191	-0.000610	0.000720	-0.000220
(-0.267)	(0.265)	(1.290)	(-0.766)	(-1.145)	(-0.0130)	(0.202)	(-0.779)	(-0.0964)	(-0.545)	(-1.288)	(1.494)	(-0.522)
1,045	2,064	1,378	966	1,676	712	1,883	1,215	240	2,089	1,329	1,141	1,116
0.101	0.154	0.483	0.029	0.098	0.234	0.223	0.143	0.131	0.032	0.094	0.158	0.017

(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)
id 26	id 27	id 28	id 29	id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.549***	-1.385**	-0.0843	-4.287**	-0.183**	-0.306***	-0.236***	0.628*	-0.281***	-0.168***	-0.406***	-0.245***	-0.229***
(-11.58)	(-2.453)	(-0.914)	(-2.266)	(-2.365)	(-4.474)	(-8.440)	(1.912)	(-7.332)	(-3.415)	(-4.989)	(-7.072)	(-3.237)
0.0157	1.773	-2.783	1.036	-2.073	-0.467	-0.785	-1.335	-0.0447	-0.956	0.0671	-1.601	-1.347
(0.0148)	(0.491)	(-1.575)	(0.233)	(-1.214)	(-0.679)	(-1.021)	(-0.952)	(-0.0564)	(-1.235)	(0.0691)	(-1.398)	(-0.649)
1.522***	5.437	1.485**	18.54*	2.567***	2.483***	2.608**	22.64***	0.889**	3.437***	7.477***	2.874***	4.393***
(4.727)	(1.529)	(2.129)	(1.980)	(3.990)	(3.030)	(2.492)	(3.374)	(2.152)	(4.306)	(4.595)	(5.550)	(3.180)
-0.000382	-0.00133	0.000902	-0.000120	0.000254	0.000246	0.000209	0.000367	8.12e-05	6.77e-05	-0.000179	0.000613*	0.000899
(-0.741)	(-0.495)	(1.619)	(-0.0347)	(0.509)	(0.816)	(0.572)	(0.316)	(0.252)	(0.211)	(-0.285)	(1.710)	(1.469)
1,195	74	1,134	60	1,069	1,177	514	106	1,329	1,066	377	1,102	337
0.332	0.282	0.026	0.298	0.053	0.459	0.202	0.396	0.256	0.023	0.087	0.076	0.262

(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)
id 39	id 40	id 41	id 42	id 43	id 44	id 45	id 46	id 47	id 48	id 49	id 50	id 51
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.356***	-17.46*	-0.230***	-0.597***	-0.363***	0.135	-1.376***	0.00203	-2.335***	-0.419***	-2.768*	-1.507	-0.331**
(-6.270)	(-2.021)	(-7.351)	(-6.062)	(-4.218)	(0.777)	(-4.347)	(0.00449)	(-2.828)	(-7.522)	(-1.840)	(-1.610)	(-2.530)
-0.0517	-13.35**	-1.071	0.425	-0.929	-0.327	-0.765	-6.427	2.222	-0.896	-4.236	-4.189	-3.641
(-0.0576)	(-2.499)	(-1.011)	(0.257)	(-0.531)	(-0.0757)	(-0.400)	(-1.566)	(0.886)	(-0.904)	(-0.864)	(-1.507)	(-1.502)
4.017***	84.04*	6.204***	-0.394	4.089***	-12.73**	28.66***	-2.849	22.13**	2.542**	18.74*	-17.66	19.79***
(5.732)	(1.953)	(5.589)	(-0.126)	(5.253)	(-2.514)	(4.110)	(-1.179)	(2.640)	(2.064)	(1.699)	(-1.121)	(4.222)
-0.000198	0.00850	0.000117	-1.10e-05	-0.000559	-0.000475	0.000997	0.00202	-0.000728	0.000613	0.00143	0.00352	0.000871
(-0.432)	(1.380)	(0.270)	(-0.00880)	(-1.031)	(-0.390)	(0.374)	(0.965)	(-0.213)	(1.213)	(0.354)	(1.298)	(0.320)
1,218	31	560	111	815	92	50	155	41	375	52	32	30
0.041	0.334	0.203	0.415	0.042	0.159	0.360	0.135	0.253	0.421	0.095	0.475	0.583

