Jurnal Keuangan dan Perbankan, 24(2): 241–251, 2020
http://jurnal.unmer.ac.id/index.php/jkdp

Jurnal Keuangan dan Perbankan
UNIVERSITY OF MERDEKA MALANG

Article history:
Received: 2019-12-16
Revised: 2020-02-24
Accepted: 2020-03-19

Keywords:
Asset pricing, Generalized Extreme Value Distribution, Idiosyncratic tail risk

JEL Classification: G12, G23

***Kata kunci**:*
Penilaian aset, Generalized Extreme Value Distribution, Idiosyncratic tail risk

Corresponding Author:
Sung Suk Kim:
Tel. +62 21 546 0901
E-mail: sungsuk.kim@uph.edu

Idiosyncratic tail risk and stock return in Indonesia

Iyvon Herliawan[1], Sung Suk Kim [1], Kie Van Ivanky Saputra[2], Ferry Vincenttius Ferdinand[2]

[1]*Department of Management, Faculty of Economics and Business, Universitas Pelita Harapan*
[2]*Department of Mathematics, Faculty of Science and Technology, Universitas Pelita Harapan*
Jl. M. H. Thamrin Boulevard 1100 Lippo Village, Tangerang, 15811, Indonesia

Abstract

Idiosyncratic tail risk explains the financial crisis which happened due to idiosyncratic risk. It could also be used as a factor for asset pricing, making it necessary to be further studied since it could help protect investors from extreme incidents that could bring loss. We investigate the effect of idiosyncratic tail risk to the stock return in Indonesia. The data of daily stock price of 662 public companies in Indonesia that was registered in Indonesia stock exchange (IDX) are used during the period of 2006-2018. We include the firms that have at least 10 trading days in a month for providing enough observation to determine tail index to get idiosyncratic tail risk. First of all we using portfolio approach to find the effect of tail risks to the stock return is used. The results show that idiosyncratic tail risk has negative effects on the stock return in portfolio level. However, idiosyncratic tail risk does not have effects on stock return in individual firm level.

Abstrak

Idiosyncratic tail risk *menjelaskan krisis keuangan yang terjadi karena risiko idiosinkratik.* Idiosyncratic tail risk *juga dapat digunakan sebagai faktor penetapan nilai aset, sehingga perlu dikaji lebih lanjut karena dapat membantu melindungi investor dari insiden ekstrem yang dapat menyebabkan kerugian besar. Kami menyelidiki efek* idiosyncratic tail risk *terhadap* return *saham di Indonesia. Data harga saham harian dari 662 perusahaan publik di Indonesia yang terdaftar di Bursa Efek Indonesia (BEI) digunakan selama periode 2006-2018. Kami menyertakan perusahaan yang memiliki setidaknya 10 hari perdagangan dalam sebulan untuk menyediakan pengamatan yang cukup untuk menentukan indeks ekor untuk mendapatkan* idiosyncratic tail risk. *Pertama-tama kami menggunakan pendekatan portofolio untuk menginvestigasi efek risiko idiosinkratik terhadap* return *saham yang digunakan. Hasil penelitian menunjukkan bahwa* idiosyncratic tail risk *memiliki efek negatif pada* return *di tingkat portofolio. Namun,* idiosyncratic tail risk *tidak memiliki efek pada* return *di tingkat perusahaan individu.*

How to Cite: Murningsih, S., Firdaus, M., & Purwanto, B. (2020). Factors influencing Indonesian rural banks' credit disbursement. *Jurnal Keuangan dan Perbankan, 24*(2), 241-251. https://doi.org/10.26905/jkdp.v24i2.3778

ISSN: **2443-2687** (Online)
ISSN: **1410-8089** (Print)

1. Introduction

CAPM assume that stock returns follow multinormal distribution. However, empirical stock returns show generally negative skewness and higher kurtosis. Some researchers (Harvey & Siddique, 2000; Ando et al., 2006) showed the improvement of the CAPM and other asset pricing models using higher moments. Harvey & Siddique (2000) proved that when they included conditional skewness, the variation of cross section returns can be explained much better. They showed also that even if they include size and book-to-market factors, the effects of co-skewness still strong to the stock return. Hwang et al. (1999) using the emerging market data showed that co-skewness and co-kurtosis of individual stock return to the market improve the power of explanation of CAPM. They mentioned that stock returns in emerging markets tend to have relatively high skewed and leptokurtic than that of developed market, it is needed to concern higher moments in emerging markets (Hwang et al., 1999).

