No IVOL and MAX anomaly: A Study on Singapore Stock Market

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Abstract:

This paper demonstrates a positive and significant IVOL effect in the Singapore Stock Market meaning that the highly volatile stocks are showing better returns in the subsequent month. More explicitly, there is a strong positive relationship between stock's idiosyncratic volatility (IVOL) and its subsequent month's return in the Singapore equity market. This positive IVOL effect is stronger only for small market-statistic firms. But for the Large capital firms, the positive IVOL effect is insignificant. In addition, this paper shows that the relationship between maximum daily return over a month (MAX) and the subsequent month's return is positive and significant in this market. However, IVOL is the true effect of this market rather than MAX.

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Key words: Singapore stock market, Idiosyncratic Volatility, Extreme return, MAX ans IVOL effect

1. Introduction:

A growing body of empirical literature documents negative relation of past Idiosyncratic volatility (IVOL) and extreme positive stock returns (MAX) in the cross-section of expected stock returns in well-developed as well as advanced emerging markets. However, the textbook capital asset pricing model (CAPM) would predict that MAX should not carry a risk premium or discount because it is idiosyncratic in nature and hence represents diversifiable risk. Alternatively, as in Merton (1987)'s extended CAPM, if investors are constrained from forming diversified portfolios for some exogenous reasons (e.g., transaction costs, incomplete information), IVOL and MAX should command a positive risk premium to the extent it represents idiosyncratic risk. The negative IVOL and MAX effect is therefore clearly anomalous in the context of the normative mean-variance framework. Existing literature typically attribute investors' demand for such high-MAX, lottery-like, stocks to their behavioral bias reflecting the optimism that the past return performance is likely to be repeated in the future. Some recently developed descriptive models of decision making under uncertainty lend support to this position. For example, under the cumulative prospect theory (Tversky and Kahneman, 1992), investors tend to overweight the probability of extreme events and thus stocks with the extreme positive return are overpriced and earn lower subsequent returns (Barberis and Huang, 2008).

This paper investigates the preference of investors in equities listed on the Singapore Exchange Limited (SGX) to invest in stocks with extreme positive payoffs and its cross-sectional asset pricing implications. SGX represents a unique market setting in several ways. First, unlike that in most major markets around the world, SGX allows only limit orders and operates a pure order-driven trading system where buyers and sellers trade with each other without the intermediation by designated market makers or specialists. These market attributes have the

potential to decrease the likelihood of trade executions and trading activity. And the liquidity provision for all securities under such circumstance evolves only endogenously depending on limit orders submitted by regular buyers and sellers. Second, short selling is much less regulated on SGX than in other well-developed markets such as the US. until very recently, SGX maintained a relatively longer settlement period[7] and it allows a unique practice known as 'contra trading' whereby traders can buy (sell) and then sell (buy) the same stock and settle only for the differences in prices by the settlement date. Third, despite Singapore's reputation of being a globally competitive financial hub and a wealth management powerhouse, and for its transparency, governance and enforcement of its securities laws, the growth and trading activity of its stock market is increasingly falling behind other competitive markets in the region and beyond.

In line with the Canadian stock market (Aboulamer et al.,2016), in this paper, we document a strong positive relationship among IVOL as well as MAX with subsequent stock returns indicating a return continuation in the Singapore stock market. Bali et al. (2011) and Walkshäusl (2014) show a negative MAX effect in the US and the European Market. Apart from these two evidences, Ali et al. (2019a), Ali et al. (2019b), Chan and Chui (2016), Nartea, Wu, and Liu (2014), Wan (2018), Zhong and Gray (2016) also show the same negative MAX and IVOL effects in the Turkish, Finnish, Hong Kong, South Korean, Chinese and Australian stock markets respectively. In sharp contrast of these markets the Singapore and Canadian markets have the exceptional positive IVOL and MAX effects meaning that these markets are less prone to investor's overreaction and less anomalous in the context of the traditional mean-variance framework.

[7] Much in line with other major markets, currently the settlement cycle is T+2, which was T+3 until 9 December 2018 and T+5 until 14 March 2000.

2. Data and Methodology

2.1 Data

We use the daily data for all firms available on the Singapore stock exchange from January 1990 to December 2017. The data comprising 986 firms (all available active and dead securities) is downloaded from the Compustat database. The book to market ratio is not used in this paper as a control since the book value is not available for all firms. The monthly Fama French factor is downloaded from the Dartmouth webpage (http://mba.tuck.dartmouth.edu).

Using the daily stock return, we calculate the following variables:

stock return ($return_{i,t}$), maximum daily return over the previous month ($MAX_{i,t}$), minimum daily return over the previous month ($MIN_{i,t}$), momentum ($MOM_{i,t}$), short-term reversal ($REV_{i,t}$), skewness ($SKEW_{i,t}$), market beta ($BETA_{i,t}$), idiosyncratic volatility ($IVOL_{i,t}$), illiquidity($ILLIQ_{i,t}$).We calculate the daily stock return as the logarithmic difference of daily stock prices. $MAX_{i,t}$ is the maximum daily return in the month $t-1$ for the firm i. $return_{i,t}$ is the average of daily stock returns for firm i during the month of t. For $n = 2, \dots, 5$, we calculate $MAX(n)_{i,t}$ as the average of n maximum daily returns for firm i during the month $t-1$.

Following Jegadeesh and Titman (2001), we calculate the momentum variable $MOM_{i,t}$ as the cumulative return of stock i for 11 months over the period from $t-2$ to $t-12$. The short-term reversal variable $REV_{i,t}$ is the daily average return of stock i in month $t-1$ (Jegadeesh (1990), Lehmann (1990)). $SKEW_{i,t}$ is calculated as the skewness of daily stock return of firm i during the month $t-1$. $SIZE_{i,t}$ is calculated by the natural logarithm of the market-statistic of the equity of stock i in month $t-1$. Illiquidity($ILLIQ_{i,t}$) is the absolute daily average stock return over a month divided by its trading volume of stock i in month $t-1$.

