INDONESIAN MANAGED FUNDS PERFORMANCE EVALUATION AFTER GLOBAL ECONOMIC RECOVERY BY USING DATA ENVELOPMENT ANALYSIS WITH NEW RISK MEASURES (2011 – MID 2015)

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ABSTRACT

Mutual funds are the most favorable retail financial investments in Indonesia even though Indonesian financial instruments have not been penetrated well, especially among domestic investors. Therefore, unlocking potentials of managed funds, which are one of the most attractive funds in developed countries for their characteristics, are essential. The data envelopment analysis (DEA) has been long conducted to evaluate the mutual funds performance and along with the use of value-at-risk (VaR) and conditional value-at-risk (CVaR) in addition to the current traditional performance measures, DEA with these new risk measures accommodate the inevitable pervasive skewness and kurtosis while fairly evaluating the funds performance. By confirming Indonesian managed funds into the model and creating detailed analysis, applying VaR and CVaR along with traditional performance measure is useful and able to result better overall performance evaluation by highlighting 8 Indonesian's outperformed managed funds and their slacks of variables' efficiency.

Keywords: mutual funds, managed funds, performance evaluation, data envelopment analysis

I. INTRODUCTION

1.1. Research Background

More companies value international diversification after the 2007 – 2009 global crisis since such practice may give both financing and investing advantages (Kuppuswamy & Villalonga, 2010), not only among developed countries, but also in developing countries that are commonly called as emerging economic countries which have been profitable (Davis et al., 2010). Since Indonesia has been listed and deemed attractive as one of emerging economies country at least from more than 1 decade ago (Hoskisson et al., 2000), looking for further attractiveness in this country as one of international diversification options is wise for investing (Ho & Mauro, 2014) and in further academic and practical concerns, mutual funds have been found to be important forces in financial research for last four decades regarding international diversifications due to their characteristics, attractiveness, and market risk reduction among many financial instruments (Chen & Lin, 2006). Indonesian mutual funds are the most favorable retail financial instruments where around 320,000 retail investors, along with more than 21,152 licensed agents

(Kadomae, 2012). However, Indonesian fund industry is still too small compared to its market size and its relations to the nation's GDP (Le & Volguard, 2014), with around 2% of GDP, compared to 12% from Thailand and 20% of Malaysia even though in 2009-2010 Indonesia had a market boom of equity and fixed income products (Thompson, 2011). Therefore, unlocking potential of Indonesian mutual funds is necessary for both domestic and foreign market.

This study specifies to approach Indonesia's attractiveness in a scope of its national managed funds. In the country, conservative and syariah mutual funds are available retail with still around total of more than 157 trillions rupiah net asset value. It shows that 96% of the total NAV is still operating in conservative mutual funds, while only 4% of it is in syariah mutual funds. Managed funds have 7% composition of total conservative mutual funds and 23% from total syariah mutual funds (BAPEPAMLK, 2015). Compared to a developed mutual funds industry in the USA, managed funds are the most attractive funds for its low expense ratio, low trading activity, and low front-end loads (Haslem et al., 2008). The topic is discussed in moments of global economic recovery since the beginning of 2011 after the redeeming period from the global crisis, when at the end of 2008, major Asian indexes started to recover and kept on recovered through the time up until the end of 2010 (Guillen, 2011).

Besides basic risk-return statistical description, the Treynor index (Treynor, 1965) that describes excess return in exchange of unit of systematic risk, the Sharpe index (Sharpe, 1966) that values per unit return for exchanged total risk, and the Jensen α (Jensen, 1968), are still used as the very early performance measures. These earliest measurement uses two-dimension valuation of risk and return by relying on the Capital Asset Pricing Model (CAPM). These measurements might provide a whole description of a portfolio return along with the measured risks. However, main criticism concerning the CAPM model is on the validity of its underlying assumptions (Chen & Lin, 2006), where many more circumstances occur in statistical analysis.

Hence, in performance measurement, we underwent use of more terms and methods (Chen & Lin, 2006). They were those like higher moments [like being used in (Stephens & Proffitt, 1991), (Pendaraki, 2012), and so on], downside deviation (Sortino & Price, 1994), and reward-to-half-variance index (Ang & Chua, 1979). Nonlinearities are also considered to be included in modified β (Ferson & Schadt, 1996) to vary the risk premium, result a use of conditional CAPM framework. Other applied science also influenced to add into multi-index models [like being used in (Schneeweis & Spurgin, 1998), and others] as additional proxies to the fund risk. More discussions also arose concerning the model of skewness in portfolio return distribution and the time-varying risk, as famously described as "fat tails" phenomenon, which is fresh in risk management literatures. Unfortunately, in fact, the dominant above models possess unknown assumptions and may riskily create unreliable estimation. Hence, modern risk measures must be able to be adopted (Chen & Lin, 2006).