After Ang et al. (2006; 2009) showed negative effects of idiosyncratic risk to the stock return, so many evidences of effects of idiosyncratic risk and returns was found. Ang et al. (2006) showed that this idiosyncratic volatility strong negative effects on the stock return after controlling momentum, size, liquidity, short term reversal etc. Furthermore, as Hou & Loh (2016) showed that all most all the research results support the idiosyncratic volatility puzzles and tried to explain the idiosyncratic volatility with various types of firm specific and behavioral related factors. Long, Jiang, & Zhu (2018) mentioned that this idiosyncratic volatility puzzle related with tail risks.

Even if Ang et al. (2009) showed the strong evidences that the positive effects of idiosyncratic volatility to the stock return using international market, contradictive results, idiosyncratic volatility (IV) has positive effects to stock return, have been found. Fu (2009) estimated idiosyncratic volatility using Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) showed that stocks with higher idiosyncratic risk have positive effects on expected return in Spanish stock market. Higher IV stocks compensate for 1 percent greater return in a month.

Miralles-Marcelo, Miralles-Quiros, & Miralles-Quiros (2012) also showed positive effects of IV to the stock return. They mentioned their controversy results were produced because they apply different asset pricing model to estimate idiosyncratic volatility with Ang et al. (2006; 2009). Fu (2009) and Miralles-Marcelo et al. (2012) showed that if we change the method to estimate idiosyncratic risk, relation between idiosyncratic risk and stock return can be change.

Furthermore, Long et al. (2018) proposed idiosyncratic tail risk (ITR) as an alternative measure of idiosyncratic risk. They showed that ITR had negative effects on stock return in portfolio level. They showed the importance of extreme value to estimate idiosyncratic volatility to explain the cross-section stock return. Extreme value in idiosyncratic volatility, which is ITR, may stand out because investors may overweight the tail risk (Tversky & Kahneman, 1992), especially in the context the leptokurtic distribution of stock return.

On the other hand, some emerging markets did not show idiosyncratic volatility puzzle. Nartea, Ward, & Yao (2011) found that IV had positive effects on stock return in Malaysia, Singapore, Thailand, and Indonesia stock market. Pudjianto & Wibowo (2019) also found the same result in Indonesia stock market. Even if their findings could be explained the results based on risk-return trade-off based on under-diversification (Xu & Malkiel, 2002), they cannot show reasons why investors always under-diversify their portfolio than other markets.

The main contribution of our research is in asset pricing model, especially tail risk puzzle. The developments of different methodology to estimate idiosyncratic volatility (Fu, 2009; Miralles-Marcelo et al., 2012; Long et al., 2018) give opportunities to review the effects of idiosyncratic risk to the stock return, especially for the market that did not show idiosyncratic volatility puzzle. Then, we try to apply different method that used by Long et al. (2018) using ITR to re-exam effects of the idiosyncratic risk to the stock return in Indonesia stock market. It may be attractive because Indonesia stock market did not show idiosyncratic volatility puzzle (Nartea et al., 2011, Pudjianto & Wibowo, 2019).

This positive effects of idiosyncratic volatility to stock return may be related with distribution of stock return. Indonesia stock market (IDX) also has high skewness as one of big emerging market (Hwang et al., 1999). Then, if investigate that extremes value among idiosyncratic volatility, we may observe negative effects from extreme values to the stock return. If then, ITR as an alternative measurement of idiosyncratic volatility that focuses on extreme value, may be used in Indonesian stock market.