We use the market model and Fama French three-factor model in equation (1 and 2) to estimate the systematic risk ($beta_{i,t}$) and idiosyncratic volatility ($ivol_{i,t}$).

$$R_{i,d} - r_{f,d} = \alpha_i + \beta_i(R_{m,d} - r_{f,d}) + e_{i,d} \quad (1)$$

Specifically, we use the daily stock returns of month $t-1$ to estimate the equation and then calculate the market BETA of stock *we* in month *t* ($\widehat{\beta_i}$) and the idiosyncratic volatility of stock *we* in month *t* is $ivol = \sqrt{var(e_{id})}$. To calculate three factors alpha, we use.

$$R_{i,d} - r_{f,d} = \alpha_i + \beta_{1i}(R_{m,d} - r_{f,d}) + \beta_{2i}SMB + \beta_{3i}HML + e_{i,d} \quad (2)$$

[Insert Table 1 here]

Table 1 shows the summary statistics of variables. The mean of average monthly return for equal-weighted return is .058 and the standard deviation is 3.407. The mean of the average prior price-weighted return portfolio is 0.003 with a standard deviation of 0.257. The average of the MAX return is 0.123 and the standard deviation is 0.053.

2.2 Methodology

In this paper, both portfolio-level analysis and firm-level Fama-MacBeth (1973) cross-sectional regression analysis are used. The portfolio-level analysis does not impose any functional form on the relation between MAX and future returns. Hence it has the advantage of being non-parametric (Bali et al. 2011).

On the other hand, the firm-level cross-sectional analysis helps to capture information that is eliminated in the portfolio level analysis through aggregation. In the Fama–Macbeth framework we first estimate the average coefficients by using time series regression and then apply cross-

sectional regression with those estimated betas. There are several advantages (see Amit Goyal 2012) of the Fama–Macbeth approach. First, it can easily handle panel data which are not balanced. In addition, the distribution of the risk premium estimates does not depend on the number of stocks, which may vary from time to time. Second, even though we use constant betas, this framework is flexible to allow for time-varying betas. Third, it may be a possibility that autocorrelation in returns leads to autocorrelation problems in risk premium estimates. The standard error estimated from this Fama-MacBeth regression control for the cross-sectional heteroskedasticity in the data (Petersen and Mitchell, 2009).

3. Results

3.1 Portfolio-sort results

[Insert Table 2 here]

Table 2 presents the same equal and prior price-weighted[8] average monthly returns of ten portfolios that are created by sorting 986 Singapore stocks based on the idiosyncratic volatility calculated from Capital Asser Pricing Model (IVOL_CAPM) in panel A and idiosyncratic volatility calculated from Fama-French three-factor model (IVOL_FF) in panel B during the sample period of January 1990 to December 2017. We sort all portfolios in each month and report the average returns. Portfolio 1 is the portfolio that contains the return of those stocks which have the lowest IVOL and Portfolio 10 is the portfolio that contains stock returns of the highest IVOL

[8] Weighting returns by using market capitalization calculated in the end of the prior year will not resolve the bias in portfolio returns, except during the first period of the year (Asparouhova, Bessembinder, Kalcheva 2010). Hence we use prior price weighting.

generating stocks. The highest IVOL_CAPM portfolio produces a very high average monthly return of 12.306 with a t-statistic of 5.613 in case of an equal-weighted return portfolio and 0.637 with a t-statistic of 5.768 for prior price-weighted return portfolios. In both cases, the return difference of two extreme portfolios is highly significant. The alpha differences also significant in both cases. The three-factor alpha difference for equal-weighted return portfolios is 13.123 with a t-statistic of 5.837 and the three-factor alpha difference for prior price-weighted return portfolios is 0.644 with a t-statistic of 5.795. In panel B, the return difference and three-factor alpha difference are very similar in the case of idiosyncratic volatility calculated by the Fama-French three-factor model.

[Insert Table 3 here]

Table 3 presents the same equal and prior price-weighted average monthly returns of ten portfolios that are created by sorting 986 Singapore stocks based on the maximum daily return within the previous month (MAX) during the sample period of January 1990 to December 2017. We sort all portfolios in each month and report the average return. Portfolio 1 is the portfolio that contains the return of those stocks which have the lowest MAX and Portfolio 10 is the portfolio that contains stock returns of the highest MAX generating stocks. The highest MAX portfolio produces a very high average monthly return of 12.702 in the case of an equal-weighted return portfolio and 0.536 for prior price-weighted return portfolios. In both cases, the return difference of two extreme portfolios is highly significant. The portfolio difference for the equal-weighted return portfolio is 9.436 with a t-statistic of 3.456 and for prior price-weighted return-portfolio is 0.379 with a t-statistic of 3.224.

[Insert Table 4 here]

Table 4 shows the average month to month transaction matrix that exhibits the proportion of stocks shifted from one portfolio to another next month. The diagonal elements of the matrix present the proportion of stocks remaining in the same portfolio in the subsequent month. If this shifting is completely random then it would be around 10%. But the diagonal element of two extreme portfolios is more than 30% meaning that MAX stocks are persistent in the extreme portfolios.

[Insert Table 5 here]

Table 5 reports the bivariate portfolio sort. We reduce the number of portfolios from 10 to 3 because 986 as a number of stocks is too small to produce 10 (10) portfolios. Hence, we produce 3(3) portfolios to show the bivariate sort results. The results present the daily average returns of the 3(3) portfolios of each month formed from January 1990 to December 2017 of 986 Singapore stocks based on the idiosyncratic volatility calculated from Capital Asser Pricing Model (IVOL_CAPM), idiosyncratic volatility calculated from Fama-French three-factor model (IVOL_FF) and maximum returns in previous months (MAX) after controlling momentum (MOM), reversal (REV), skewness (SKEW), maximum returns in previous months (MAX), and idiosyncratic volatility from CAPM (IVOL_CAPM). The IVOL and MAX portfolios are shaped each month by assigning all stocks to three equal portfolios based on each character variable and then again sorting all stocks within each portfolio based on IVOL and MAX. The last row represents the return difference between two extreme portfolios. The results of the bivariate sort are consistent with the results of the univariate sort. However, we do not report bivariate sort for all the variables because, with dependent bivariate sorts, correlated variables are not sufficiently controlled for the control variables (Bali et al. 2011).

[Insert Table 6 here]

Table 6 reports univariate sort portfolio based on MAX (n) where MAX2 is the average of the maximum two daily returns of previous month, MAX3 is the average of the maximum three daily returns of previous month, MAX4 is the average of the maximum four daily returns of previous month, MAX5 is the average of the maximum five daily returns of the previous month. The return difference is highly significant among two extreme portfolios in both equally weighted and prior price-weighted return case. Therefore, all the evidence from portfolio analysis indicates that the MAX effect is highly positive and significant in the Singapore equity market. This is an indication of the different nature of the Singapore market where the investors are less affected by behavioral biases.