Data envelopment analysis (DEA) technique has been frequently used in order to evaluate performance, in a concern to include the various models (Chen & Lin, 2006), especially in a given context of mutual funds (Cooper et al., 2000). The input-oriented BCC model solution as used in Chen and Lin (2006) when they evaluate the Chinese managed funds due to the assumption of taking into

accounts all inputs which are possible to be reduced while retaining the same level of output, not necessarily to be applied conversedly, while on the other hand, analyzing slacks among variables is additionally important and meaningful (Banker et al., 2004) to objective and sensitivity analysis of DEA model by Chen and Lin (2006). The model includes standard deviation of fund returns (σ), the root of the lower semi-variance ($\sqrt{HV}$), or the β coefficient. Even more than those, distribution of many financial return series has already been revealed. They are often asymmetric and skewed, "fat-tailed", and thus pervasive. Thus, Chen and Lin (2006) proposes their new risk measures for this research with additional topic regarding risk measures for the new risk model about value-at-risk (VaR) and conditional value-at-risk (CVaR) by applying quantile-based measures to suit asymmetric return distributions.

1.2. Problem Statements

Since the background has been comprehensively presented, a complication may arise to be discussed through the research: "How do we assess the attractiveness of Indonesian efficient managed funds? Which funds have performed efficiently after the global economic recovery?"

1.3. Research Objectives

On this paper, research is conducted to assess the attractiveness and efficiency of Indonesian managed funds and to underline outperformed and underperformed Indonesian managed funds after global economic recovery.

II. LITERATURE REVIEW

Table 2.1.
Theoretical Background

No.	Concept	Description
1	Investment	A set of program that aims desired future financial goals to be met through interest in bank products (certificate/deposits) and market returns on stocks/bonds/mutual funds (Baker et al., 2008)
2	Mutual Funds	A type of investment fund that is a bundle of collection of investments, such as stocks, bonds, or other funds (Canadian Securities Administrators, 2012)
3	Net Asset Value	The amount by which total assets exceeds total liabilities (du Toit, 1979)
4	Traditional Performance Measurement	This lies on risk-return analysis developed by Markowitz (1952) in order to assess gains by deducting periodical return with the previous returns per base return and standard deviations. It also discusses further risk analysis concerning total risk and systematic risk by Treynor (1965) and Sharpe (1966), along with the Jensen α (1968).
5	Data Envelopment Analysis	Data-oriented approach for evaluating the performance of a set of peer entities called decision making units (DMUs) which convert multiple inputs into multiple outputs (Cooper et al., 2011)
6	New Risk Measures	Properly reflected DEA model to overcome the pervasive skewness and leptokurtosis return

		distributions of a certain financial data by introducing value-at-risk (VaR) and conditional value-at-risk (CVaR) into inputs of the existing DEA models (Chen & Lin, 2006)
7	Global Economic Crisis & Recovery	The global economic crisis was the time of 2007-2009 crises of recession and sheer magnitude caused by the consumer finance that is showed by housing mortgages to affect the corporate finance and finally the global economy (Kuppuswamy & Villalonga, 2010). In Asia, the global economic crisis started to recover in the end of November 2008 where Japan's Nikkei, Hong Kong's Hang Seng, and South Korean's KOSPI experienced daily return jump for more than 1% and this redemption period ended at the end of 2010 (Guillen, 2011).

III. RESEARCH METHODOLOGY

3.1. Sampling

Purposive sampling is being used for the research in accordance with intended samples for the topic of the research (Sekaran & Bougie, 2010). Active Indonesian managed funds (mixed funds) are comprised of 50 samples available in Kontan (2015) website document. The samples consist of 44 conservative managed funds and 6 syariah managed funds (Table 4.3.). The study will combine the evaluation performance of both conservative and syariah managed funds in one observation under the topic of Indonesian managed funds.