The main result shows that idiosyncratic risks which is estimated using ITR has negative effects on the stock return in portfolio level. On the other hand, the firm level regression results using Fama-MacBeth (1973) have negative coefficient but statistically insignificant. However, our research results clearly show that when we estimate idiosyncratic risk using different method, puzzle that was originally raised by Ang et al., (2006) can be found also in Indonesia.

The following part of the papers will be written as follows. We will develop the hypothesis based on the idiosyncratic risk which is estimated using ITR has negative effects on stock return. Then we explain the data and methodology. After that we show the empirical results based on time series and cross-sectional regression.

2. Hypotheses Development

These empirical evidences showed that, tail risk is different from common volatility which is focuses on total risk and focuses extreme changes that appears higher moments (Harvey & Siddique, 2000; Ando et al., 2006). Tail risk could avoid the potential of incompatibility of normal distribution that did not give attention to higher-order-moments. The concern to the higher moments of stock return increase not only because of existence of higher moments but also frequent financial crisis than expected.

Bali, Cakici, & Whitelaw (2014) showed using hybrid tail betas, tail risk give positive effects on expected return. Huang et al. (2012) showed that firm-specific extreme downside risk or left tail risk had positive effect to expected return. These results were further supported by Kelly & Jiang (2014). Harris, Nguyen, & Stoja (2019) also found that systematic downturn tail risks have positive effects on the stock return.

While, Van Oordt & Zhou (2016) propose a new systematic tail risk measure and showed that tail risks do not have positive influence on stock return in market crash. On the other hand, Long et al. (2018) showed opposite results compared to those of Huang et al. (2012) and Kelly & Jiang (2014). They found that idiosyncratic tail risk has negative effects on expected return which they called as "idiosyncratic tail risk puzzle." Estimating method from Long et al. (2018) can show negative effects on stock returns because ITR capture well the factors that have negative relation between IV and stock return. This ITR may be related with maximum daily return (MAX, Bali Cakici, & Whitelaw, 2011), and/or other firm specific factors such as low-book-to market ratio (Barinov, 2011). Chabi-Yo, Ruenzi, & Weigert (2018) with the new version of systematic tail risk measure found that tail risks have negative effects on the stock return in case of market crash. Gao, Lu, & Song (2019) found that negative effects of tail risks to the variation of cross section returns from out-of-the money options of various asset classes. Baltussen, Van Bekkum, & Van der Grient (2018) proved that components of uncertainty related with volatility lower the cross-sectional stock return. They explained the negative effects of uncertainty of volatility because investors tend to have a structural preference for uncertainty about risk (Baltussen et al., 2018). Atilgan et al. (2020) find again that tail risks have strong negative effects on the cross-sectional stock returns. They explained that this negative relation between tail risks and expected returns are related with momentum. When stock return of the firms drops significantly, investors underreact to the information, then stock return of next month still show the pattern of momentum (Atilgan et al., 2020)

Importance of heavy tails or effects of extreme values on decision making was also explained by prospect theory (Tversky & Kahneman, 1992). If investors decide their investment decision in stock markets according to the prediction of disposition effect to left tail risks, they will not realize their losses when stock return drop shapely (Benartzi & Thaler, 1995). The postponed realized return may give more negative return. While if the investor regard stock that have heavy rights tails as lottery stocks (Bali et al., 2011; Meng & Pantzalis, 2018), extreme right tails also results in negative returns.

Then, heavy tails from both sides may give negative effects on the stock return. Tail risk we estimated from both side, which is ITR, may have negative effects to stock returns. Then, we make the following hypothesis

H_1: idiosyncratic tail risk (ITR) has negative effects to the stock return

3. Data, Method, and Analysis

The data used in this research is the data of daily stock price of public companies registered on the Indonesia Stock Exchange from 2006 to 2018. In addition to the daily stock price, in the calculation of idiosyncratic tail risk, risk-free rate data, *MKT* (Market) factor, *SMB* (Small Minus Big), and daily and monthly *HML* (High Minus Low) were also needed. In order to calculate the control variable, monthly trading volume data, market capitalization, and the amount of outstanding shares were needed. Data that was obtained was data from 662 different companies in Indonesia within a period of 156 months which fulfills the criteria of having at least 10 days of trading day in a month. All the data got from S&P Capital Intelligence.