Appendix B:

Table B.1: OLS-Regression based on Volatility_10day (data set after September 2008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	id 2	id 3	id 4	id 5	id 6	id 7	id 8	id 9	id 10	id 11	id 12	id 13
VARIABLES	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
rm	-0.0707***	-0.225***	-0.0697***	-0.0553***	-0.00589	-0.458***	-0.458***	-0.00346	-0.570***	-0.0907***	-0.275***	-0.0892***
	(-3.982)	(-6.679)	(-4.451)	(-3.574)	(-0.427)	(-8.401)	(-8.401)	(-0.968)	(-10.63)	(-3.214)	(-4.318)	(-2.591)
r2	-0.00529	0.0733	-0.0237	-0.104	-0.196	-1.981*	-1.981*	-0.0668	-1.606	0.781	0.275	0.656
	(-0.0113)	(0.0872)	(-0.0498)	(-0.204)	(-0.568)	(-1.837)	(-1.837)	(-0.909)	(-1.244)	(0.677)	(0.177)	(0.899)
k10d	0.965***	2.170***	1.039***	1.245***	1.506***	1.207***	1.207***	1.946***	0.732*	1.762***	1.149**	2.280***
	(3.748)	(7.269)	(3.659)	(4.289)	(3.836)	(3.358)	(3.358)	(5.146)	(1.819)	(3.776)	(2.564)	(3.954)
Constant	-7.71e-05	-0.000175	-9.72e-05	-5.93e-05	6.45e-05	0.000940**	0.000940**	4.00e-05	0.000872**	-0.000386	-0.000317	-0.000385
	(-0.443)	(-0.408)	(-0.566)	(-0.322)	(0.557)	(2.081)	(2.081)	(0.770)	(2.177)	(-1.155)	(-0.500)	(-1.397)
Observations	1,196	1,196	1,196	1,196	1,196	1,176	1,176	1,196	1,155	1,196	1,196	1,107
R-squared	0.220	0.103	0.244	0.224	0.138	0.304	0.304	0.101	0.388	0.229	0.080	0.190
Robust t-statisti	in parenthese											
*** p<0.01,	** p<0.05,	* p<0.1										

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
id 14	id 15	id 16	id 17	id 18	id 19	id 20	id 21	id 22	id 23	id 24	id 25	id 26	id 27	id 28
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.373***	-0.674***	-0.328***	-0.130***	-0.332***	-0.0472**	-0.323***	-0.308***	-0.142***	-0.291***	-0.310***	-0.264***	-0.505***	-0.543***	-0.151**
(-7.862)	(-12.76)	(-5.728)	(-3.723)	(-5.090)	(-2.013)	(-6.796)	(-4.111)	(-3.987)	(-8.708)	(-7.180)	(-3.684)	(-8.863)	(-6.312)	(-2.043)
0.456	-0.922	1.639	0.765	0.302	-0.845	0.259	1.005	0.456	-0.157	0.0783	-0.499	-0.00617	1.416	-0.748
(0.424)	(-0.815)	(1.524)	(0.922)	(0.221)	(-0.653)	(0.231)	(0.611)	(0.540)	(-0.240)	(0.0704)	(-0.331)	(-0.00536)	(0.475)	(-0.484)
0.718**	0.240	2.202***	1.461***	1.102***	1.929***	1.197***	2.240***	1.864***	1.537***	2.082***	2.199***	0.775***	1.535*	1.478***
(2.267)	(1.022)	(6.621)	(3.794)	(4.536)	(3.893)	(3.166)	(3.884)	(7.103)	(5.151)	(9.351)	(5.410)	(3.472)	(1.664)	(3.938)
-0.000112	0.000494	-0.000621	-0.000430	0.000429	0.000228	-0.000229	-0.000639	-0.000194	-0.000435	0.000158	-7.81e-05	-0.000371	-0.000421	0.000513
(-0.165)	(1.116)	(-0.785)	(-1.123)	(0.577)	(0.694)	(-0.437)	(-0.903)	(-0.423)	(-0.970)	(0.309)	(-0.158)	(-0.697)	(-0.279)	(0.882)
774	1,196	645	971	759	1,196	1,196	582	979	1,196	1,195	1,162	1,192	225	1,178
0.218	0.472	0.157	0.155	0.248	0.366	0.152	0.250	0.101	0.154	0.190	0.105	0.335	0.162	0.040

