Does Downside Risk Matter more in Asset Pricing? Evidence from Indonesia

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Abstract

This study examines downside risk matters in asset pricing, particularly evidence from Indonesia. Using ten reference indexes for passive instruments and 674 companies listed on the Indonesia Stock Exchange between 2020-2021. The four measurements are the traditional families (beta and standard deviation/risk) and downside risk families (semi-deviation and downside beta). For those, we divide 674 stocks into quintiles (5 groups). Every quintile is investigated by four measurements using Fama-Macbeth regression. semi-deviation in those close to standard deviation. Standard deviation affects semi-deviation portfolios in quintiles 1 and 2 and portfolios sorted beta and downside beta in quintile 2. Beta does not affect all portfolios. Eighth, semi-deviation affects portfolios sorted semi-deviation in quintiles 1,2,3,and 5. Downside beta does not affect all portfolios.

Keywords: downside risk; semi deviation; downside beta; beta; standard deviation;

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Introduction

Asset pricing is the theory that explains the relationship between risk and return. Markowitz makes the first portfolio selection model that submits the principle of diversification(Markowitz, 1952). The Markowitz portfolio model is started by the desire of investors who want to minimize risk. It shows that investors should buy several stocks with different compositions for loss prevention. It explains how to optimize the return and the risk. The relationship among stocks should have less perfect positive correlations.

Based on Markowitz (1952), The model started by CAPM that developed by Sharpe (Sharpe, 1964), Lintner (Lintner, 1965) and Mossi (Mossin, 1966). CAPM can explain the relationship between systematic risk and the expected return on investment. CAPM shows the initial model of market rationality. Investors accepted systematic risk as the beta coefficient.

In asset pricing theories, asset returns are frequently explained by risk factors. In this research, the risk factors are beta, downside beta, standard deviation and semi-deviation. To test asset pricing, this research uses the Fama-Machbeth two-step regression(Fama & MacBeth, 1973).

This study aims to answer nine question, in which first, how are ten indexes mutual fund references are standard deviation, beta, semi-deviation and downside beta priced? Second, how are the portfolios sorted by standard deviation, semi-deviation, beta and downside beta are these priced? Third, how much the average portfolios' return every quintile do? fourth, How much are the indexes and 20 sorted portfolios measured by Sharpe, modified Sharpe, Treynor, and modified Treynor? Fifth, which are the better performance between indexes and 20 sorted portfolios? Sixth, does the standard deviation significantly affect the portfolio sorted by the standard deviation, semi-deviation, beta, and downside beta from the first quintile to fifth quintile? Seventh, does beta significantly affect the portfolio sorted by the standard deviation, semi-deviation, beta, and downside beta? Eighth, does semi-deviation significantly affect the portfolio sorted by the standard deviation, semi-deviation, beta, and downside beta? Ninth, does downside beta significantly affect the portfolio sorted by the standard deviation, semi-deviation, beta, and downside beta?

This study investigate the downside risk in asset pricing, particularly during the pandemic 2020-2021 when Indonesia was in economic recovery after a recession from pandemic Covid-19. The discussion of downside risk is one of the topics among academics (Estrada, 2002);(Ang et al., 2006); (Rashid & Hamid, 2015). Investors show different signals regarding upside and downside risk. The attention of investors puts more weight on loss than profit so they want more significant compensation for holding the higher downside risk stocks. This paper also uses Fama-Macbeth regression to see the significant downside beta, beta, standard deviation, and semi-deviation.

Asset pricing literature has well documented that higher sensitivities to market down movement are priced by higher returns. The downside risk is documented in the US and UK (Harvey & Siddique, 2000)(Ang et al., 2006)(Pedersen & Hwang, 2007)(Boyer et al., 2010) and Emerging markets (Estrada, 2002)(Estrada & Serra, 2005)(Estrada, 2007). Nonetheless, there is only one study that investigated the Indonesian stock market in this respect (Syahputra, 2018). The research only looked for an optimal portfolio based on downside risk using variance and semi-variance.

The idea of downside risk comes from Roy (Roy, 1952). He shows that many investors want to minimize their loss from a possible disaster or safety first. The principle of safety plays an important role in the decision-making process. Second, the investor cares more about the downside risk than market risk and suggests constructing portfolios with semi-variance (Markowitz, 1952). The studies of Roy (1952) and Markowitz (1952) develop a new approach to asset pricing. A risk taken by the investor should be rewarded and it is called the risk premium.

The theoretical foundation relating to investors' preferences has been developed about rational behavior. It states that investors put greater weight on adverse market conditions. The theories are lower-partial-moment framework, loss aversion, and disappointment aversion preferences. Losses impact a bigger emotional on people than does an equivalent amount of gain. The theory is called loss aversion preference(Tversky & Kahneman, 1992). Disappointment aversion preferences show that investors dislike losses more than gains(Gul, 1991).