Estimation of idiosyncratic tail risk was done based on the studies done by Huang et al. (2012) and Long et al. (2018), which was done by following these steps:

First of all, for every stock i on every month, run the regression using the Fama-French three factor model (Fama & French, 1993).

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_i^{MKT}(MKT_t - r_{f,t}) + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is daily stock return i on day t, $r_{f,t}$ is daily risk-free rate on day t, MKT_t is daily market return on day t, SMB_t is risk factor based size on day t and HML_t is risk factor based on book-to-market ratio on day t. Residuals of regression, $\varepsilon_{i,t}$, are used as the idiosyncratic return for stock i on day t.

Then, for each stock i for every month t, idiosyncratic tail risk is estimated from idiosyncratic return for 3 years until t-1 month. After that, we apply block minima method to get 20 minimum idiosyncratic return for each stock and for each month. The chosen observations are donated as $x_1, x_2, ..., x_n$. These chosen minimum idiosyncratic returns are composed of our extreme sample.

Based on each chosen extreme idiosyncratic stock returns for every month, maximum likelihood method is applied to estimate the tail index (ξ) or the tail on the Generalized Extreme Value Distribution (Long et al., 2018). The following logarithmic likelihood function of Generalized Extreme Value Distribution is used to find the value of location (μ), scale (σ), and shape (ξ) parameter that maximize the value of this function:

$$I(\mu, \sigma, \xi) = -n\, log\sigma - \left(\frac{1}{\xi} + 1\right) \sum_{i=1}^{n} log\left(1 + \xi \frac{X_i - \mu}{\sigma}\right) - \sum_{i=1}^{n} \left(1 + \xi \frac{X_i - \mu}{\xi}\right)^{-\frac{1}{\xi}} \quad (2)$$

Where: $1 + \xi \frac{X_i - \mu}{\sigma} > 0$. The estimated value of then notated as estimation for idiosyncratic tail risk for stock i month t or $ITR_{it} = \hat{\xi}$.

The control variables are used to control the effect of other risk factors which influence on the stock returns. All control variables are calculated monthly. These are the control variable being used as Long et al. (2018): Market beta ($BETA$), each stock's systematic risk of the market is defined as the beta in CAPM at least three years monthly data. Market capitalization (*SIZE*), firm size is defined as the log (market capitalization). The market capitalization is calculated by stock price times number of outstanding shares at end of previous June. Book-to-market (*BM*), book-to-market is defined as the log (book-to-market) at the end of the last year. Momentum (*MOM*), momentum is defined as stock returns during 11 months from t-12 to t-2. Short-term reversals (*REV*), short-term reversals is defined as one-month stock return t-1. Illiquidity (*Amihud*), illiquidity is defined as the ratio of the absolute stock return to trading value in rupiah terms using monthly frequency and multiply 10^{10}. Co-skewness (*Coskew*), the co-skewness is defined as the third standardized cross central moment from the individual stock return and the market return. Co-kurtosis (*Cokurt*): the co-kurtosis is defined as the fourth standardized cross central moment from individual stock return and market return. Idiosyncratic volatility (*IV*), monthly idiosyncratic volatility of each stock is defined as volatility of the daily residual returns of each stock for each month from the Fama–French 3 factors model. Idiosyncratic skewness (*Iskew*), idiosyncratic skewness of each stock for each month is defined as the skewness of the daily residual returns for each stock for each month from the Fama–French three factors model. Idiosyncratic kurtosis (*Ikurt*), idiosyncratic kurtosis of each stock for each month is defined as the kurtosis of the daily residual returns of reach stock for each month from the Fama–French 3 factors model. Maximum daily return (MAX), maximum daily return is defined as the highest daily return during the previous month for each stock.