3.2 Cross-sectional regression results

After portfolio-level analysis, we conduct the Fama-MacBeth (1973) cross-sectional regression analysis to show both the IVOL and MAX effect in the Singapore stock market. As we mentioned before that the Fama–MacBeth (1973) regression first generates the average coefficients by using time series regression and then it runs cross-sectional regression with those estimated coefficients. The positive side of the Fama–MacBeth (1973) approach is that it can easily manage panel data that are not balanced. Furthermore, the distribution of the risk premium estimates does not depend on the number of stocks, which may vary from time to time. And at last, even though in the presence of constant betas, this framework is flexible to allow for time-varying betas.

To find the magnitude of the IVOL effect in the Singapore stock market, we use the following economic specifications:

$$R_{i,t+1} = \gamma_{0,t} + \gamma_{t,1} IVOL(CAPM\ and\ FF)_{i,t} + \gamma_{t,2} BETA_{i,t} + \gamma_{t,3} SIZE_{i,t} + \gamma_{t,4} MOM_{i,t} + \gamma_{t,5} ILLIQ_{i,t} + \gamma_{t,6} REV_{i,t} + \gamma_{t,7} SKEW_{i,t} + \varepsilon_{i,t+1} \quad (5)$$

[Insert Table 7 here]

[Insert Table 8 here]

Tables 7 and 8 both show the significance of a positive IVOL-return relationship by using Fama-MacBeth (1973) cross-section regression. In Table 7, the IVOL_CAPM coefficient is 2.805 with a t-statistic of 2.882. But after putting all controls in the model, the IVOL_CAPM coefficient is not significant. In the case of prior price-weighted return regression, the IVOL_CAPM coefficients are positive and insignificant. However, all IVOL_FF coefficients are positive and highly significant in table 8. The IVOL_FF coefficient is 1.197 with a t-statistic of 5.591 without any control and with all controls, the IVOL_FF coefficient is 1.090 with a t-statistic of 5.283.

To find the magnitude of MAX effect in the Singapore stock market, we use the following economic specifications:

$$R_{i,t+1} = \gamma_{0,t} + \gamma_{t,1} MAX_{i,t} + \gamma_{t,2} BETA_{i,t} + \gamma_{t,3} SIZE_{i,t} + \gamma_{t,4} MOM_{i,t} + \gamma_{t,5} ILLIQ_{i,t} + \gamma_{t,6} REV_{i,t} + \gamma_{t,7} SKEW_{i,t} + \varepsilon_{i,t+1} \quad (6)$$

[Insert Table 9 here]

Table 9 presents the coefficients and t-statistics of 4 different models. In the first model, we regress return with lag MAX variable without any specifications. The MAX coefficient in model 1 of Table 9 is 0.324 with a t-statistic of 5.385. After including all the specifications, the t-statistic also remains very high. The MAX coefficient in model 4 (table 9) is 0.228 with a t-statistic

of 4.703. From table 9 we also find that the lag MOM, REV and SIZE coefficients are also significant. Panel B of Table 9 reports the prior price-weighted return regression coefficients and associated Newey-West (1987) adjusted t-statistics. The MAX coefficient in model 1 of panel B (table 9) is 0.065 with a t-statistic of 1.285 which is not significant but after including all the economic controls the MAX coefficient is significant. Hence in both cases, we find that in the Singapore stock market MAX effect is positive and significant.

[Insert Table 10 here]

Table 10 reports Fama MacBeth regression results with MAX (n) as the main control where MAX2 is the average of the maximum two daily returns of previous month, MAX3 is the average of the maximum three daily returns of previous month, MAX4 is the average of the maximum four daily returns of previous month, MAX5 is the average of the maximum five daily returns of the previous month. Table 10 confirms that the positive MAX effect is robust in all MAX (n). In model 1, the MAX 2 coefficient is 0.400 with a t-statistic of 4.594 in the equal-weighted return regression and 0.010 with a t-statistic of 1.982 in prior price-weighted return regression. In the same way, MAX 5 coefficient is 0.757 with a t-statistic of 3.989 in the equal-weighted return regression and 0.015 with a t-statistic of 1.791 in the prior price-weighted return regression in model 4.

This paper shows the return predictive capability of the idiosyncratic volatility (IVOL) and maximum daily return over the previous month (MAX) in the Singapore equity market. After Canadian evidence, this paper gives another example of positive IVOL and MAX effect in a developed market like Singapore. We find a significant relationship among the lag idiosyncratic volatility (IVOL) and maximum daily return over the previous month (MAX) with the monthly average return after controlling for a large set of well-known return predictors, such as beta, firm size, momentum, illiquidity, short-term reversal, and skewness.

3.3: Is the positive IVOL effect driven by the MAX effect?

The negative IVOL-return relationship is reversed in the U.S. stock market when it controlled by MAX (Bali et al. 2011). Annaert et al. (2013), and Walkshausl (2014) also document that IVOL anomaly is gone after control with MAX. However, Nartea et al. (2014) show that the IVOL effect and MAX effects are independent in the case of the South Korean stock market. In the Singapore stock market, we observe that the IVOL effect is still significant even after putting MAX as a control.

[Insert Table 11 here]

Table 11 demonstrates that both IVOL_CAPM and IVOL_FF survive after the inclusion of MAX and MIN as control and on the other hand the positive MAX effect vanished. Hence, we deduce that IVOL is the true effect in the Singapore market rather than MAX.

3.4 Subsample analysis:

In this section, first, we check whether this positive IVOL effect is higher in the current period or not. We divide the entire dataset into two subsamples from 1990 to 2003 and from 2004 to 2017.

[Insert Table 12 here]

[Insert Table 13 here]

In both panel A and Panel B of table 12 and 13, we observe that 2004 to 2017 results show much greater significance than 1990 to 2003. IVOL_CAPM coefficient in 2004 to 2017 sample is 4.513 with a t-statistic of 4.672 in equal-weighted return regression and 0.151 with a t-statistic of 6.575 in prior price-weighted return regression. This significant relationship exists even after controlling for other relevant variables. Table 13 denotes the same regression Fama-Macbeth regression result

where IVOL_FF is the main regressor. The results are very similar to those in table 11 where 2004 to 2017 sample firms have a high positive IVOL effect in case of both equal and prior price-weighted return regression. Here IVOL_FF coefficient in 2004 to 2017 sample is 2.355 with a t-statistic of 5.599 in equal-weighted return regression and 0.095 with a t-statistic of 7.649 with prior price-weighted return regression.