The method measuring downside risk divides two which are high order moments (skewness and kurtosis) and three parameters (mean-variance-skewness). First, High order moment uses the three parameters for the first time (Kraus & Litzenberger, 1976). Several studies use asset pricing three-moments as three parameters(Friend & Westerfield, 1980); (Diacogiannis, 1994);(Poitras & Heaney, 1999);(Boyer et al., 2010); (Neuberger, 2012). Second, the semivariances expectation are included downside risk measurement (Bawa & Lindenberg, 1977); (Harlow & Rao, 1989); (Estrada, 2002).

This research objective is that the downside risk does matter for asset pricing during the short recession and economic recovery in Indonesia. This research following Ali (2019) uses four different risk measurements from traditional risk (standard deviation and beta) and the other two risk measures in the downside risk family (semi-deviation and downside beta). This research follows other research (Ang et al., 2006), this research is checked contemporaneous interrelationships between realized risk and realized return by sorting portfolios based on different risk variables. The data used are market return, indexes return that are the benchmark of a managed fund, and also the 674 companies list on the Indonesian Stock Exchange.

Literature Review

In the last 50 years, the literature has proposed different methods to catch downside risks. The methods of downside risk are classified into two groups that are skewness and kurtosis incorporating CAPM Kraus and Litzenberger (1976), Friend and Westerfield (1980), Hwang and Satchell (1999), dan Harvey and Siddique (2000); and CAPM mean-semivariance and CAPM downside Hogan and Warren (1974), also, Bawa and Lindenberg (1977), Harlow and Rao (1989), and Estrada (2002).

In the first category, Kraus dan Litzenberger (1976) researched the impact of skewness on asset pricing with CAPM three-parameter, including skewness on the formula. They found that the third moment supports CAPM and traditional CAPM. Furthermore, several studies show a skewness preference for traditional mean-variance analysis such as Friend dan Westerfield (1980), Hassett et al.(1985), Diacogiannis (1994), dan Poitras dan Heaney (1999). CAPM's fourth moment was collaborative skewness and kurtosis adding risk measurement (Hwang & Satchell, 1999). They explained coskewness and cokurtosis better than conventional mean-variance. Harvey and Siddique (2000) extend CAPM for conditional skewness. It shows that conditional skewness explains the variance expected return US equity with size and book-to-market ratio.

Stock with higher expected idiosyncratic skewness can result in lower future returns (Boyer et al., 2010). The third moment showed that long-term returns would not be biased in reality (Neuberger, 2012). Buying the smallest decile and highest decile skewness will be expected to return 19 basis points next week (Amaya et al., 2015). The commodities with negative skewness would get more excess return (Fernandez-Perez et al., 2018).

In the second category, models considered input downside risk with semi-variance analysis. It fills the weaknesses of CAPM that used only variance and covariance. The measurement used semi-variance and co semi-variance(Hogan & Warren, 1974). Lower Mean Partial (LMP) was used to measure only returns that fall below some given rate of return and the model-derived LPM-CAPM model(Bawa & Lindenberg, 1977). The formula downside beta for asset i is given below:

$$\beta_i^D = \frac{E\left\{(R_i - R_f).min\left[\left((R_M - R_f),0\right)\right]\right\}}{E\left\{\min\left[(R_M - R_f),0\right]^2\right\}} \quad (1)$$

Where Ri is asset return i, RM is market portfolio return and Rf is the risk-free rate. Kemudian, Harlow and Rao (1989) adopted Bawa dan Lindenberg's (1977) framework, however, they suggested using the mean market from every relevant distribution rather than risk-free as the benchmark return, pointing out in equation (2).

$$\beta_i^D = \frac{E\{(R_i - \mu_i).min[((R_M - \mu_i),0)]\}}{E\{\min[(R_M - \mu_i),0]^2\}} \quad (2)$$

Empirically, previous studies examined the model and show evidence of downside risk premium. The LPM-CAPM (Bawa & Lindenberg, 1977) (Ang et al., 2006) investigated downside risk and market return in US and show a downside risk premium of about 6%/year. The stocks strongly correlated with the market during a downturn have average high returns and are independent variables such as size, value, liquidity, and momentum. Consistently, CAPM comparing LPM-CAPM show that the asymmetric model (LPM-CAPM) could be explained more(Pedersen & Hwang, 2007).

Empirical evidence to support downside beta explain the return in an emerging market.(Estrada, 2007)(Estrada, 2002)(Estrada & Serra, 2005). Comparing regular beta and downside beta show that the downside beta from Estrada (2002) outperforms other risks in the emerging market. (Mamoghli & Daboussi, 2010).