(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)
id 29	id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38	id 39	id 40	id 41	id 42
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.495***	-0.0842	-0.439***	-0.259***	-0.327***	-0.237***	-0.0561	-0.148***	-0.203***	-0.265***	-0.137***	-0.768***	-0.178***	-0.483***
(-3.169)	(-1.572)	(-7.062)	(-7.506)	(-5.027)	(-5.555)	(-1.551)	(-3.651)	(-4.933)	(-4.737)	(-3.237)	(-4.214)	(-5.186)	(-6.369)
1.196	1.941*	-0.683	-1.777***	-2.242	-0.106	-0.647	2.284**	0.974	0.662	-0.313	-5.175**	0.572	0.608
(0.348)	(1.936)	(-0.731)	(-3.223)	(-1.302)	(-0.127)	(-0.643)	(2.115)	(0.851)	(0.517)	(-0.289)	(-2.350)	(1.005)	(0.351)
1.675	1.887***	0.164	0.572*	2.636***	0.906***	1.267***	2.009***	1.668***	1.250**	1.334***	3.721***	0.963***	0.904
(1.308)	(5.619)	(0.465)	(1.858)	(3.423)	(3.455)	(3.016)	(4.198)	(5.731)	(2.433)	(4.094)	(3.225)	(4.848)	(1.440)
0.000809	-0.000546	0.000274	0.000306	0.000906	7.97e-05	3.59e-05	-0.000184	-8.43e-05	0.000395	-0.000168	0.00274	-0.000102	-0.000223
(0.384)	(-1.128)	(0.793)	(0.864)	(1.434)	(0.234)	(0.0951)	(-0.379)	(-0.206)	(0.888)	(-0.345)	(1.060)	(-0.281)	(-0.424)
138	1,052	1,171	550	308	1,196	1,031	657	1,134	591	1,178	112	763	361
0.096	0.127	0.441	0.301	0.384	0.289	0.058	0.126	0.122	0.323	0.051	0.143	0.277	0.430

(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)
id 43	id 44	id 45	id 46	id 47	id 48	id 49	id 50	id 51	id 52	id 53	id 56
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.236***	-0.503**	-0.232***	-0.706***	-0.309***	-0.410***	-0.369**	-0.341**	-0.293***	-0.422***	0.545	-1.667***
(-3.927)	(-2.329)	(-3.000)	(-7.307)	(-3.807)	(-5.946)	(-2.358)	(-2.563)	(-3.713)	(-5.259)	(0.483)	(-3.326)
1.052	-1.220	-0.00548	-4.732	3.346***	-1.308	-2.020	2.992	-3.923	-2.413	-27.95	-7.942***
(1.158)	(-0.296)	(-0.00479)	(-1.377)	(2.852)	(-0.716)	(-0.530)	(1.580)	(-1.004)	(-1.264)	(-0.797)	(-2.967)
2.729***	3.789***	4.432***	1.783**	1.580**	1.211**	0.916*	0.916	1.987**	1.922***	8.247	7.339**
(7.693)	(3.268)	(5.035)	(2.393)	(2.258)	(2.377)	(1.731)	(0.786)	(2.208)	(3.268)	(1.226)	(2.528)
-0.000571	-0.00804	-4.58e-05	0.000528	-0.00393**	0.000550	0.00200	-0.00407**	0.000557	-0.000497	0.00148	0.0127*
(-1.195)	(-1.326)	(-0.0319)	(0.402)	(-2.095)	(1.206)	(0.819)	(-2.301)	(0.397)	(-0.284)	(0.379)	(1.934)
879	27	113	345	140	620	103	123	125	143	8	31
0.130	0.293	0.302	0.104	0.174	0.440	0.061	0.201	0.226	0.177	0.600	0.471