3.2. Data Gathering

1) Daily NAV, daily return, and names of each managed funds are taken from: http://pusatdata.kontan.co.id/reksadana/
2) Daily return of Indonesian government's 14-year bond are generated from: http://www.idx.co.id/id-id/beranda/informasipasar/obligasidansukuk/laporantransaksiotc.aspx
3) Daily return of Jakarta Composite Index can be extracted from: http://finance.yahoo.com/q/hp?s=^JKSE&a=00&b=1&c=2011&d=05&e=31&f=2015&g=d
4) Daily return of Indonesian government's Tresury Bills (Sertifikat Bank Indonesia) can be gotten from: http://pusatdata.kontan.co.id/makroekonomi/sbi/

3.3. Variable Measurement

A. Return

The basic multi-period return that is built by multiple one-period returns (Tsay, 2005) can be expressed as:

$$1 + R_t = \frac{P_t}{P_{t-1}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

where return in decimal and the return in R, the P represents the price of assets where in this case, the P represents the NAV of the mutual funds and t indicated data in certain t period of time and t-1 shows the data in 1 period of time before t.

B. Standard Deviation

In modern portfolio theory, the standard deviation measures the risk to be brought by investors in an individual asset (Markowitz, 1952) where variance is the standard deviation result powered by two. The formula of standard deviation can be expressed by (Tsay, 2005):

$$\hat{\sigma}_x = \frac{1}{T-1}\sum_{t=1}^{T}\sqrt{(x_t - \hat{\mu}_x)^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where the estimation of standard deviation (sample) is comprised by the x_t as certain independent value of a certain period whish represents the return/gain of NAV movement in certain period of time in the case and the $\hat{\mu}_x$ as the estimated average of the samples which can be understood as the average return/gain of the NAV movements.

C. Sharpe Ratio

The Sharpe ratio (1966) is used to measure the influence of total risk of an individual asset to its return. The formula might be described as follows:

$$SR = \frac{R_i - R}{\sigma_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where the σ_i describes the annual total risk of the individual asset while being described literaly into the total risk of the return/gain of the NAV movements, the R_i expresses the expected return of the asset that can be represented by the average return/gain of each mutual fund, and the R represents the benchmark return for the asset (mutual fund) which is weighted 50% of daily government bond return and 50% of daily Jakarta Composite index return, as assumed where the basic compositions of managed funds (mixed funds) are bonds and stocks (Mankiw, 2009), while the deduction of R_i by the R indicates that the Sharpe ratio measures the excess return to its volatility by the total risk.

D. Treynor

The Treynor ratio (1965) measures how an excess return from a risk-free asset (typically the treasury bill) might be traded off by its systematic risk. The formula is described as follows:

$$TR = \frac{R_i - R_f}{\beta_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where the R_i simply indicates the expected return of an individual asset as described by the average return/gain of the NAV movements, the R_f specifies the risk-free asset return which uses SBI index as the base (OECD, 2003), and the β_i describes the systematic risk of the individual asset which later be explained by the formula (13). The $R_i - R_f$ is also known as the risk premium. Thus, the formula indicates the trade off between the asset's risk premium and its systematic risk.

E. Jensen α

The Jensen α (1968) measures the security of getting an excess return in the capital asset pricing model (CAPM). Therefore, getting bigger α indicates positive abnormal return. Its formula might be described as follows:

$$\alpha_J = R_i - [R_f + \beta_i(R_M - R_f)] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where the α_J represents the Jensen α, while the asset return, risk-free rate, and individual asset β are similarly mentioned in the Treynor and Sharpe ratio. Additionally, the Jensen α also includes the variable of R_M in order to measure the market return as the ratio is usually used in stock market performance evaluation that in this case also uses the same measurement as the R in the Sharpe ratio (Formula 3).

F. Higher Moments

The higher moment measurement consists of skewness and kurtosis in order to measure the normality of the return distribution. Thus, first of all, the skewness might be measured by expressing this calculation (Tsay, 2005):

$$\hat{S}(x) = \frac{1}{(T-1)\hat{\sigma}_x{}^3}\sum_{t=1}^{T}(x_t - \hat{\mu}_x)^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

and the kurtosis can be defined as:

$$\widehat{K}(x) = \frac{1}{(T-1)\hat{\sigma}_x{}^4} \sum_{t=1}^{T} (x_t - \hat{\mu}_x)^4 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

Both are essential in return distribution analysis for its essence of being third and fourth central moment of X to summarize the extent of asymmetry and tail-thickness of a data distribution. Among the samples $(X_1, X_2, \dots, X_t)$, the above both formulas apply. The important variables include estimated σ in case of this sample skewness and kurtosis. The x_t represents the observed price of asset that is the return/gain in a specific period, while the estimated average of it is described by the $\hat{\mu}_x$.