The other studies, comparing CAPM and three measurements of downside risk CAPM for assessing the Karachi Stock Exchange show that CAPM has a negative premium while CAPM downside risk Bawa and Lindeberg (1977) and Harlow and Rao (1989) show a positive risk premium. The D-CAPM from Estrada (2007) shows variance results in several periods.

This research has several hyphotheses:

$Ha_1 \neq 0$, Beta has significantly affected the expected return of sorted portfolios

$Ha_2 \neq 0$, Downside beta has significantly affected the expected return of sorted portfolios

$Ha_3 \neq 0$, Standard deviation has significantly affected the expected return of sorted portfolios

$Ha_4 \neq 0$, Semi-deviation has significantly affected the expected return of sorted portfolios

Research Methods

The data comes from the Indonesia Stock Exchange 2020-2021 with stock and market returns. The shares used are all shares located in Indonesia. Its stock market is the Composite Stock Price Index (IHSG). The comparison index used is an index that is used as a reference for passive investments such as IDX 30, LQ-45, MNC36, BISNIS-27, SMinfra18, SRI-KEHATI, JII, PEFINDO, IDX Value, and IDX High Dividend 20. The other data are portfolios with quintiles of data sorted by beta, downside beta, standard deviation and semi-deviation The type of research is quantitative research. The population is all shares listed on the Indonesia Stock Exchange and samples are 674 companies

To investigate the downside risk matter in Indonesia, this research will calculate the traditional risks which are standard deviation and beta; and the downside risk which are semi-deviation and beta downside. The formula's return is below:

$$r = ln\frac{P_1}{P_0}$$

R is the return portfolio or market. P_1 is the stock price or market indeces in time 1. P_0 is the stock price or market indeces in time 0

$$\sigma_i = \sqrt{\frac{\sum(r_i - \bar{r})^2}{n-1}}$$

σ is standard deviation. r_i is return securities. $\bar{r}$ is expected return. n is total data. n-1 is for sample data under 30.

The formula's beta is below

$$\sigma_{im}^2 = \frac{\sum(r_m - \overline{r_m})(r_i - \overline{r_i})}{n-1}$$

$$\sigma_m^2 = \frac{\sum(r_m - \overline{r_m})^2}{n-1}$$

$$\beta = \frac{\sigma_{im}^2}{\sigma_m^2}$$

σ_{im}^2 is the covariance between market return and portfolio return. σ_m^2 is the variance of the market return. β is beta market. r_m is return market. $\overline{r_m}$ is expected return market. r_i is return securities. $\overline{r_i}$ is expected return securities. The formula's semi-deviation is below

$$\Sigma_i = \sqrt{\frac{\sum_{r_i<\overline{r_i}}^n (r_i - \bar{r})^2}{n-1}}$$

Σ is semi-deviation. $\sum_{r_i<\bar{r}}^n (r_i - \bar{r})^2$ is the sum squared return below the expected return. The formula's downside beta is below

$$\Sigma_{im}^2 = \frac{\sum_{r_i<\overline{r_i} r,_{m<\overline{r_m},}}^n (r_m - \overline{r_m})(r_i - \overline{r_i})}{n-1}$$

$$\Sigma_m^2 = \frac{\sum_{r_m<\overline{r_m}}^n (r_m - \overline{r_m})^2}{n-1}$$

$$\beta^{-}=\frac{\Sigma_{im}^{2}}{\Sigma_{m}^{2}}$$

$\Sigma_{im}^{2}$is a semi covariance between market return and portfolio return. Σ_{m}^{2} is the semi-variance of the market return. β^{-} is downside beta.

the ten reference indexes for passive instruments are calculated by standard deviation and semi deviation and beta and downside beta. Further, we divide 5 portfolios that are sorted by standard deviation, semi-deviation, beta dan downside beta. Those are measured by standard deviation,semi-deviation, beta, and downside beta. Second, we calculate the performance of the sorted portfolios to Sharpe, modified Sharpe, Treynor, and modified Treynor. Third, we compare the performance of sorted portfolio to positive indexes performance. Fourth, we use Fama-Macbeth regression to examine beta and standard deviation, and downside beta and semi-deviation to expected return sorted portfolio.

Comparing the portfolio chosen needs return and risk because the same return has a different risk. We use Sharpe, Treynor, Modified Sharpe, and Modified Treynor methods. The formula Sharpe (1966) is below:

$$S_{p}=\frac{\overline{r}_{i}-\overline{r}_{f}}{\sigma_{p}}$$

S_p is Sharpe measurement. $\overline{r}_{i}$ is the average return from the portfolio i. $\overline{r}_{f}$ is the average level return from risk-free assets (Bank Indonesia interest rates). σ_{p} is a standard deviation portfolio. The formula Treynor (1965) is below:

$$T_{p}=\frac{\overline{r}_{i}-\overline{r}_{f}}{\beta_{p}}$$

T_p is Treynor measurement. $\overline{r}_{i}$ is the average return from portfolio i. $\overline{r}_{f}$ is the average level return from risk-free assets (Bank Indonesia interest rates). β_{p} is a beta portfolio. The modified Sharpe measurement (Baghdadabad & Fooladi, 2015) is below:

$$S_{p}^{M}=\frac{\overline{r}_{i}-\overline{r}_{f}}{\Sigma_{p}}$$

S_{p}^{M} is the modified Sharpe measurement. $\overline{r}_{i}$ is the average return from the the portfolio i. $\overline{r}_{f}$ is the average level return from risk-free assets (Bank Indonesia interest rates) about 0.00324. Σ_{p} is semi-deviation portfolio. The modified treynor measurement (Baghdadabad & Fooladi, 2015) is below:

$$T_{p}^{M}=\frac{\overline{r}_{i}-\overline{r}_{f}}{\beta_{p}^{-}}$$

T_p^M is the modified Treynor measurement. $\bar{r}_i$ is the average return from the portfolio i. $\bar{r}_f$ is the average level return from risk-free assets (Bank Indonesia interest rates) about 0.00324. $\beta_p^-$is a downside beta portfolio.

We use two-step Fama-Macbeth Regression to see the significant beta, downside beta, standard deviation, and semi-deviation. The first step Fama-Machbeth regression is below

$$\bar{r}_i = \alpha + \gamma\beta_i$$

$$\bar{r}_i = \alpha + \gamma\beta_i^-$$

$$\bar{r}_i = \alpha + \gamma\sigma_i$$

$$\bar{r}_i = \alpha + \gamma\Sigma_i$$

$\bar{r}_i$ is the average return for security i. α is the risk free for portfolio i. γ is risk premium. β_i is beta for security i. β_i^- is the downside beta for security i. $\sigma_i$is the standard deviation for security i. Σ_i is the semi-deviation for security i. The second step Fama-Macbeth Regression is below

$$\bar{r}_t = \alpha + \gamma\beta_t$$

$$\bar{r}_t = \alpha + \gamma\beta_t^-$$

$$\bar{r}_t = \alpha + \gamma\sigma_t$$

$$\bar{r}_t = \alpha + \gamma\Sigma_t$$

$\bar{r}_t$ is the average return for the portfolio in month i. α is the risk-free for the portfolio in month i. γ is risk premium. β_i is a beta market return for portfolio in month i. β_i^- is the downside beta for portfolio in month i. $\sigma_i$is the standard deviation for portfolio in month i. Σ_i is the semi-deviation for portfolio in a month i.

Results and Discussions

Results

Table 1 Measuring Standard Deviation, Semi-deviation, Beta and Downside Beta on Market Preference Passive Investment

Indexes Codes	Average	Aver. Excess Return	σ	Σ	β	β^{-}
COMPOSITE	0.004586	0.00135	0.056086	0.041471	1	1.223512
LQ45	-0.00098	- 0.00422	0.071247	0.05353	1.219743	1.507889
IDX30	-0.002	- 0.00523	0.069042	0.051677	1.175631	1.448056
IDXV30	0.001041	- 0.00220	0.094848	0.068936	1.564264	1.9404
IDXHIDIV20	0.000175	- 0.00306	0.071625	0.05337	1.194444	1.480076
JII	-0.00598	- 0.00922	0.062768	0.042363	1.013025	1.162016
BISNIS-27	-0.00138	- 0.00461	0.062259	0.046105	1.041682	1.28006
SRI-KEHATI	-0.00138	- 0.00462	0.07018	0.050693	1.14485	1.393223
SMinfra18	-2E-05	- 0.00326	0.083018	0.060802	1.425734	1.729283
MNC36	-0.00228	- 0.00552	0.067156	0.049515	1.12829	1.384181
PEFINDO25	-0.00157	- 0.00481	0.073857	0.053802	1.201233	1.446243

Source: self-processed

The above table shows that ten indexes reference passive investment and Composite (IHSG). Every index has been calculated by standard deviation, semi-deviation, beta, and downside beta. The most considerable risk or standard deviation is IDXV30 about 0.094848 meanwhile, the smallest risk is COMPOSITE about 0.056086. The biggest semi-deviation, which only has the collective data under the average sample, is IDXV30 about 0.068936, and the smallest semi-deviation is COMPOSITE regarding 0.041471. The greatest beta and downside beta is IDXV30 and the smallest beta is COMPOSITE and the downside beta is JII. From the four measurements calculated, we can see that the downside beta is bigger than the beta for all indexes. However, Semi-deviation parameters are lower than the standard deviation for all indexes.