(54)	(55)	(56)	(57)	(58)	(59)
id 57	id 58	id 59	id 60	id 61	id 62
exr	exr	exr	exr	exr	exr
0.0563	0.0563	-0.235	-0.603***	-0.164	-1.274*
(0.293)	(0.293)	(-1.557)	(-2.830)	(-0.451)	(-2.710)
3.973	3.973	6.476	0.639	18.14	13.96
(1.307)	(1.307)	(1.552)	(0.0685)	(1.587)	(0.542)
-3.042	-3.042	0.201	2.223**	-3.362	-4.612
(-0.794)	(-0.794)	(0.138)	(2.655)	(-1.364)	(-1.828)
-0.00400	-0.00400	-0.00208	0.00334	-0.00434	-0.0181
(-1.572)	(-1.572)	(-0.621)	(1.406)	(-0.746)	(-0.971)
45	45	55	28	29	7
0.118	0.118	0.088	0.443	0.374	0.656

Table B.2: OLS-Regression based on Volatility_30day (data set after September 2008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	id 2	id 3	id 4	id 5	id 6	id 7	id 8	id 9	id 10	id 11	id 12	id 13
VARIABLES	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
rm	-0.0751***	-0.289***	-0.0763***	-0.0648***	-0.00490	-0.567***	-0.567***	-0.0105***	-0.586***	-0.122***	-0.309***	-0.117***
	(-4.042)	(-6.262)	(-4.770)	(-3.896)	(-0.341)	(-11.32)	(-11.32)	(-2.649)	(-12.51)	(-4.525)	(-5.239)	(-3.922)
r2	0.0568	0.691	0.0908	0.0658	-0.126	-1.126	-1.126	-0.122	-2.000	0.660	1.637	0.433
	(0.138)	(0.746)	(0.228)	(0.161)	(-0.383)	(-0.605)	(-0.605)	(-1.566)	(-1.633)	(0.612)	(1.152)	(0.462)
k30d	1.288***	2.181***	1.298***	1.556***	2.088***	1.269*	1.269*	2.982***	1.061*	2.071***	0.910***	3.131***
	(3.570)	(4.415)	(3.604)	(4.051)	(3.305)	(1.891)	(1.891)	(3.965)	(1.843)	(3.220)	(2.788)	(3.359)
Constant	-9.89e-05	-0.000258	-0.000122	-0.000108	4.19e-05	0.000805	0.000805	5.89e-05	0.000939**	-0.000345	-0.000626	-0.000241
	(-0.604)	(-0.590)	(-0.776)	(-0.660)	(0.377)	(1.540)	(1.540)	(1.101)	(2.420)	(-1.091)	(-0.988)	(-0.814)
Observations	1,196	1,196	1,196	1,196	1,196	1,158	1,158	1,196	1,137	1,196	1,194	1,082
R-squared	0.203	0.051	0.222	0.189	0.090	0.326	0.326	0.058	0.370	0.181	0.043	0.143
Robust t-statistics	in parentheses											
*** p<0.01,	** p<0.05, * p<0.1											

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
id 14	id 15	id 16	id 17	id 18	id 19	id 20	id 21	id 22	id 23	id 24	id 25	id 26	id 27	id 28
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.415***	-0.762***	-0.446***	-0.185***	-0.388***	-0.0657***	-0.430***	-0.381***	-0.199***	-0.402***	-0.421***	-0.259***	-0.511***	-0.586***	-0.240**
(-8.917)	(-14.09)	(-5.618)	(-6.401)	(-5.858)	(-2.594)	(-8.952)	(-4.988)	(-3.107)	(-10.83)	(-11.54)	(-6.720)	(-9.397)	(-4.845)	(-2.234)
0.421	-0.895	1.502	0.713	0.0401	-0.449	0.327	-0.229	0.120	-0.141	-0.524	-0.321	-0.0201	0.389	-0.695
(0.356)	(-0.736)	(1.069)	(0.790)	(0.0284)	(-0.382)	(0.328)	(-0.1000)	(0.0945)	(-0.221)	(-0.547)	(-0.195)	(-0.0175)	(0.111)	(-0.461)
0.944*	-0.321	1.957***	2.174***	1.279***	2.374***	1.368***	2.452**	2.690***	1.793***	2.675***	1.349**	1.068***	1.859	1.883***
(1.648)	(-0.948)	(3.402)	(3.012)	(3.413)	(3.528)	(2.988)	(2.175)	(4.192)	(5.221)	(7.373)	(2.185)	(3.914)	(1.507)	(2.974)
-9.59e-05	0.000502	-0.000267	-0.000392	0.000330	0.000141	-0.000293	0.000146	-0.000117	-0.000363	0.000271	-0.000190	-0.000354	-0.000302	0.000483
(-0.120)	(1.076)	(-0.261)	(-0.963)	(0.394)	(0.484)	(-0.592)	(0.180)	(-0.206)	(-0.808)	(0.550)	(-0.371)	(-0.667)	(-0.139)	(0.852)
648	1,196	479	912	654	1,196	1,196	402	911	1,196	1,193	1,154	1,180	143	1,168
0.205	0.471	0.072	0.136	0.219	0.298	0.142	0.150	0.053	0.140	0.171	0.041	0.330	0.136	0.021