[Insert Table 14 here]

[Insert Table 15 here]

In both panel A and Panel B of table 14 and 15, we observe that small firms, in the sample from the year 2004 to 2017, have a higher IVOL effect than the large firms. This result exists in both IVOL_CAPM and IVOL_FF case. IVOL_CAPM coefficient of small firms in 2004 to 2017 sample is 4.950 with a t-statistic of 5.768. IVOL_FF coefficient of small firms in 2004 to 2017 sample is 2.574 with a t-statistic of 5.871 without any control. After including all the controls IVOL_CAPM coefficient of small firms in 2004 to 2017 sample is 4.379 with a t-statistic of 4.548. IVOL_FF coefficient of small firms in 2004 to 2017 sample is 2.085 with a t-statistic of 4.935.

[Insert Table 16 here]

[Insert Table 17 here]

In Tables 16 and 17 we conduct similar subsample analyses to find out the MAX effect. Table 16 shows that 2004 to 2017 sample results consist of higher significance than 1990 to 2003. MAX coefficient in 2004 to 2017 sample is 0.613 with a t-statistic of 5.232 in equal-weighted return regression and 0.020 with a t-statistic of 6.952 in prior price-weighted return regression without any control. After putting relevant controls in the model, the MAX coefficient in 2004 to 2017

sample is 0.471 with a t-statistic of 5.618 in equal-weighted return regression and 0.014 with a t-statistic of 3.708 in prior price-weighted return regression. In table 17, we show that small firms have a higher MAX effect than large firms.

4. Conclusion

We find a robust and significant positive IVOL and MAX effect in the Singapore stock market. We also find that the IVOL effect is still significant even after putting MAX as a control. Though the Singapore stock market is still progressing and assumed to be considered by investors with risk-seeking behavior, our result is somewhat opposite. First, we find a statistically significant positive connection between MAX and future returns even after controlling other relevant controls like beta, BM, Size, illiquidity, and skewness. The positive MAX effect is also robust when we use the average of the five highest maximum daily returns, MAX (5) as well as both prior price and equal-weighted case. Second, even after controlling with MAX and MIN, the IVOL effect remains positive and significant, i.e., IVOL is the true effect in the Singapore market. The results of this paper should be interesting for investors, policymakers and other parties involved with the Singapore equity market. International portfolio investors also can get a few relevant information if they want to know about this market.

References

Aboulamer, A., & Kryzanowski, L. (2016). Are idiosyncratic volatility and MAX priced in the Canadian market?. *Journal of Empirical Finance*, *37*, 20-36.

Ali, S. R. M., Ahmed, S., Hasan, M. N., & Östermark, R. (2019a). Predictability of Extreme Returns in the Turkish Stock Market. *Emerging Markets Finance and Trade*, 1-13.

Ali, S. R. M., Ahmed, S., & Östermark, R. (2019b). Extreme returns and the investor's expectation for future volatility: Evidence from the Finnish stock market. *The Quarterly Review of Economics and Finance*.

Annaert, J., De Ceuster, M., & Verstegen, K. (2013). Are extreme returns priced in the stock market? European evidence. *Journal of Banking & Finance*, *37*(9), 3401-3411.

Bali, T. G., Cakici, N., & Whitelaw, R. F. (2011). Maxing out: Stocks as lotteries and the cross-section of expected returns. *Journal of Financial Economics*, *99*(2), 427-446.

Barberis, N., & Huang, M. (2008). Stocks as lotteries: The implications of probability weighting for security prices. *American Economic Review*, *98*(5), 2066-2100.

Chan, Y. C., & Chui, A. C. (2016). Gambling in the Hong Kong stock market. *International Review of Economics & Finance*, *44*, 204-218.

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of political economy*, *81*(3), 607-636.

Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *The journal of finance*, *42*(3), 483-510.

Nartea, G. V., Wu, J., & Liu, H. T. (2014). Extreme returns in emerging stock markets: evidence of a MAX effect in South Korea. *Applied financial economics*, *24*(6), 425-435.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *The Review of Financial Studies*, *22*(1), 435-480.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, *5*(4), 297-323.

Walkshäusl, C. (2014). The MAX effect: European evidence. *Journal of Banking & Finance*, *42*, 1-10.

Wan, X. (2018). Is the idiosyncratic volatility anomaly driven by the MAX or MIN effect? Evidence from the Chinese stock market. *International Review of Economics & Finance*, *53*, 1-15.

Zhong, A., & Gray, P. (2016). The MAX effect: An exploration of risk and mispricing explanations. *Journal of Banking & Finance*, *65*, 76-90.

Table 1: Summary Statistics

	mean	sd	median
return	0.058	3.407	0.001
MAX	0.123	3.389	0.053
MOM	0.660	11.986	0.094
REV	0.058	3.414	0.002
ILLIQ	0.000	0.022	0.000
SIZE	18.585	1.762	18.342
IVOL_CAPM	0.145	31.964	0.001
IVOL_FF	0.036	0.408	0.020
MAX2	0.086	1.700	0.043
MAX3	0.068	1.137	0.036
MAX4	0.056	0.855	0.031
MAX5	0.048	0.685	0.027
SKEW	0.219	1.206	0.209

Note: This table shows summary statistics for the 986 firms included in Singapore in the sample period from January 1990 to December 2017. MAX is the maximum daily stock return over the previous month. Size (SIZE) is the natural logarithm of market equity (stock price multiplied by the number of shares outstanding) at the end of the previous month. $MOM_{i,t}$ as the cumulative return of stock i for 11 months over the period from $t-2$ to $t-12$. Illiquidity (ILLIQ) is the absolute monthly stock return divided by its trading volume. Short-term reversal (REV) is the monthly stock return over the previous month. Skewness (SKEW) is total skewness using daily stock returns over the previous month. Idiosyncratic volatility (IVOL_CAPM) is the annualized idiosyncratic volatility relative to the Capital Asset Pricing Model using daily stock returns over the previous month. Idiosyncratic volatility (IVOL_FF) is the annualized idiosyncratic volatility relative to the Fama French three factor model using daily stock returns over the previous month. MAX2 is the average of the maximum two daily returns of the previous month, MAX3 is the average of the maximum three daily returns of the previous month, MAX4 is the average of the maximum four daily returns of the previous month, MAX5 is the average of the maximum five daily returns of the previous month.