Table 2 Standard Deviation Portfolios are Meassured by the Measurement of the Beta, Downside Beta, Standard Deviation, and Semi-deviation

Portfolio σ	Mean Return	Excess Return (Mean Return-0.00324(risk-free))	β	β^{-}	σ	Σ
1	0.002375	-0.00087	0.3871	0.490101	0.024767	0.017645
2	-0.00048	-0.00372	0.961443	1.055192	0.06074	0.039079
3	0.00135	-0.00189	0.814499	1.021474	0.054842	0.039837
4	0.009598	0.006358	0.789883	0.90658	0.066775	0.043056
5	0.00211	-0.00113	0.81817	1.010454	0.053363	0.037694

Source: Self-processed

Table 2 shows that on the first quintile standard deviation portfolio, the beta is lower than the downside beta such as 0.3871 and 0.490101. It is similar to others, such as 0.961443 and 0.961443, 0.814499 and 1.021474, 0.789883 and 0.90658, 0.81817, and 1.010454. These are beta and downside beta quintiles 2,3, 4, and 5. However, the standard deviation is always bigger than the semi-deviation in standard deviation portfolios. Standard deviation and semi-deviation from quintile 1 to quintile 5 are 0.024767 and 0.017645, 0.06074 and 0.039079, 0.054842 and 0.039837, 0.066775 and 0.043056, and 0.053363 and 0.037694.

Table 3 Portfolios sorted by Beta with Beta, downside beta, Standard Deviation and Semi-deviation

Portfolio β	Mean Return	Excess Return	β	β^-	σ	Σ
1	-0.02975	-0.03299	-1.04084	-0.29394	0.173407	0.166924
2	-0.00706	-0.0103	0.097952	0.126617	0.039468	0.033302
3	0.017988	0.014748	0.620524	0.787977	0.059601	0.025697
4	0.009963	0.006723	1.306132	1.559067	0.082194	0.052865
5	0.02375	0.02051	2.781708	2.303417	0.239822	0.091633

Source: Self-processed

Table 3 shows portfolios sorted by beta. Beta is bigger than downside beta on quintile 5 regarding 2.781708 and 2.303417. Between quintiles 1 and 4, beta is smaller than downside betas, respectively such as -1.04084 and -0.29394, 0.097952 and 0.126617, 0.620524 and 0.787977, and 1.306132 and 1.559067. The standard deviation is higher than the semi-deviation from quintile 1 to 5. The standard deviation and semi-deviation from quintile 1 to quintile 5, respectively, are 0.173407 and 0.166924, 0.039468 and 0.033302, 0.059601 and 0.025697, 0.082194 and 0.052865, 0.239822 and 0.091633.

Table 4 Portfolios Sorted by Semi-deviation and Measured by Beta, downside Beta, Standard Deviation, and Semi-deviation

Portofolio Σ	Mean Return	Excess Return	β	β^-	σ	Σ
1	-0.01662	-0.01986	0.025683	0.059569	0.010725	0.012933
2	-0.04439	-0.04763	0.071141	0.092561	0.027735	0.026539
3	-0.06514	-0.06838	0.105375	0.206373	0.04861	0.046068
4	-0.10344	-0.10668	-0.1715	-0.01589	0.121191	0.121191
5	-0.19673	-0.19997	-1.00643	-1.12132	0.353071	0.352755

Source: Self-processed

Table 4 shows portfolios sorted by semi-deviation and measured by beta, downside risk beta, risk, and semi-deviation. Beta is higher than downside beta from quintile 1 to quintile 4 except quintile 5. The parameters beta and downside beta are 0.025683 and 0.059569, 0.071141 and 0.092561, 0.105375 and 0.206373, -0.1715 and -0.01589, and -1.00643 and -1.12132. The standard deviation and the semi-deviation are similar in quintile 4. The standard deviation is higher than the semi-deviation in quintiles 2, 3, and 5 such as 0.027735 and 0.026539, 0.04861 and 0.046068, 0.353071 and 0.352755, respectively . Only quintile 1 is higher the semi-deviation than the standard deviation about 0.010725 and 0.012933.

Table 5 Portfolios sorted by Downside Risk and Measured by Beta, Downside Beta, Standard Deviation and Semi-deviation

Portfolios β^-	Mean Return	Excess Return	β	β^-	σ	Σ
1	-0.02975	-0.03299	-1.04084	-0.29394	0.173407	0.166924
2	-0.00706	-0.0103	0.097952	0.126617	0.039468	0.033302
3	0.017988	0.014748	0.620524	0.787977	0.059601	0.025697
4	0.009854	0.006614	1.310257	1.57152	0.082463	0.053438
5	0.023858	0.020618	2.777583	2.290964	0.239989	0.091237

Source: Self-processed

Table 5 shows the portfolios sorted by downside risk beta and measured by beta, downside risk beta, risk, and semi-deviation. Beta is higher than downside beta in all quintiles except quintile 5. The parameters beta and downside beta are -1.04084 and -0.29394, 0.097952 and 0.126617, 0.620524 and 0.787977, 1.310257 and 1.57152, and 2.777583 and 2.290964. The standard deviations are higher than the Semi-deviation, such as 0.173407 and 0.166924, 0.039468 and 0.033302, 0.059601 and 0.025697, 0.082463 and 0.053438, 0.239989 and 0.091237.