(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)
id 29	id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38	id 39	id 40	id 41	id 42	id 43
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.746***	-0.260**	-0.450***	-0.239***	-0.379***	-0.266***	-0.0791**	-0.162***	-0.234***	-0.241***	-0.273***	-0.593*	-0.209***	-0.486***	-0.326***
(-2.978)	(-2.210)	(-6.583)	(-8.191)	(-5.096)	(-5.735)	(-2.542)	(-3.146)	(-5.813)	(-4.143)	(-6.286)	(-1.735)	(-4.617)	(-5.908)	(-4.849)
-0.0536	-2.157	-0.627	-0.292	-0.757	-0.0705	-1.700**	0.864	0.316	-1.044	0.127	-5.932**	0.745	-0.0905	0.0731
(-0.0107)	(-0.965)	(-0.661)	(-0.467)	(-0.453)	(-0.0831)	(-2.438)	(0.736)	(0.262)	(-0.599)	(0.143)	(-2.058)	(0.819)	(-0.0496)	(0.0545)
2.697*	2.610***	0.0870	1.599**	1.267	0.809**	1.780***	3.049***	1.460***	3.536***	2.981***	2.023	1.237***	2.056*	3.718***
(1.875)	(3.680)	(0.165)	(2.441)	(1.348)	(2.091)	(3.609)	(4.668)	(2.785)	(4.055)	(5.902)	(0.936)	(2.820)	(1.749)	(6.384)
-0.000978	0.000101	0.000198	8.10e-05	0.00104	9.63e-05	0.000262	-0.000521	1.72e-05	0.000702	-0.000176	0.00246	-0.000401	-0.000334	-0.000615
(-0.312)	(0.157)	(0.578)	(0.234)	(1.383)	(0.280)	(0.784)	(-0.948)	(0.0412)	(1.410)	(-0.386)	(0.669)	(-0.878)	(-0.435)	(-1.145)
95	1,039	1,165	511	199	1,196	1,029	468	1,146	435	1,186	75	580	206	833
0.136	0.059	0.444	0.226	0.354	0.268	0.030	0.088	0.060	0.307	0.048	0.058	0.234	0.388	0.063

(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)
id 45	id 46	id 47	id 48	id 49	id 50	id 51	id 52	id 57	id 58	id 59	id 60
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.509***	-1.023***	-0.601*	-0.320***	-0.981***	-0.536***	-0.320***	-0.991***	-1.918	-1.918	-0.274	103.7
(-3.676)	(-6.250)	(-1.818)	(-4.228)	(-4.006)	(-3.167)	(-4.054)	(-3.666)	(-1.503)	(-1.503)	(-1.217)	
2.112*	-3.530	2.649	-2.429	-3.747	-1.471	-6.324	-9.219**	-9.112	-9.112	-0.208	670.8
(1.735)	(-1.235)	(0.926)	(-1.642)	(-0.817)	(-0.759)	(-1.438)	(-2.361)	(-0.640)	(-0.640)	(-0.0385)	
7.936***	3.408***	5.118	3.107***	5.619***	-1.034	2.854	8.232*	28.35	28.35	-3.062	-1,188
(3.558)	(3.164)	(1.307)	(3.197)	(3.243)	(-0.574)	(1.520)	(1.930)	(1.729)	(1.729)	(-1.248)	
0.000645	-0.000475	-0.00524*	0.00120**	0.00310	-0.000369	0.00152	0.00173	0.000747	0.000747	0.000253	0.00348
(0.367)	(-0.285)	(-1.735)	(2.492)	(1.055)	(-0.159)	(1.012)	(0.428)	(0.0577)	(0.0577)	(0.0599)	
89	214	44	479	82	53	65	30	11	11	51	4
0.212	0.107	0.135	0.441	0.094	0.358	0.241	0.393	0.200	0.200	0.168	1.000