G. Root of The Lower Semi-Variance

It considers minus deviation to represent the whole deviation (risk) in DEA model (Chen & Lin, 2006). It is also emphasized that the use of heterogeneous variance in all evaluation data in order to distinguish the treatment of every observed data (Bryk & Raudenbush, 1988). The formula is described as follows:

$$\sqrt{HV_J} = \sqrt{\sum [\min(R_J - \bar{R}_J, 0)]^2} \dots\dots\dots\dots\dots\dots\dots\dots\dots (8)$$

Where we can define the R_j as the return/gain of the fund in a specific period and the $\bar{R}_j$ as the average of it, where the deductionf of both are not equal to zero (0).

H. Value-at-Risk

Farid (2012) explains the approach of historical simulation method in Microsoft Excel spreadsheet. Through historical simulation method, periodical VaR might be assessed gradually by considering the calculations of:

1) Return observations
2) VaR confidence level for maximum loss
3) VaR index based on its confidence level
4) Daily VaR

I. Conditional Value-at-Risk

Farid (2013) also continued his model of CVaR by using the previously determined daily VaR. The determination starts by modeling the Monte Carlo – historical simulation model. The Monte Carlo simulation is done by conducting models of Historical Simulation in Monte Carlo spreadsheet model. The calculation of CVaR lies on comprehensions about following steps:

1) Simulated historical returns based on VaR
2) Historical return deducted by the simulated historical returns (VaR)
3) Selection of the right tail of the distribution of point (2) in absolute
4) Selection of point (3) that exceeds the VaR amount
5) Averaging the selected point (4) as the final result of CVaR.

J. Data Envelopment Analysis

Chen and Lin (2006) fartherly describes that the model is finished by using the BCC input-oriented model (Banker et al., 1984) by dualing the linear program with a constraint capturing returns to scale characteristics, and can be defined as:

$$\min \theta - \varepsilon \sum_{r=1}^{t} {s_r}^+ - \theta \sum_{i=1}^{m} {s_r}^- \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (9)$$

S.t.:

$$x_{ij_0}\theta - s_i^- - \sum_{j=1}^{n} x_{ijj}\lambda_j = 0, i = 1, \dots, m,$$

$$-s_r^+ + \sum_{j=1}^{n} y_{rj}\lambda_j = y_{rj_0}, \qquad r = 1, \dots, t,$$

$$\sum_{j=1}^{n} \lambda_j = 1, \lambda_j \geq 0, \qquad j = 1, \dots, n,$$
$$s_i^- \geq 0, \qquad i = 1, \dots, m,$$
$$s_r^+ \geq 0, \qquad r = 1, \dots, t.$$

The model is going to be gradually processed in OSDEA-GUI software and will be explained further in the following subpoints of methods of analysis.

3.4. Methods of Analysis

3.4.1. Assessment and Analysis of Inputs and Outputs of the DEA Model

A. Risk-return Tradeoffs (σ)

$$COV = \frac{Expected\ Return\ (r)}{STDEV\ (\sigma)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (10)$$

The coefficient of variations would be better off if it is in the biggest number. Comparing the COVs enables easy and useful statistical analysis to assess comparitively better risk-return results.

B. Risk-return Tradeoffs ($\sqrt{HV}$)

In this case, comparing the COVs between those resulted from the standard deviation and $\sqrt{HV}$ will be also useful to see whether normal distribution exists among the funds or not.

$$COV = \frac{\sqrt{HV}}{Expected\ Return\ (r)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (11)$$

C. CAPM Beta (β_j)

By having the assumed wighted average of 50% stock market (JCI) and 50% of daily return of bond index (Mankiw, 2009)

$$B_j = \frac{Cov(R_j, R_m)}{Var(R_m), Cov(R_j, R_m)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (12)$$

Positive/negative result and its magnitude of results can be analyzed where the result might not be valid if the p-value of the slope is more than 5% and the result might be valid if it has p-value of less or equal than 5%.

D. Jensen Alpha (α_j), Treynor, and Sharpe Ratios

Treynor and Sharpe ratios are able to be analyzed by assessing the formulas of (3) and (4). These formulas suggest bigger number in these ratios.