Univariate Time Series Analysis

Univariate time series analysis was done using several steps: All companies were sorted and divided into 5 portfolios (quintile portfolio) based on idiosyncratic tail risk (*ITR*), Then, monthly equal-weighted return and value-weighted return portfolio was calculated and along with their average. This equal-weighted and value weighed stock return are used as dependent variables for each portfolio. After that, sixth portfolio was made which was the difference in return between the high and low idiosyncratic tail risk portfolios. Later, the alpha from CAPM and Fama-French Three Factor Model (FF3) was calculated from the portfolio that had been divided.

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Firm-level Fama-MacBeth Regression

Firm-level cross-sectional regressions were done by following the Fama-Macbeth regression model (1973):

$$R_{i,t+1} = \lambda_{0,t} + \lambda_{1,t} ITR_{i,t} + \lambda_{2,t} BETA_{i,t} + \lambda_{3,t} SIZE_{i,t} + \lambda_{4,t} BM_{i,t} + \lambda_{k,t} Other\ risk\ measures_{k,t} + \varepsilon_{i,t}$$

Table 1. Descriptive statistics

Variable	# of obs	Minimum	Maximum	Mean	Median	Std	Skewness	Kurtosis
RET	12,784	-0.3233	0.6180	0.0127	0.0000	0.1258	1.3986	7.9960
ITR	12,784	-0.6801	1.0693	0.0901	0.0948	0.2094	0.0802	3.6754
BETA	12,784	-9.0825	10.2362	0.5844	0.5672	1.0706	0.0482	9.8678
SIZE	12,784	4.3875	8.7243	6.2071	6.1277	0.8863	0.3253	2.5716
BM	12,784	-4.0360	2.7575	-0.2417	-0.1569	1.1512	-0.2962	2.9660
MOM	7,627	-1.4851	4.1692	0.0195	0.0539	0.0653	2.0181	6.6355
Rev	12,270	-0.3051	0.6454	0.0122	0.0000	0.1247	1.5142	5.5679
Amihud	12,436	0.0000	128.907.51	491.670	20.6400	2759.71	19.5942	599.4273
Coskew	12,784	-509.677	749.084	-5.8862	-1.0810	44.5467	-0.2371	52.6000
Cokurt	12,784	-17.4996	61.2765	-1.1070	0.0754	4.7635	7.2167	59.2633
IV	12,784	0.0000	0.1258	0.0236	0.0198	0.0148	1.4549	5.7784
Iskew	12,784	-3.8107	3.7080	0.2471	0.2179	0.7912	0.0816	1.3071
Ikurt	12,784	-1.7053	13.6322	0.5504	0.0617	1.6805	2.2750	7.6155
Max	12,317	0.0000	0.1786	0.0635	0.0500	0.0458	1.1915	0.6294

Where: $R_{i,t+1}$ is return for i on the month *t+1* and independent variable is *ITR, BETA, SIZE, BM,* and other control variable on previous months.

The regression was run for every month stock return on *ITR* without and with other control variables until 14 times. When we estimate the value of λ_1 and other parameter to remove the violation of homoscedastic assumption, we adjust standard deviation using White's heteroskedastic robust method. We expect λ_1 has negative effects to the stock return to prove our hypothesis.

4. Results

Descriptive and correlation statistics

Table 1 shows the statistical descriptive analysis result done to the monthly value of stock return and the risk factors included were *ITR, BETA, SIZE, BM, Coskew, Cokurt, IV, Iskew*, and *Ikurt* from 12,784 observation. It also shows that the monthly stock return has more than 3 kurtosis. Normal distribution has the number of kurtosis equal to 3. Thus, it could be concluded that the monthly stock return does not have normal distribution. In addition, it was found that the *BETA* value had the average value of 0.5844. The average value of *BETA* was supposedly to show the market *BETA* value which is 1.00. The difference in the *BETA* value was caused by using daily data of each company on this research to do the calculation. The use of daily data caused underestimation because non-synchronous trading of the individual stock tends to reduce the covariance between an individual stock and the market. Therefore, the *BETA* value obtained is less than the supposedly market *BETA* value which is 1.00.