Table B.3: OLS-Regression based on Volatility_60day (data set after September 2008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	id 2	id 3	id 4	id 5	id 6	id 7	id 8	id 9	id 10	id 11	id 12	id 13
VARIABLE	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
rm	-0.0688***	-0.325***	-0.0725***	-0.0615***	-0.00506	-0.643***	-0.643***	-0.00888**	-0.626***	-0.112***	-0.356***	-0.143***
	(-3.222)	(-5.164)	(-3.756)	(-3.123)	(-0.332)	(-17.90)	(-17.90)	(-2.159)	(-13.13)	(-3.982)	(-5.758)	(-7.503)
r2	0.0522	0.458	0.0900	0.0840	-0.115	-3.747***	-3.747***	-0.153*	-2.515*	0.640	-1.166	-0.391
	(0.130)	(0.453)	(0.237)	(0.220)	(-0.366)	(-2.731)	(-2.731)	(-1.945)	(-1.678)	(0.596)	(-0.581)	(-0.639)
k60d	1.892***	2.728***	1.828***	2.242***	3.036***	0.502	0.502	3.830***	0.752	3.613***	1.098***	2.687***
	(3.713)	(3.431)	(3.650)	(4.091)	(2.820)	(0.712)	(0.712)	(3.170)	(1.029)	(3.687)	(2.698)	(3.126)
Constant	-0.000106	-0.000189	-0.000122	-0.000109	2.47e-05	0.00128***	0.00128***	4.97e-05	0.000960**	-0.000365	0.000561	-6.34e-05
	(-0.652)	(-0.422)	(-0.786)	(-0.677)	(0.230)	(3.082)	(3.082)	(0.925)	(2.417)	(-1.154)	(0.914)	(-0.267)
Observatio	1,196	1,196	1,196	1,196	1,196	1,106	1,106	1,196	1,085	1,196	1,142	1,045
R-squared	0.196	0.032	0.214	0.183	0.071	0.372	0.372	0.038	0.400	0.178	0.040	0.101
Robust	t-statistics	parenthes										
*** p<0.01,	** p<0.05,	* p<0.1										

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
id 14	id 15	id 16	id 17	id 18	id 19	id 20	id 21	id 22	id 23	id 24	id 25	id 26	id 27
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.478***	-0.773***	-0.378**	-0.193***	-0.437***	-0.0742**	-0.537***	-0.384***	-0.364***	-0.457***	-0.486***	-0.200***	-0.549***	-1.385**
(-9.053)	(-12.77)	(-2.501)	(-6.714)	(-6.964)	(-2.400)	(-10.30)	(-4.411)	(-3.777)	(-10.94)	(-13.04)	(-5.170)	(-11.56)	(-2.453)
-0.129	-0.914	1.282	0.784	0.122	-0.366	0.480	1.061	0.227	-0.189	-1.557	0.220	0.0204	1.773
(-0.0818)	(-0.760)	(0.817)	(0.752)	(0.0856)	(-0.308)	(0.478)	(0.601)	(0.180)	(-0.289)	(-1.136)	(0.184)	(0.0192)	(0.491)
0.129	-0.637	1.610	2.969**	1.884***	3.188***	2.756***	3.084	5.530***	2.068***	3.102***	1.747***	1.520***	5.437
(0.172)	(-1.011)	(1.317)	(2.259)	(3.154)	(3.873)	(3.436)	(1.189)	(4.215)	(4.254)	(7.024)	(2.931)	(4.714)	(1.529)
8.44e-06	0.000509	-0.000708	-0.000504	7.89e-05	8.57e-05	-0.000296	-9.32e-05	-0.000344	-0.000361	0.000720	-0.000220	-0.000407	-0.00133
(0.0111)	(1.093)	(-0.568)	(-1.189)	(0.0948)	(0.299)	(-0.604)	(-0.0964)	(-0.640)	(-0.797)	(1.494)	(-0.522)	(-0.789)	(-0.495)
710	1,196	400	983	671	1,196	1,196	240	962	1,196	1,141	1,116	1,193	74
0.200	0.471	0.034	0.112	0.241	0.255	0.146	0.131	0.049	0.120	0.158	0.017	0.332	0.282