E. Skewness and Kurtosis

We might determine whether the a distribution is skewed or not by comparing the t-stat and t-critical (rule of thumb of 2) of the distribution's skewness, where if the t-stat is more(+)/less(-) than the t-critical, H_0 is rejected and the the distribution is validly skewed. The same assumption goes to kurtosis. The t-stat calculation is described below (Tsay, 2005):

$$t = \frac{\hat{S}(x)}{\sqrt{\frac{6}{T}}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (13)$$

$$t = \frac{\hat{K}(x) - 3}{\sqrt{\frac{24}{T}}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (14)$$

F. Value-at-Risk (VaR_j)

The VaR measures the maximum losses that might occur with current choosen assets with 99% confidence level (Sercu, 2009).

G. Conditional Value-at-Risk (CVaR_j)

CVaR measures more comprehensive risk of losing an asset return with a continuous measurement from the VaR by assessing exceeding return deviation of historical time-series

data from a simulated VaR model (Farid, 2013). Thus, the CVaR might value the most extreme losses even further than the VaR.

3.4.2. Processes and Comprehensions of DEA Model

A. DEA Model with New Risk Measures

Table 3.2
DEA Model with New Risk Measures

Inputs	Outputs
1. Standard Deviation	1. Returns
2. Square-root of Half Variance	2. Jensen Alpha
3. CAPM Beta	3. Sharpe Ratio
4. Skewness	4. Treynor Ratio
5. Kurtosis	
6. VaR	
7. CVaR	

(Source: Chen & Lin, 2006)

In order to finish the model by assessing its efficiency, DEA is conducted in OSDEA – GUI software as provided in http://www.opensourcedea.org/index.php?title=OSDEA_GUI_Downloads. The author uses the latest OSDEA-GUI version when it was downloaded on June 5th, 2015 to conduct the DEA model as described in formula (11).

B. Assessment of Objective Results and Slacks Solutions of the DEA Model

The objective values can necessarily be ranked where the higher an objective result of a DMU, the more efficient those DMUs are (Cooper et al., 2000).

IV. DATA COLLECTION AND ANALYSIS

4.1. Assessment and Analysis of Inputs and Outputs of DEA Model

Before being processed in OSDEA-GUI software in order to understand the efficiency of Indonesian managed funds, assessing and analyzing each inputs and outputs are essential. Each variable explains charateristics of the Decision Making Units (DMUs) and understanding them is essential for the research. Hence, to understand the performance of funds, following assessment is necessary:

4.1.1. Analysis of Indonesian Managed Funds' Covariances

Among all 50 observations, Indonesian managed funds generates an average of 0.0192% of return each day. This number is still below the benchmark return of weighted bonds and Jakarta Composite index with 0.0281% per day. With total active days of 244 days, average Indonesian managed funds can get 4.679% of return in a year while the benchmark return can exceedingly have 6.851% return.

Table 4.1. describes the top 10 Indonesian managed funds best performers based on covariance. Among the top ten, expected annual return of 9.156% exceeds the benchmark return of weighted bonds and JCI. 6 of them have more than 9% of expected annual return while the top 3 still have lower return compared to the benchmark return, even though it is traded off by the smaller amount of total risk (standard deviation), where Equity Prima stands out (in terms of total risk) by having less than 0.2% standard deviation with almost 0.05 difference of Covariance compared to the closest managed fund, Schroder Dana Kombinasi.

Among the top 10, we have one syariah fund: SAM Syariah Berkembang, with more than 10% expected annual return. Kresna Fleksima also stands out from others by generating 15.3% of expected annual return with reasonable total risk by bearing 0.09% per day.

Table 4.1.
Top 10 Funds Best Performers Based on Covariance (2011 – MID 2015)

Rank	Top 10 Best Performers (Cov)	Daily Return	Daily STDEV	COV	Annual Return (%)
1	Equity Prima	0.000214738	0.001896796	0.11321095	5.239607937
2	Schroder Dana Kombinasi	0.000265987	0.003909866	0.068029779	6.490090733
3	Cipta Dinamika	0.000190846	0.002877053	0.066333945	4.656649624
4	Kresna Fleksima	0.00062687	0.009737991	0.064373682	15.29563689
5	Nikko BUMN Plus	0.000467854	0.009054557	0.051670549	11.41563536
6	Schroder Syariah Balanced Fund	0.000408613	0.00804174	0.050811531	9.970160065
7	Semesta Dana Maxima	0.000418144	0.008677319	0.0481882	10.20272269
8	TRIM Kombinasi II	0.000399848	0.008739006	0.045754365	9.756282792
9	Maybank GMT Dana Fleksi	0.000315456	0.006908668	0.045660927	7.697131113
10	SAM Syariah Berimbang	0.000444181	0.010145715	0.043780139	10.83801188
			Average Annual Return (%)		9.156192908