It is also found from Table 1 that there are negative *BM* values. This is caused by using the logarithmic function in the calculation of the *SIZE* and *BM* variable from the market capitalization data and book-to-market ratio. The use of logarithmic function resulted in negative value if the market capitalization and book-to-market ratio is greater than 1. Calculation using logarithmic function was done to create the skewness and kurtosis variable of *SIZE* and *BM* to have reasonable values.

Table 2. Correlation between ITR and Other Risk Variables

Variable	Correlation	*t* Statistic
BETA	0,0137	0.1490
SIZE	0,1074	1,1863
BM	-0,0674	-0.7430
MOM	-0,0827	-0,5709
REV	-0,0257	-0,1888
Amihud	-0,0358	-0,3629
Coskew	0,0137	0,1451
Cokurt	0,0057	0.0590
IV	-0,1643	-1,8195*
Iskew	-0,0076	-0,0723
Ikurt	0,0068	0,0605
Max	-0,1352	-1,4566

Note: Numbers inside brackets are *t* statistical value. Symbol *, **, and *** shows the significance level of 10 percent, 5 percent, and 1 percent, respectively.

Table 2 shows the result of the correlation average in the cross-section between ITR and other risk factors. Correlation between *ITR* and *SIZE, IV* and Max is -0.1074, -0.1643 dan -0.1352, respectively. Correlation between *ITR* and those three factors are three highest correlation values even though they are not significant statistically. Absolute statistical value t which is the correlation result between *ITR* and *IV* is -1.8195. This value is close to 1.96 which is the statistical value of t if α = 5 percent. *ITR* itself explains the information found on the distribution tail, where *IV* explain the information completely. Therefore, it could be stated that *ITR* and *IV* have different information since no relation was found between the *ITR* and *IV*. The same conclusion applies between *ITR* and the other risk factors.

Univariate Fama-French Analysis

Table 3 shows that there are signs that indicate the presence of "idiosyncratic tail risk puzzle" on this research. The last column for panel A shows the difference of portfolio stock return between the portfolios with high and low *ITR* has negative values, but it is not significant. The average of portfolio also tends to decrease with the increase of *ITR*. In addition, CAPM alpha and FF3 alpha of panel A, shows a significant difference. The difference between High-Low *ITR* is 0.92 percent per month and significant in 5 percent with t-statistic -2.3. Abnormal return from low to high *ITR* from both CAPM and FF3 tends to decrease monotonically. Thus, we can conclude that in the portfolio-level analysis, we find "idiosyncratic tail risk puzzle" or negative effect from idiosyncratic tail risk toward stock return in Indonesia. This result is consistent with Huang et al. (2012) and Kelly & Jiang (2014), Long et al. (2018), Chaibi-Yo et al. (2018), and Altigan et al. (2020). This result shows that in extreme stock return in Indonesia may have momentum effects as Altigan et al. (2020) and tail risk and idiosyncratic volatility have reverse effects to the stock return. In other word, higher moments of risks that are not be captured well in idiosyncratic risk volatility explain well the deviation of cross-section stock return.