(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)
id 28	id 29	id 30	id 31	id 32	id 33	id 34	id 35	id 36	id 37	id 38	id 39	id 40
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.0843	-4.287**	-0.183**	-0.306***	-0.236***	0.628*	-0.275***	-0.168***	-0.406***	-0.245***	-0.229***	-0.363***	-17.46*
(-0.914)	(-2.266)	(-2.365)	(-4.474)	(-8.440)	(1.912)	(-5.531)	(-3.415)	(-4.989)	(-7.072)	(-3.237)	(-6.456)	(-2.021)
-2.783	1.036	-2.073	-0.467	-0.785	-1.335	0.0135	-0.956	0.0671	-1.601	-1.347	-0.0191	-13.35**
(-1.575)	(0.233)	(-1.214)	(-0.679)	(-1.021)	(-0.952)	(0.0171)	(-1.235)	(0.0691)	(-1.398)	(-0.649)	(-0.0214)	(-2.499)
1.485**	18.54*	2.567***	2.483***	2.608**	22.64***	0.955*	3.437***	7.477***	2.874***	4.393***	4.242***	84.04*
(2.129)	(1.980)	(3.990)	(3.030)	(2.492)	(3.374)	(1.780)	(4.306)	(4.595)	(5.550)	(3.180)	(6.031)	(1.953)
0.000902	-0.000120	0.000254	0.000246	0.000209	0.000367	8.06e-05	6.77e-05	-0.000179	0.000613*	0.000899	-0.000192	0.00850
(1.619)	(-0.0347)	(0.509)	(0.816)	(0.572)	(0.316)	(0.240)	(0.211)	(-0.285)	(1.710)	(1.469)	(-0.417)	(1.380)
1,134	60	1,069	1,177	514	106	1,196	1,066	377	1,102	337	1,186	31
0.026	0.298	0.053	0.459	0.202	0.396	0.263	0.023	0.087	0.076	0.262	0.043	0.334

(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)
id 41	id 42	id 43	id 45	id 46	id 47	id 48	id 49	id 50	id 51
exr	exr	exr	exr	exr	exr	exr	exr	exr	exr
-0.230***	-0.597***	-0.363***	-1.376***	0.00203	-2.335***	-0.419***	-2.768*	-1.507	-0.331**
(-7.351)	(-6.062)	(-4.218)	(-4.347)	(0.00449)	(-2.828)	(-7.522)	(-1.840)	(-1.610)	(-2.530)
-1.071	0.425	-0.929	-0.765	-6.427	2.222	-0.896	-4.236	-4.189	-3.641
(-1.011)	(0.257)	(-0.531)	(-0.400)	(-1.566)	(0.886)	(-0.904)	(-0.864)	(-1.507)	(-1.502)
6.204***	-0.394	4.089***	28.66***	-2.849	22.13**	2.542**	18.74*	-17.66	19.79***
(5.589)	(-0.126)	(5.253)	(4.110)	(-1.179)	(2.640)	(2.064)	(1.699)	(-1.121)	(4.222)
0.000117	-1.10e-05	-0.000559	0.000997	0.00202	-0.000728	0.000613	0.00143	0.00352	0.000871
(0.270)	(-0.00880)	(-1.031)	(0.374)	(0.965)	(-0.213)	(1.213)	(0.354)	(1.298)	(0.320)
560	111	815	50	155	41	375	52	32	30
0.203	0.415	0.042	0.360	0.135	0.253	0.421	0.095	0.475	0.583