(Source: Primary Data Calculation)

4.1.2. Analysis of Modified Covariances (Root of Semi Lower Variance)

here are only three funds that are experiencing lower total risk compared to the standard deviation. They are the top performed Equity Prima, one of worst performed Kresna Mrs Flex, and the average-performed HPAM Premium 1 and obviously, such a finding tops Equity Prima at number one again. Meanwhile, among the 50, 14 funds have above average of increasing modified covariance (minus) and the other 36 experiences decreasing covariance less than average increase. Such a circumstance made new names on the top 10, including Aberdeen Dana Handal and MNC Dana Kombinasi.

4.1.3. Assessment of Funds' Systematic Risk

Among 50 observed managed funds, 47 of them have positive systematic risk and all of them are validly tested with 5% of alpha. There is only one fund to have validly negative systematic risk. It is one of worst performed (covariance) Kresna Mrs Flex. On the other hand, the average-performed HPAM Premium 1 and the worst performed Harvestindo Istimewa. Five funds that are validly closest to 0 (zero) amount of systematic risk are the top covariance performer Equity Prima, Aberdeen Dana Handal, BNP Paribas Equitra, Cipta Dinamika, and Schroder Dana Kombinasi with all respective values less than 0.09. And among all managed funds, five of validly systematic-riskiest funds are Prospera Balance, Schroder Providence Fund, Pratama Berimbang, First State MS, and CIMB Principal Balanced Growth, while all valid funds are inelastically affected by the weighted benchmark return.

4.1.4. Understanding Funds' Sharpe, Treynor, and Jensen Alpha

Only 16 funds to have positive Sharpe ratio, 34 funds for Treynor, and 23 funds for Jensen Alpha. As shown in Table 4.2., after looking for managed funds that have all positive ratios, we can generate new covariance-ranked funds based on those funds that have all positive ratios.

4.1.5. Assessment of Funds' Higher Moments

Among 50 funds, we can only have 1 fund (Equity Prima) without skewness and we can find no fund without kurtosis. Thus, 99% among 100 times of t-test suggests valid existence of skewness and kurtosis in the Indonesian managed funds.

4.1.6. Analyzing Indonesian Managed Funds' Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR)

According to the VaR measurement, we can see that investors might be least worried if they have Minna Padi Keraton with small amount of 0.00052% per day. This amount tops the managed fund among 50 observed managed funds, while the biggest VaR among the 16 also holds the biggest VaR among 50 observations. On the other hand, Panin Dana Unggulan, Nikko BUMN Plus, and Pratam Berimbang are the managed funds that investors might have to be prepared to lose the most in a day with the amoung of value-at-risk of 1.2%, 1.1%, and 1.099% consecutively.

Then, from the CVaR measurement, there is a significantly seen change of rank AAA Balanced Fund, where in the VaR measurement, it ranks third but in CVaR's, it ranks the least with the amount of possible loss up to 9.52% in a day. Schroder Syariah Balanced Fund as syariah managed fund tops the list by bearing only 0.3% of possible loss in a day, while the other syariah managed funds (TRIM Syariah Berimbang and SAM Syariah Berimbang) are still on top 5. The top of the CVaR ranking among the 16 holds the second least amount of CVaR among 59 other managed funds, beaten by the worst performed covariance, Harvestindo Istimewa.

Table 4.2.
Covariance-ranked of All Managed Funds with Positive Sharpe, Treynor, and Jensen Alpha (2011 – MID 2015)