Table 2: IVOL sorted Portfolio return

Panel A: Portfolio return based on IVOL_CAMP

Portfolios	EW	PPW
	Avg. Return	Avg. Return
Low IVOL_CAPM	0.896	0.060
2	0.420	0.023
3	0.314	0.024
4	0.450	0.022
5	0.473	0.031
6	0.749	0.045
7	1.435	0.319
8	4.568	0.175
9	4.499	0.159
High IVOL_CAPM	13.201	0.696
Diff 10-1	12.306***	0.637***
t-statistic	(5.613)	(5.768)
Three factor alpha Diff 10-1	13.123***	0.644***
t-statistic	(5.837)	(5.795)

Panel A: Portfolio return based on IVOL_FF

Portfolios	EW	PPW
	Avg. Return	Avg. Return
Low IVOL_FF	1.169	0.127
2	0.355	0.031
3	0.488	0.030
4	0.449	0.052
5	0.487	0.039
6	0.626	0.030
7	0.854	0.055
8	4.892	0.421
9	4.200	0.142
High IVOL_FF	13.484	0.625
Diff 10-1	12.315***	0.497***
t-statistic	(5.572)	(4.490)
Three factor alpha Diff 10-1	13.142***	0.510***
t-statistic	(5.801)	(4.548)

Note: The results present the average return of the 10 portfolios of each month formed from January 1990 to December 2017 of 986 Singapore firms based on idiosyncratic volatility calculated from Capital Asser Pricing Model (IVOL_CAPM) and on idiosyncratic volatility calculated from Fama French three-factor model (IVOL_FF). The IVOL portfolios are shaped each month

by assigning all stocks to ten equal portfolios. The last two rows represent the return and three-factor alpha difference between two extreme portfolios. Returns are the average monthly return. EW is the equal weighted and PPW is the prior price weighed return.

Table 3: MAX sorted Portfolio return

Panel A: Portfolio return based on MAX

Portfolios	EW	PPW
	Avg. Return	Avg. Return
Low MAX	3.267	0.157
2	0.340	0.022
3	0.455	0.034
4	0.442	0.031
5	0.551	0.035
6	0.772	0.050
7	1.092	0.044
8	2.560	0.451
9	4.823	0.195
High MAX	12.702	0.536
Diff 10-1	9.436***	0.379***
t-statistic	(3.456)	(3.224)
Three factor alpha Diff 10-1	9.836***	0.406***
t-statistic	(3.882)	(3.554)

Note: The results present the average return of the 10 portfolios of each month formed from January 1990 to December 2017 of 986 Singapore firms based on maximum returns in previous months (MAX). The MAX portfolios are shaped each month by assigning all stocks to ten equal portfolios based on the MAX variable. The last two rows represent the return and three-factor alpha difference between two extreme portfolios. Returns are the average monthly return

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Table 4: Month to Month Stock Transition Matrix

	1	2	3	4	5	6	7	8	9	10
1	0.366	0.142	0.080	0.061	0.051	0.045	0.044	0.048	0.049	0.077
2	0.140	0.250	0.156	0.119	0.088	0.067	0.055	0.041	0.034	0.026
3	0.077	0.159	0.187	0.138	0.109	0.097	0.072	0.063	0.041	0.029
4	0.055	0.117	0.129	0.167	0.129	0.109	0.090	0.075	0.098	0.040
5	0.050	0.083	0.112	0.132	0.150	0.130	0.105	0.221	0.071	0.047
6	0.046	0.065	0.092	0.104	0.123	0.135	0.128	0.117	0.097	0.060
7	0.041	0.054	0.081	0.087	0.103	0.127	0.145	0.127	0.120	0.100
8	0.048	0.043	0.058	0.067	0.095	0.112	0.125	0.152	0.143	0.113
9	0.056	0.035	0.041	0.054	0.075	0.086	0.116	0.138	0.187	0.192
10	0.096	0.048	0.060	0.068	0.074	0.090	0.116	0.111	0.126	0.311

Note: Ten portfolios are formed every month from January 1990 to December 2017 by sorting stocks based on the maximum daily returns (MAX) over the past one month. The table shows that the average month to month transition matrices for the stocks in these portfolios. More explicitly it indicates the average probability that a stock in the portfolio we (row portfolios) in one month will be in decile j (column portfolios) in the subsequent month.

Table 5: Bivariate sort portfolio return based on IVOL_CAPM, IVOL_FF, MAX and other characters

	MOM	REV	SKEW	MAX	SIZE	ILLIQ
Low IVOL_CAPM	7.606	5.249	6.026	4.151	14.524	6.950
2	3.091	3.897	5.961	2.512	8.838	10.626
High IVOL_CAPM	16.307	17.858	15.017	20.341	1.010	6.796
Diff	8.701*	12.609***	8.990*	16.191***	-13.514***	-0.154
(t-statistics)	(1.765)	(2.935)	(1.894)	(3.369)	(-6.159)	(-0.078)

	MOM	REV	SKEW	MAX	SIZE	ILLIQ
Low IVOL_FF	7.604	4.748	6.026	4.139	14.524	6.952
2	3.093	3.536	5.961	2.495	8.838	10.632
High IVOL_FF	16.307	16.087	15.017	20.370	1.010	6.788
Diff	8.703*	11.339***	8.990*	16.230***	-13.514***	-0.163
(t-statistics)	(1.765)	(2.930)	(1.895)	(3.378)	(-6.159)	(-0.082)

	MOM	REV	SKEW	IVOL_CAPM	SIZE	ILLIQ
Low MAX	6.849	4.723	5.431	1.688	14.483	6.932
2	2.815	3.521	5.386	1.850	8.814	10.602
High MAX	14.639	16.008	13.486	20.765	1.007	6.769
Diff	7.791*	11.286***	8.055*	19.078***	-13.476***	-0.163
(p values)	(2.11)	(2.988)	(2.310)	(3.434)	(-6.158)	(-0.082)

Note: The results present the average return of the 3 portfolios of each month formed from January 1990 to December 2017 of 986 Singapore firms based on idiosyncratic volatility calculated from Capital Asser Pricing Model (IVOL_CAPM), idiosyncratic volatility calculated from Fama French three-factor model (IVOL_FF) and maximum returns in previous months (MAX) after controlling momentum (MOM), a reversal (REV), skewness(SKEW), idiosyncratic volatility (IVOL), maximum returns in previous months (MAX) . The IVOL and MAX portfolios are shaped each month by assigning all stocks to three equal portfolios based on each character variable and then again sort all stocks within each portfolio based on IVOL and MAX. The last row represents the return difference between two extreme portfolios. Returns are the average monthly return