Table 6 Indexes are Measured by Sharpe, Modified Sharpe, Modified Sharpe, Treynor, and Modified Treynor

Indexes	Sharpe	Modified Shar	Treynor	Modified Treynor
COMPOSITE	0.02404	0.03251	0.00135	0.00110
LQ45	- 0.05919	- 0.07878	- 0.00346	- 0.00280
IDX30	- 0.07581	- 0.10128	- 0.00445	- 0.00361
IDXV30	- 0.02316	- 0.03186	- 0.00140	- 0.00113

IDXHIDIV20	- 0.04276	- 0.05739	- 0.00256	- 0.00207
JII	- 0.14690	- 0.21766	- 0.00910	- 0.00793
BISNIS-27	- 0.07411	- 0.10008	- 0.00443	- 0.00360
SRI-KEHATI	- 0.06582	- 0.09113	- 0.00404	- 0.00332
SMinfra18	- 0.03924	- 0.05358	- 0.00228	- 0.00188
MNC36	- 0.08214	- 0.11140	- 0.00489	- 0.00398
PEFINDO25	- 0.06510	- 0.08936	- 0.00400	- 0.00332

Source: Self processed

Table 6 shows the evaluation of 10 indexes that are mutual funds preferences' and the stock market (Composite). The Sharpe, modified Sharpe, Treynor, and modified 10 indexes are negative performance. Only has composite positive performance

Table 7 Beta, Downside Beta, Standard Deviation and Semideviation Portfolios are Measured by Sharpe, Modified Sharpe, Treynor and Modified Treynor

No.	Portfolios	Sharpe	Portfolios	Modified Sharpe	Portfolios	Treynor	Portfolios	Modified Treynor
1	$\Sigma 4$	0.622041	$\Sigma 4$	6.713656	$\beta 3$	0.247446	$\beta 3$	0.573919
2	$\Sigma 5$	0.198692	$\Sigma 5$	0.178334	β_3^-	0.247446	β_3^-	0.573919
3	$\beta 1$	0.031696	$\beta 1$	0.112234	$\sigma 4$	0.095215	β_5^-	0.225983
4	β_1^-	0.031696	β_1^-	0.112234	β_5^-	0.085912	$\beta 5$	0.223828
5	$\beta 3$	0.023767	$\beta 3$	0.018716	$\beta 5$	0.085522	$\sigma 4$	0.147668
6	β_3^-	0.023767	β_3^-	0.018716	$\beta 4$	0.081794	$\beta 4$	0.127173
7	$\sigma 4$	0.008049	β_5^-	0.009	β_4^-	0.080206	β_4^-	0.12377
8	β_5^-	0.007423	$\beta 5$	0.008904	$\sigma 5$	-0.02118	$\sigma 5$	-0.02998
9	$\beta 5$	0.007373	$\sigma 4$	0.007013	$\sigma 3$	-0.03446	$\sigma 3$	-0.04744
10	$\beta 4$	0.005147	$\beta 4$	0.004312	$\sigma 1$	-0.03493	$\sigma 1$	-0.04902
11	β_4^-	0.005048	β_4^-	0.004209	$\sigma 2$	-0.06124	$\sigma 2$	-0.09519
12	$\sigma 5$	-0.00138	$\sigma 5$	-0.00112	$\beta 1$	-0.19025	$\beta 1$	-0.19763
13	$\sigma 1$	-0.00223	$\sigma 1$	-0.00176	β_1^-	-0.19025	β_1^-	-0.19763
14	$\sigma 3$	-0.00232	$\sigma 3$	-0.00185	$\beta 2$	-0.26097	$\beta 2$	-0.30929
15	$\sigma 2$	-0.00387	$\sigma 2$	-0.00353	β_2^-	-0.26097	β_2^-	-0.30929
16	$\beta 2$	-0.10515	$\beta 2$	-0.08135	$\Sigma 5$	-0.56637	$\Sigma 5$	-0.56688
17	β_2^-	-0.10515	β_2^-	-0.08135	$\Sigma 4$	-0.88026	$\Sigma 4$	-0.88026
18	$\Sigma 3$	-0.64892	$\Sigma 3$	-0.33134	$\Sigma 3$	-1.40671	$\Sigma 3$	-1.48433
19	$\Sigma 2$	-0.66952	$\Sigma 1$	-0.33339	$\Sigma 2$	-1.71732	$\Sigma 1$	-1.53561
20	$\Sigma 1$	-0.77327	$\Sigma 2$	-0.51458	$\Sigma 1$	-1.85175	$\Sigma 2$	-1.79472
COMPOSITE		0.02404		0.03251		0.00135		0.00110