No	Funds	Daily Return	Daily STDEV	Covariance	Expected Annual Return (%)
1	Kresna Fleksima	0.00062687	0.009737991	0.064373682	15.2956369
2	Nikko BUMN Plus	0.000467854	0.009054557	0.051670549	11.4156354
3	Schroder Syariah Balanced Fund	0.000408613	0.00804174	0.050811531	9.97016006
4	Semesta Dana Maxima	0.000418144	0.008677319	0.0481882	10.2027227
5	TRIM Kombinasi II	0.000399848	0.008739006	0.045754365	9.75628279
6	Maybank GMT Dana Fleksi	0.000315456	0.006908668	0.045660927	7.69713111
7	SAM Syariah Berimbang	0.000444181	0.010145715	0.043780139	10.8380119
8	MNC Dana Kombinasi	0.000362103	0.008394444	0.043136022	8.83531152
9	Sucorinvest FF	0.000469746	0.01126106	0.041714161	11.4617943
10	Minna Padi Keraton	0.000317371	0.007970468	0.039818305	7.74384093
11	Panin Dana Unggulan	0.000333731	0.008387876	0.039787365	8.14304839
12	Pratama Berimbang	0.000466379	0.012146865	0.038394997	11.3796442
13	Schroder Providence Fund	0.000351545	0.009593253	0.03664505	8.5777033
14	AAA Balanced Fund	0.000289111	0.008065481	0.035845465	7.0543059
15	TRIM Syariah Berimbang	0.000338633	0.009480286	0.035719676	8.26263897
16	First State MS	0.000296174	0.011065871	0.026764597	7.22663569
		Average Expected Annual Return			9.6162815

(Source: Primary Data Calculation)

4.2. DEA Model Result

4.2.1. DEA Objective Solution

While determining DMUs with closest objective value to 0 as the least inefficient and DMUs with amount of result of 1 as the efficient managed funds, we essentially apply the input-oriented BCC model in DEA among 50 Indonesian managed funds with 11 variables each and we have already had the efficiency measurement result.

In accordance with Table 4.3., among 50 observed Indonesian managed funds, 24 are efficient as shown in where we can also see that 3 of syariah managed funds that possess all positive Sharpe, Treynor, and Jensen Alpha are also efficient (SAM Syariah Berimbang, Schroder Syariah Balanced Fund, and TRIM Syariah Berimbang). Thus, we can also see that 21 other efficient funds are conservative managed funds. However, it is also surprising to find that among 16 funds that have all positive Sharpe, Treynor, and Jensen Alpha, 8 of them do not belong with efficient managed funds. Thus, we can see that 16 out of 24 efficient funds have problems in either Sharpe, Treynor, or Jensen Alpha. It is also felt odd to see that the worst performed managed funds based on covariance, Harvestindo Istimewa, is also deemed efficient. Obviously, these findings require more explanations. Therefore, we need more sophisticated table to explain what is occuring among efficient funds and we see how three negative-return managed funds are deemed efficient. Hence, out of the 9 managed funds that overcame Sharpe, Treynor, and Jensen alpha, there are 13 others that possess positive daily return which 12 of them are surprisingly less than weighted benchmark daily return of 0.02807%. All efficient managed funds also only generates 0.0220% of daily return or 5.37%, compared to 0.0166% daily return / 4.0434% anually.

Such findings are also discussed by Banker et al., (1984) in what Chen and Lin finds where DEA is a comprehensive tool to include any kinds of inputs that are even negative in order to create maximum inputs. Chen and Lin (2006) also discusses possibility of possessing models with negative amount of outputs because the model might even take into account of efficient DMUs with negative amount. Therefore, such predicament might occur in researches. This hole is a point that researchers need to be aware of. Thus, understanding the nature of the research is exceedingly important task to do, compared to our abillity to operate and generate results from the software.

4.2.2. DEA Slacks Solution

On the other hand, we can also evaluate variables of the efficient and inefficient funds that should have been able to perform better. The least inefficient variable is kurtosis, followed by Value-at-Risk and Sharpe ratios, which all have less than 12 funds with inefficient variables in that category. Jensen alpha has the most funds which are inefficient, followed by Treynor ratio, βj, return, and the root of semi lower variance. This must be because of the full coverage of factors that the Jensen Alpha has. It comprises the return, standard deviation, risk-free rate asset, weighted benchmark return, and the betha, all at once. Readers might evaluate by using his/her own preferences to see which favored variable needs to be highlighted. For example, all funds that overcame Sharpe, Treynor, and Jensen Alpha in Table 4.2. except TRIM Kombinasi 2, AAA Balanced Fund, and First State MS (which should have performed better with given amount of inputs) have performed efficiently in returns. On the other hand, it is also proven that possessing kurtosis and skewness is efficient among Indonesian managed funds, which really emphasizes the importance of overcoming performance measures that only cover the assumption of normally distributed returns.