Table 6: Portfolios return based on MAX (n)

Panel A: Equal Weighted Portfolios

Portfolios	Avg. Return (MAX2 sorted)	Avg. Return (MAX3 sorted)	Avg. Return (MAX4 sorted)	Avg. Return (MAX5 sorted)
Low MAX	2.947	3.039	3.079	3.111
2	0.373	0.392	0.459	0.538
3	0.430	0.472	0.491	0.492
4	0.400	0.403	0.373	0.364
5	0.520	0.421	0.518	0.466
6	0.556	0.589	0.529	0.597
7	0.964	0.783	0.739	0.804
8	1.245	1.413	1.355	1.315
9	5.502	5.490	5.565	2.497
High MAX	11.366	11.302	11.194	14.118
Diff 10-1	8.419***	8.263***	8.115***	11.007***
t-statistics	(3.884)	(3.565)	(3.550)	(3.848)

Panel B: Prior Price Weighted Portfolios

Portfolios	Avg. Return (MAX2 sorted)	Avg. Return (MAX3 sorted)	Avg. Return (MAX4 sorted)	Avg. Return (MAX5 sorted)
Low MAX	0.148	0.158	0.162	0.170
2	0.022	0.030	0.037	0.037
3	0.037	0.028	0.023	0.026
4	0.028	0.036	0.032	0.030
5	0.027	0.021	0.030	0.037
6	0.041	0.040	0.046	0.048
7	0.046	0.047	0.041	0.039
8	0.051	0.052	0.083	0.087
9	0.513	0.511	0.484	0.386
High MAX	0.487	0.477	0.461	0.538
Diff 10-1	0.339***	0.319***	0.299***	0.369**
t-statistic	(3.004)	(3.585)	(2.995)	(3.143)

Note: The results present the average return of the 10 portfolios of each month formed from January 1990 to December 2017 of 986 Singapore firms based on maximum returns in previous months (MAX (n)). The MAX (n) portfolios are shaped each month by assigning all stocks to ten equal portfolios based on the MAX variable. The last two rows represent the return difference between two extreme portfolios. Returns are the average monthly return

Table 7: Fama-MacBeth cross-sectional regression for IVOL_CAPM effect

Panel A: Equal Weighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
IVOL_CAPM	2.805** (2.882)	2.864** (2.979)	2.170** (2.144)	1.668 (1.633)
BETA		-0.002 (-0.887)	-0.002 (-0.630)	-0.001 (-0.527)
SIZE			-0.011*** (-4.606)	-0.011*** (-4.038)
MOM				0.006* (2.246)
ILLIQ				-.871 (-1.892)
REV				0.066*** (3.618)
SKEW				-0.003 (-0.434)

Panel B: Prior Price Weighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
IVOL_CAPM	2.554 (1.451)	2.021** (2.191)	2.247*** (3.342)	2.266*** (4.012)
BETA		-0.004*** (-3.631)	-0.002 (-1.661)	-.002* (-1.821)
SIZE			-0.002 (-1.69)	-0.010* (-2.041)
MOM				0.001*** (3.890)
ILLIQ				-.9289 (-2.321)
REV				0.019 (1.384)
SKEW				0.002 (-2.090)

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (6) of 986 Singapore firms for the period from January 1990 to December 2017. We regress the monthly stock return on a set of lag explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW).

Table 8: Fama-MacBeth cross-sectional regression for IVOL_FF effect

Panel A: Equal Waighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
IVOL_FF	1.197*** (5.591)	1.274*** (5.854)	1.291*** (5.532)	1.090*** (5.283)
BETA		-0.001 (-0.824)	-0.002 (-0.730)	-0.001 (-0.849)
SIZE			-0.004 (-1.82)	-0.005 (-1.766)
MOM				0.009** (2.684)
ILLIQ				-0.562 (-1.338)
REV				0.080*** (4.290)
SKEW				-0.006 (-0.870)

Panel B: Prior Price Weighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
IVOL_FF	.027 (1.324)	0.426** (2.464)	0.030 (1.311)	.033** (2.622)
BETA		0.001 (1.050)	0.001 (1.100)	0.002 (0.582)
SIZE			-0.001* (-2.342)	-0.000* (-2.52)
MOM				0.000** (2.498)
ILLIQ				-0.452 (-0.830)
REV				0.006* (2.211)
SKEW				0.000 (-0.944)

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (6) of 986 Singapore firms for the period January 1990 to December 2017. We regress the monthly stock return on a set of lag explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW)

Table 9: Fama-MacBeth cross-sectional regression for MAX effect

Panel A: Equal Weighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
MAX	0.324*** (5.385)	0.335*** (5.062)	0.323*** (4.561)	0.228*** (4.703)
BETA		-0.002 (-0.824)	-0.001 (-0.523)	-0.001 (-0.430)
SIZE			-0.007*** (-2.880)	-0.009** (-3.009)
MOM				0.010** (3.066)
ILLIQ				-0.603 (-1.468)
REV				0.095*** (4.542)
SKEW				-0.010 (-1.332)

Panel B: Prior Price Weighted Fama-MacBeth regression				
	(1)	(2)	(3)	(4)
MAX	0.325** (2.885)	0.041*** (3.046)	.367*** (3.361)	0.007** (2.911)
BETA		0.005*** (-5.932)	0.001*** (-4.215)	-0.003* (-2.281)
SIZE			-0.005* (-1.350)	-0.001** (-1.991)
MOM				0.010** (3.922)
ILLIQ				-.545 (-1.625)
REV				0.040* (2.182)
SKEW				-0.001** (-2.960)

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of 986 Singapore firms for the period from January 1990 to December 2017. We regress the monthly stock return on a set of lag explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW).