Table 3. Effects of ITR (IV) to the stock return in portfolio level

	Low 1		2		3		4		5 High		High-Low	
Panel A: Portfolio sorted based on ITR												
Equally-weighted returns	2.11%	***	2.03%	***	2.34%	***	2.10%	***	1.80%	***	-0.31%	
	(3.24)		(2.69)		(3.32)		(2.91)		(2.87)		(-0.81)	
Value-weighted returns	2.02%	***	1.27%		1.36%	*	1.49%	**	1.56%	**	-0.46%	
	(-2.69)		(1.62)		(1.84)		(-2.19)		(-2.33)		(-0.72)	
CAPM alpha	-0.07%		-0.50%		-0.08%		-0.32%		-0.38%		-0.92%	**
	(-0.17)		(-1.10)		(-0.19)		(-0.71)		(-0.98)		(-2.31)	
FF3 alpha	-0.02%		-0.52%		-0.03%		-0.28%		-0.33%		-0.92%	**
	(-0.04)		(-1.14)		(-0.08)		(-0.65)		(-0.85)		(-2.30)	
Panel B: Portfolio sorted based on IV												
Equally-weighted returns	1.91%	***	1.72%	***	1.77%	**	2.60%	***	2.40%	***	0.49%	
	(2.96)		(2.62)		(2.41)		(3.68)		(3.14)		(0.81)	
Value-weighted returns	1.24%	**	1.75%	**	1.52%	**	1.74%	**	2.28%	***	1.04%	
	(2.10)		(2.43)		(2.14)		(2.39)		(2.72)		(1.41)	
CAPM alpha	-0.37%		-0.58%		-0.72%		0.25%		0.10%		-0.14%	
	(-0.99)		(-1.54)		(-1.71)		(0.55)		(0.19)		(-0.23)	
FF3 alpha	-0.37%		-0.54%		-0.69%		0.30%		0.13%		-0.11%	
	(-1.00)		(-1.42)		(-1.62)		(0.68)		(0.23)		(-0.17)	

Note: Numbers inside brackets are t statistic value. Symbol *, **, and *** shows the significance level of 10 percent, 5 percent dan 1 percent, respectively.

On the other hand, Panel B from Table 5 showed that there is no idiosyncratic volatility effects on the stock return in Indonesia market. This result is contractive with Ang et al., (2006; 2009), and Bali et al, (2011). However, this result is consistent with Miralles-Marcelo et al. (2012) in Spanish market and Nartea et al. (2011) dan Pudjianto & Wibowo (2019) in Indonesia stock market. Idiosyncratic risk estimated with IV have positive effects on stock return. Even if the difference of high-low portfolio is not significant statistically, coefficient from low to high IV portfolio tends to increase.

Firm-level Fama-MacBeth (1973) Analysis

This section was focused to see the effects of *ITR* on the stock return using Fama-Macbeth regression. The calculation result on Table 4 indicates that *ITR* has no significant role in stock return. However, all the coefficient of the ITR has consistently negative sign. It means that after controlling risk factors such as *BETA, SIZE*, and *BM*, the risk factors reduce the effects of the *ITR* to the stock return. Simultaneously risk factors also do not affect to the expected return. This could be shown from the t-statistic of all risk factors do not significant in 5 percent significant level.

The calculation result on Panel B in Table 5 shows that by doing Fama-Macbeth cross-sectional regression on *ITR, BETA, SIZE, BM*, and risk factors of systematic risk, does not result in any factor that significantly affect the cross sectional expected return. The same result is also shown on Panel C in Table 6, which shows no factor that significantly affects the expected return.

Based on the results from Table 6, it can be said that even if *ITR* has the negative coefficient from all regression models but that number is not significant statistically. This indicates that *ITR* in individual level cannot show idiosyncratic tail risk puzzle. This result is consistent with Long et al. (2018). However, idiosyncratic volatility (*IV*) also does not have significant effects to the stock return. This result is contradictory to the evidence form Pudjianto & Wibowo (2019) and Nartea et al. (2012). They showed that positive relationship between *IV* and stock return. Perhaps this contradictory result comes from different period of data.

Table 4. Panel A: ITR effects on stock return after controlling various risk factors

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel A: Trading characteristics measures						
Cons.	0.0150**	0.0256*	0.0197	0.0197	0.0230	0.0254
	(2.59)	(1.75)	(-0.77)	(1.30)	(1.54)	(0.94)
ITR	-0.0071	-0.0050	-0.0010	-0.0058	-0.0043	0.0054
	(-1.32)	(-0.95)	(-0.10)	(-1.02)	(-0.80)	(0.52)
BETA		-0.0011	-0.0002	-0.0014	-0.0004	0.0026
		(-0.60)	(-0.10)	(-0.72)	(-0.22)	(0.65)
SIZE		-0.0017	-0.0013	-0.0005	-0.0013	-0.0025
		(-0.71)	(-0.32)	(-0.20)	(-0.56)	(-0.62)
BM		-0.0003	0.0001	0.0005	0.0003	0.0002
		(-0.14)	(0.06)	(0.25)	(0.12)	(0.09)
MOM			0.0013			-0.0019
			(0.21)			(-0.24)
Rev				0.0151		0.0136
				(1.13)		(0.63)
Amihud					0.0000	0.0000
					(0.68)	(1.23)
Adj R^2	0.0097	0.0564	0.1643	0.0772	0.0744	0.2108

Note: Numbers inside brackets are t statistic value. Symbol *, **, and *** shows the significance level of 10 percent, 5 percent dan 1 percent, respectively.