Source: self-processed

Table 7 shows the ranking of Sharpe. Modified Sharpe, Treynor, and modified Treynor from quintile 1 to 5 in beta, downside beta, standard deviation, and semi-deviation portfolios. Good portfolios are positive performance. The positive performances in Sharpe method are 11 portfolios. the ranking from 1 to 11 are Σ4, Σ5, $\beta1$, β_1^-, $\beta3$, β_3^-, $\sigma4$, β_5^-, $\beta5$, $\beta4$, and β_4^- that are 0.622041, 0.198692, 0.031696, 0.031696, 0.023767, 0.023767, 0.008049, 0.007423, 0.007373, 0.005147, 0.005048. The positive performances in modified Sharpe method are Σ4, Σ5, $\beta1$, β_1^-, $\beta3$, β_3^-, β_5^-, $\beta5$, $\sigma4$, $\beta4$, and β_4^- that are 6.713656, 0.178334, 0.112234, 0.112234, 0.018716, 0.018716, 0.009, 0.008904, 0.007013, 0.004312, and 0.004209. The positive performances in Treynor method are $\beta3$, β_3^-,$\sigma4$, β_5^-, $\beta5$, $\beta4$, and β_4^- that are 0.247446, 0.247446, 0.095215, 0.085912, 0.085522, 0.081794, and 0.080206. The positive performances in modified Treynor are $\beta3$, β_3^-, β_5^-, $\beta5$, $\sigma4$, $\beta4$, and β_4^- that are 0,573919, 0,573919, 0,225983, 0,223828, 0,147668, 0,127173, and 0,12377.

Table 8 Fama-Macbeth Regression for Portfolios Downside Beta, Beta, Standard Deviation, and Semi-deviation as Dependent Variables and beta, downside beta, risk, and semi-deviation as Independent Variables

Portfolios β^-	β	β^-	σ	Σ
1	0.005841	0.015928	-0.02936	-0.10516
2	-0.04567	-0.01028	0.26553***	-0.13259
3	0.007374	0.057968	0.043165	-0.19022
4	-0.01958	0.021733	0.061556	-0.17168
5	0.012209	-0.00025	0.021569	-0.05798
Portfolios Beta	β	β^-	σ	Σ
1	0.005229	0.016159	-0.02825	-0.10416
2	-0.04034	0.041034	0.26553***	-0.13259
3	0.007374	0.057968	0.043165	-0.19022
4	-0.02037	0.022924	0.061327	-0.17174
5	0.0114	0.005818	0.021833	-0.0578
Portfolios σ	β	β^-	σ	Σ
1	0.000263	0.003604	0.067133	-0.18365
2	0.001009	-7E-07	0.150321	-0.55285**
3	0.00944	0.006782	0.165789	-0.59167*'

4	0.016148	0.018034	0.037444	-0.43287
5	0.014594	0.041285	0.013939	-0.22367
Portfolios				
Σ	β	β^-	σ	Σ
1	-0.00289	0.000546	-0.24998**	-0.57201***
2	0.002209	0.008712	0.08304***	-0.66545***
3	0.004416	0.008736	0.18343	-0.48118***
4	-0.00105	0.002602	-0.05565	-0.1813
5	0.046659	0.063061	-0.16738	-0.34020*

*** is significant under 0.01; ** is significant under 0.05; * is significant under 0.10

Table 8 shows Fama-Macbeth regression. Beta and downside beta do not significantly to all portfolios. We can conclude that beta and downside beta do not matter in Indonesia. Portfolios sorted beta and downside beta have not been affected for 4 measurements except standard deviation in quintile 2. Portfolio semi deviation is only affected by semi-deviation in quintiles 1,2, 3, and 4. Standard deviation also affects the semi-deviation portfolios in quintiles 1 and 2.

Discussions

Table 1 shows that positive mean returns are on composite after less the risk-free rate. Table 2 shows that the excess return of portfolios sorted standard deviation in quintile 4 has a positive return. Table 3 shows that the excess return of portfolios sorted beta in quintiles 3, 4, and 5 are positive. Table 4 shows that the positive excess return of portfolios sorted semi-deviation is none. Table 5 shows that the excess return of portfolios sorted downside beta in quintile 3, 4, dan 5 are positive.

Table 6 shows ten indexes mutual fund references and the Indonesian Stock Market (Composite). Only composite has a positive return compared to all risks such as beta, downside beta, standard deviation and semi-deviation. Only has been rewarded composite the risk by positive return.