Table 10: Fama-MacBeth cross-sectional regression for MAX effect with MAX (n)

Panel A: Equal Weighted Fama-MacBeth regression

	Model 1		Model 2		Model 3		Model 4	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX2	0.40***	(4.59)						
MAX3			0.547***	(4.33)				
MAX4					0.675**	(4.15)		
MAX5							0.757***	(3.98)
BETA	0.00	(-0.73)	-0.002	(-0.92)	-0.003	(-1.02)	-0.003	(-1.10)
SIZE	-0.01*	(-2.47)	-0.007*	(-2.23)	-0.007*	(-2.25)	-0.007**	(-2.46)
MOM	0.01**	(2.67)	0.010**	(2.51)	0.010**	(2.48)	0.011**	(2.44)
ILLIQ	-.564	(-1.33)	-.495	(-1.15)	-.430	(-1.02)	-.385	(-0.91)
REV	0.09***	(4.43)	0.082***	(4.33)	0.080***	(4.36)	0.082***	(4.29)
SKEW	-0.01	(-1.45)	-0.011	(-1.45)	-0.010	(-1.39)	-0.009	(-1.27)

Panel B: Prior Price Weighted Fama-MacBeth regression

	Model 1		Model 2		Model 3		Model 4	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX2	0.446**	(2.71)						
MAX3			0.591**	(2.51)				
MAX4					0.718**	(2.40)		
MAX5							0.804*	(2.27)
BETA	-0.004**	(-2.44)	-0.004	(-2.35)	-0.004	(-2.32)	-0.005*	(-2.28)
SIZE	-0.006*	(-2.05)	-0.005	(-2.19)	-0.006*	(-2.38)	-0.006**	(-2.56)
MOM	0.010***	(3.85)	0.009	(3.84)	0.009***	(3.81)	0.010***	(3.76)
ILLIQ	-0.461	(-1.52)	-.388	(-1.32)	-0.313	(-1.13)	-0.264	(-1.03)
REV	0.037*	(2.09)	0.034	(2.02)	0.033*	(2.00)	0.035*	(2.04)
SKEW	-0.011*	(-2.69)	-0.010	(-2.48)	-0.010	(-2.32)	-0.009*	(-2.17)

Note: This table reports the monthly Fama-Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of 986 Singapore firms for the period from January 1990 to December 2017. We regress the monthly stock return on a set of lag explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW), natural log of market capitalization (Ln (ME**)**.

Table 11: Fama-MacBeth cross-sectional regression with MAX MIN and IVOL together as control

	Equal-weighted				Past Price weighted			
	Model 1		Model 2		Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	4.725**	(2.891)			-1.971*	(1.733)		
IVOL_FF			2.472***	(3.786)			2.115**	(2.142)
BETA	-0.001	(-0.472)	-0.002	(-1.245)	0.000	(0.740)	0.005*	(-2.144)
SIZE	0.004	(0.992)	0.011**	(2.501)	0.004**	(1.473)	0.002	(0.675)
MOM	0.006*	(2.015)	0.008*	(2.315)	0.001***	(3.942)	0.001***	(3.637)
ILLIQ	-.895	(-1.674)	-.364	(-0.923)	-.560	(-1.037)	-.427	(-0.753)
REV	0.052**	(3.149)	0.065***	(3.679)	0.006*	(2.418)	0.006*	(2.228)
SKEW	-0.002	(-0.35)	0.000	(-0.022)	0.000	(-0.025)	0.000	(0.196)
MAX	-0.170	(-1.811)	-0.423**	(-3.178)	-0.062	(-1.535)	-0.364*	(-1.963)
MIN	-0.959***	(-3.257)	-0.759**	(-2.712)	-0.883*	(-1.831)	-0.001	(-0.146)

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics of 986 Singapore firms for the period from January 1992 to December 2017. We regress the monthly stock return on a set explanatory lag variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW), natural log of market capitalization (Ln (ME**)),** maximum return over a month (MAX) and minimum return over a month (MIN)

Table 12: Fama-MacBeth cross-sectional regression for IVOL_CAPM effect from January 1990 to December 2003 and January 2004-December 2017

Panel A: Equal Waighted Fama-MacBeth regression

January 1990 to December 2003				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	0.119	0.081	0.585	0.673
BETA			-0.002	-1.329
SIZE			-0.003	-1.764
MOM			0.002	0.502
ILLIQ			0.259	1.483
REV			-0.015	-1.500
SKEW			-0.003**	-2.583

January 2004- December 2017				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	4.513***	4.672	4.099***	4.035
BETA			-0.002	-0.448
SIZE			-0.020***	-3.559
MOM			0.011***	3.871
ILLIQ			-.0189**	-2.079
REV			0.123***	3.685
SKEW			-0.005	-0.356

Panel B: Past price Weighted Fama-MacBeth regression

January 1990 to December 2003				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	2.677	1.104	-0.216	-0.639
BETA			0.001	1.364
SIZE			0.000	-1.754
MOM			0.001	1.550
ILLIQ			.0308	0.616
REV			-0.002	-1.700
SKEW			-0.001*	-2.111

January 2004- December 2017				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
MAX	0.151***	6.575	0.095**	3.041
BETA			0.000	-0.553
SIZE			-0.001**	-3.116
MOM			0.001**	2.603
ILLIQ			-0.138	-1.491
REV			0.013**	2.546
SKEW			0.000	0.169

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of an average 986 Singapore firms for the period from January 1990 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW)

Table 13: Fama-MacBeth cross-sectional regression for IVOL_FF effect from January 1990 to December 2003 and January 2004-December 2017

Panel A: Equal Waighted Fama-MacBeth regression

January 1990 to December 2003				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	0.053	0.411	0.132	1.616
BETA			-0.002	-1.699
SIZE			-0.003	-1.726
MOM			0.003	0.522
ILLIQ			.0248	1.418
REV			-0.015	-1.538
SKEW			-0.003**	-2.618

January 2004- December 2017				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	2.355***	5.599	2.003***	5.010
BETA			-0.003	-0.672
SIZE			-0.008	-1.320
MOM			0.017	3.220
ILLIQ			-1312.1	-1.564
REV			0.156	4.521
SKEW			-0.011	-0.725

Panel B: Past Price Weighted Fama-MacBeth regression

January 1990 to December 2003				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	-0.059	-1.112	-0.016	-0.538
BETA			0.001	1.261
SIZE			0.000	-1.555
MOM			0.001	1.695
ILLIQ			0.434	0.602
REV			-0.002	-1.688
SKEW			-0.001*	-2.179

January 2004- December 2017				
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	0.095	7.649	0.072***	7.003
BETA			0.000	-0.811
SIZE			-0.001*	-2.061
MOM			0.001**	2.659
ILLIQ			-0.112	-1.199
REV			0.012**	2.567
SKEW			0.000	-0.135