Table 5. Panel B: ITR effects on stock return after controlling various risk factors

	Model 7	Model 8	Model 9
Panel B: Systematic risk measures			
Cons.	0.0260*	0,0253*	0,0265*
	(1.74)	(1.73)	(1.73)
ITR	-0,0049	-0,0049	-0,0045
	(-0.94)	(-0.92)	(-0.84)
BETA	-0,0001	-0,0003	-0,0017
	(-0.03)	(-0.09)	(-0.51)
SIZE	-0,0016	-0,0016	-0,0018
	(-0.69)	(-0.69)	(-0.73)
BM	-0,0001	-0,0003	-0,0004
	(-0.06)	(-0.19)	(-0.24)
Coskew	0,2626		0,6651
	(0.77)		(1.60)
Cokurt		18,2211	41,0744
		(0.53)	(0.90)
Adj R^2	0,0752	0,0695	0,0889

Note: Numbers inside brackets are t statistic value. Symbol *, **, and *** shows the significance level of 10 percent, 5 percent dan 1 percent, respectively.

Table 6. Panel C: ITR effects on stock return after controlling various risk factors

	Model 10	Model 11	Model 12	Model 13	Model 14
Panel C: Idiosyncratic risk measures					
Cons.	0.0340**	0.0256*	0.0271*	0.0233	0.0357**
	(2.14)	(1.75)	(1.90)	(1.57)	(2.25)
ITR	-0.0065	-0.0056	-0.0057	-0.0060	-0.0077
	(-1.17)	(-1.06)	(-1.10)	(-1.13)	(-1.44)
BETA	-0.0011	-0.0011	-0.0012	-0.0011	-0.0011
	(-0.64)	(-0.61)	(-0.64)	(-0.51)	(-0.54)
SIZE	-0.0026	-0.0017	-0.0019	-0.0009	-0.0024
	(-1.08)	(-0.72)	(-0.80)	(-0.37)	(-1.00)
BM	-0.0002	-0.0000	-0.0003	0.0005	0.0005
	(-0.13)	(-0.03)	(-0.19)	(0.25)	(0.26)
IV	-0.0944				-0.1775
	(-0.97)				(1.46)
Iskew		0.0013			0.0015
		(0.95)			(1.00)
Ikurt			0.0002		0.0005
			(0.24)		(0.51)
Max				-0.0115	0.0035
				(-0.33)	(0.09)
Adj R^2	0.0730	0.0675	0.0693	0.0775	0.0118

Note: Numbers inside brackets are t statistical value. Symbol *, **, and *** shows the significance level of 10 percent, 5 percent dan 1 percent, respectively.

Conclusion

In this research, there are two methods of analysis being done which are univariate Fama-French analysis and firm-level Fama-MacBeth regression. The research focused on the influence of idiosyncratic tail risk to stock return in Indonesia in the period of 10 years with 662 companies involved. We conclude that idiosyncratic tail risk has a significant negative effect to the stock return in Indonesia in portfolio level. However, the result of firm level Fama-MacBeth shows idiosyncratic tail risk has no effect to the stock return in Indonesia. Then, it can be said that idiosyncratic tail risk factors contain information that are not present in other idiosyncratic risk factors at least portfolio level.

Further analysis can be done by making portfolios based on other controlled variables, using bivariate portfolio-level analysis. It is needed to be investigated that the relation idiosyncratic tail risk with certain firm specific factors like investment and cash flows of the firm.

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