The highest return is β_5^- about 0.023858 and the lowest return is Σ5 about -0.19673. The biggest beta and downside beta are β5 about 2.781708 and 2.303417. The smallest beta and downside beta are β1 and Σ5 about -1.04084 and -1.12132. The highest standard deviation and semi-deviation are Σ5 about 0.353071 and 0.352755. The lowest standard deviation and semi-deviation are Σ1 about 0.010725 and 0.012933.

Table 6 shows the biggest Sharpe and modified Sharpe are Σ4 about 0.622041 and 6.713656. The smallest Sharpe and modified Sharpe are Σ1 and Σ2 about -0.77327 and -0.51458. The biggest Treynor and modified Treynor are $\beta 3$ about 0.247446 and 0.573919. The smallest Treynor and modified Treynor are Σ1 and Σ2 about -1.85175 and -1.79472.

Table 6 shows that composite index and 20 portfolios sorted by beta and standard deviation (traditional risks). From the four method of evaluation risks and return, several portfolios are better than the composite index. Sharpe method and modified Sharpe method show that 4 portfolios are higher than composite that are Σ4, Σ5, $\beta 1$, β_1^-. Treynor and modified Treynor show 11 portfolios that are better than a composite index that are $\beta 3$, β_3^-, $\sigma 4$, β_5^-, $\beta 5$, $\beta 4$, and β_4^-.

The D-CAPM from Estrada (2007) shows variance results in several periods. Empirical evidence to support downside beta explain the return in an emerging market.(Estrada, 2007)(Estrada, 2002)(Estrada & Serra, 2005). Comparing regular beta and downside beta show that the downside beta from Estrada (2002) outperforms other risks in the emerging market.(Mamoghli & Daboussi, 2010). The other studies, comparing CAPM and three measurements of downside risk CAPM for assessing the Karachi Stock Exchange show that CAPM has a negative premium while CAPM downside risk Bawa and Lindeberg (1977) and Harlow and Rao (1989) show a positive risk premium. In this paper, we find that beta and downside have not significantly affected Indonesia in 20 portfolios. Standard deviation and Semi-deviation affects expected return portfolios. Standard deviation affects portfolios sorted downside beta and beta in quintile 2, and portfolios sorted semi-deviation in quintile 1 and 2. Semi-deviation significantly affects standard deviation portfolios in quintiles 2 and 3 and all semi-deviation portfolios except quintiles 4.

Beta which is not surprising exhibits little or no support beta. It is similar to previous study (Harvey, 1995)(Barry et al., 2002)(Serra, 2003)(Drew et al., 2003)(Wang & Di Iorio, 2007). Downside beta is different from previous studies Ang et al. (2006) and Ali (2019). This paper shows the downside beta has no power to affect 20 portfolios. This paper only finds that standard deviation and semi-deviation can be priced in Indonesia. Those are an individual risks for companies.

Conclusion

It can be concluded that this paper has several examinations. First, the downside beta in 10 passive instruments indexes is bigger than the beta regular except for JII. Also, semi-deviation in those close to standard deviation. The biggest standard deviation, semi-deviation, beta and downside beta are IDXV30 meanwhile the smallest standard deviation, semi-deviation, beta, and downside beta are COMPOSITE (IHSG). Second, The biggest beta and downside beta are $\beta 5$. The smallest beta and downside beta are $\beta 1$ and $\Sigma 5$. The highest standard deviation and semi-deviation are $\Sigma 5$. The lowest standard deviation and semi-deviation are $\Sigma 1$. Third, The highest return is β_5^- and the lowest return is $\Sigma 5$. Fourth, the biggest Sharpe and modified Sharpe are $\Sigma 4$. The smallest Sharpe and modified Sharpe are $\Sigma 1$ and $\Sigma 2$. The biggest Treynor and modified Treynor are $\beta 3$. The smallest Treynor and modified Treynor are $\Sigma 1$ and $\Sigma 2$. Fifth, Sharpe method and modified Sharpe method show that 4 portfolios are higher than composite that are $\Sigma 4$, $\Sigma 5$, $\beta 1$, β_1^-. Treynor and modified Treynor show 11 portfolios that are better than a composite index that are $\beta 3$, β_3^-, $\sigma 4$, β_5^-, $\beta 5$, $\beta 4$, and β_4^-. Sixth, standard deviation affects semi-deviation portfolios in quintiles 1 and 2 and portfolios sorted beta and downside beta in quintile 2. Seventh, beta does not affect all portfolios. Eighth, semi-deviation affects portfolios sorted semi-deviation in quintiles 1,2,3,and 5. Ninth, downside beta does not affect all portfolios.

Following the result, Fama-Macbeth regression portfolios beta and downside beta have not been affected. It means that investors do not put more weight on loss than profit from market sensitivities. However, standard deviation and semi-deviation portfolios have affected by standard deviation and semi-deviation. It means that investors still put more weight on loss than profit individually. From those, there is a possible avenue for future work to investigate the microstructure or characteristic companies.

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