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of an average 986 Singapore firms for the period from January 1992 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW)

Table 14: Fama-MacBeth cross-sectional regression for IVOL_CAPM effect of small and large firms with subsample of January 1990 to December 2003 and January 2004- December 2017

Panel A: Fama-MacBeth regression with the small firms

	January 1990 to December 2003			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	1.839	0.767	3.139	1.306
BETA			-0.004	-1.802
SIZE			-0.013***	-3.902
MOM			0.000	-0.023
ILLIQ			0.416	1.246
REV			-0.025	-1.591
SKEW			-0.004	-1.840

	January 2004- December 2017			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	4.950***	5.768	4.379***	4.548
BETA			-0.003	-0.452
SIZE			-0.052*	-2.001
MOM			0.018***	3.778
ILLIQ			-1.843**	-2.839
REV			0.100***	3.122
SKEW			-0.019	-0.920

Panel B: Fama-MacBeth regression with large

	January 1990 to December 2003			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	-0.943	-0.381	0.390	0.181
BETA			-0.003	-1.392
SIZE			0.002	1.113
MOM			0.005	0.946
ILLIQ			.0235	0.757
REV			-0.008	-0.640
SKEW			-0.001	-0.661

	January 2004- December 2017			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_CAPM	13.094*	2.366	14.092*	2.257
BETA			-0.021	-0.910
SIZE			-0.012	-1.105
MOM			-0.008	-0.630
ILLIQ			-3.166	-1.357
REV			0.102	0.803
SKEW			0.023	0.944

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of 986 Singapore firms for the period from January 1992 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes lag variable like idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW).

Table 15: Fama-MacBeth cross-sectional regression for IVOL_FF effect of small and large firms with subsample of January 1990 to December 2003 and January 2004- December 2017

Panel A: Fama-MacBeth regression with the small firms

	January 1990 to December 2003			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	0.119	0.775	0.331*	2.505
BETA			-0.005*	-2.166
SIZE			-0.013***	-3.855
MOM			0.000	-0.005
ILLIQ			0.310	1.123
REV			-0.027	-1.648
SKEW			-0.004*	-2.167

	January 2004- December 2017			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	2.574***	5.871	2.085***	4.935
BETA			-0.001	-0.234
SIZE			-0.030	-1.132
MOM			0.025***	3.697
ILLIQ			-1.058**	-2.267
REV			0.136***	4.293
SKEW			-0.025	-1.212

Panel B: Fama-MacBeth regression with large

	January 1990 to December 2003			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	-0.122	-1.052	0.075	0.616
BETA			-0.003	-1.178
SIZE			0.001	0.978
MOM			0.004	0.810
ILLIQ			0.160	0.545
REV			-0.010	-0.837
SKEW			-0.001	-0.593

	January 2004- December 2017			
	Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat
IVOL_FF	2.913	1.894	2.915*	1.997
BETA			-0.026	-0.962
SIZE			-0.004	-0.799
MOM			-0.008	-0.592
ILLIQ			-3.789	-1.244
REV			0.143	1.215
SKEW			0.019	0.853

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of an average 986 Singapore firms for the period from January 1990 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW).

Table 16: Fama-MacBeth cross-sectional regression for MAX effect January 1990 to December 2003 and January 2004- December 2017

Panel A: Fama-MacBeth regression with the Equal weighted return

	January 1990 to December 2003				January 2004- December 2017			
	Model 1		Model 2		Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX	0.009	0.267	0.022	0.690	0.613***	5.232	0.471***	5.618
BETA			-0.002	-1.852			-0.002	-0.486
SIZE			-0.003	-1.769			-0.014**	-2.497
MOM			0.003	0.586			0.018***	3.662
ILLIQ			0.271	1.559			-1.370	-1.680
REV			-0.014	-1.411			0.180***	4.623
SKEW			-0.003**	-2.630			-0.018	-1.197

Panel B: Fama-MacBeth regression with Past Price weighted return

	January 1990 to December 2003				January 2004- December 2017			
	Model 1		Model 2		Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX	0.146	1.072	-0.001	-0.330	0.020***	6.952	0.014***	3.708
BETA			0.001	1.362			0.000	-0.758
SIZE			0.000	-1.584			-0.001**	-2.564
MOM			0.001	1.730			0.001***	3.159
ILLIQ			0.048	0.590			-0.127	-1.404
REV			-0.002	-1.448			0.014**	2.766
SKEW			-0.001*	-2.218			0.000	-0.346

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of an average 986 Singapore firms for the period from January 1990 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW)

Table 17: Fama-MacBeth cross-sectional regression for MAX effect small and large firms with subsample of January 1990 to December 2003 and January 2004- December 2017

Panel A: Fama-MacBeth regression with the small firms

	January 1990 to December 2003				January 2004- December 2017			
	Model 1		Model 2		Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX	0.003	0.081	0.033	0.734	0.679***	5.238	0.517***	5.351
BETA			-0.005*	-2.344			-0.001	-0.125
SIZE			-0.013***	-3.970			-0.040	-1.483
MOM			-0.001	-0.164			0.026***	4.193
ILLIQ			0.467	1.476			-1.279*	-2.626
REV			-0.021	-1.315			0.159***	4.842
SKEW			-0.004	-1.784			-0.034	-1.664

Panel B: Fama-MacBeth regression with large

	January 1990 to December 2003				January 2004- December 2017			
	Model 1		Model 2		Model 1		Model 2	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
MAX	0.005	0.145	0.031	0.741	0.804	1.835	0.751*	2.050
BETA			-0.004	-1.487			-0.027	-0.966
SIZE			0.001	0.940			-0.008	-1.144
MOM			0.005	0.862			-0.005	-0.415
ILLIQ			1.565	0.562			-4.412	-1.405
REV			-0.008	-0.662			0.176	1.342
SKEW			-0.001	-0.739			0.008	0.456

Note: This table reports the monthly Fama Macbeth cross-sectional regression slope coefficients and their associated Newey-West (1987) adjusted t-statistics for the equation (5) of an average 986 Singapore firms for the period from January 1990 to December 2003 and January 2004 to December 2017. We regress the monthly stock return on a set explanatory variable that includes idiosyncratic volatility (IVOL), market beta (BETA), momentum (MOM), illiquidity (ILLQ), short-term reversal (REV), firm Size (SIZE), skewness (SKEW