Besides that, among efficient returns, TRIM Kombinasi II possesses unique characteristics. It only lacks some points near 1×10^{-10} to reach efficient variables of standard deviation, root of semi lower variance, β_j, VaR, CVaR, Sharpe, Jensen alpha, and return. Only for this DMU with such close to 0 amount of slacks, the OSDEA-GUI still deems it as efficient decision making unit.

Table 4.3.
Summary Report of DEA Solutions with Performance Measures
Indonesian Managed Funds (2011 – MID 2015)

Rank	DMU Name	Objective Value	STDEV of Return (%)	SQ of SLV (%)	Bj	Skewness	Kurtosis	VaR (%)	CVaR (%)	Sharpe (%)	Treynor (%)	Jensen Alpha (%)	Return (%)
1	Semesta Dana Maxima	1	0.8677	0.9815	0.4292	-0.9340	9.9791	0.5306	1.0217	1.5833	0.0542	0.0192	0.0418
2	TRIM Kombinasi II	1	0.8739	0.9873	0.3235	-0.7876	8.2836	0.2990	0.9003	4.5754	0.0662	0.0183	0.0400
3	Harvestindo Istimewa	1	0.0432	0.0503	-0.0775	0.5128	479.2280	0.0038	0.0401	-82.3573	0.3361	-0.0049	-0.0075
4	TRIM Syariah Berimbang	1	0.9480	1.0286	0.3326	-0.5961	7.6642	0.1544	0.8265	3.5720	0.0460	0.0121	0.0339
5	BNP Paribas Equitra	1	0.3610	0.3788	0.0721	0.7555	109.1372	0.1086	0.3556	-3.8305	-0.0598	-0.0050	0.0142
6	First State Indonesia Balanced Fund	1	0.5926	0.6138	0.1970	0.6267	129.4017	0.1265	0.5732	-0.6992	0.0273	0.0035	0.0239
7	Equity Prima	1	0.1897	0.1890	0.0582	-0.0402	132.8360	0.4448	0.5220	-3.4806	0.0501	0.0024	0.0215
8	Net Dana Fleksi	1	0.8284	0.8662	0.3461	-0.5134	7.9320	0.0124	0.6854	-8.1207	-0.1668	-0.0610	-0.0392
9	Intru Garuda Satu	1	0.5108	0.5675	0.1433	-0.9262	8.4638	0.0685	0.4524	-3.4328	-0.0605	-0.0099	0.0099
10	HPAM Premium I	1	1.1428	1.0696	-0.0640	0.8005	22.8754	0.7707	1.4920	-0.3425	-0.0866	0.0061	0.0241
11	Cipta Dinamika	1	0.2877	0.3053	0.0875	-0.3164	4.3289	0.4011	0.5164	-3.1251	0.0060	-0.0003	0.0191
12	Harvestindo Maxima	1	0.3701	0.3899	0.1465	-0.6875	11.1114	0.5597	0.7496	-10.9912	-0.1881	-0.0295	-0.0090
13	Manulife Dana Campuran II	1	0.7301	0.8064	0.3225	-0.5477	7.0310	0.0192	0.5763	-1.2549	0.0011	-0.0027	0.0189
14	Minna Padi Keraton	1	0.7970	0.8409	0.3030	-0.3842	10.9571	0.0005	0.5992	0.4593	0.0435	0.0103	0.0317
15	Aberdeen Dana Handal	1	0.5488	0.5511	0.0656	-0.1507	13.3276	0.3457	0.6665	-0.8336	0.0695	0.0040	0.0231
16	Maybank GMT Dana Fleksi	1	0.6909	0.7749	0.3320	-0.8479	8.5041	0.1752	0.6592	0.5022	0.0391	0.0098	0.0315
17	AXA Citra Gold	1	0.5509	0.6471	0.2916	-1.6627	17.4695	0.1329	0.5416	-4.0696	-0.0442	-0.0157	0.0057
18	Kresna Mrs Flex	1	1.2166	1.1954	-0.1527	0.7324	19.4603	1.1655	1.7793	-1.7000	0.0736	-0.0098	0.0073
19	Schroder Dana Kombinasi	1	0.3910	0.4204	0.1121	-0.5133	8.6080	0.5239	0.6958	-0.2105	0.0717	0.0070	0.0266
20	Manulife Dana Stabil Berimbang	1	0.5346	0.5806	0.1872	-0.2996	6.7597	0.1547	0.5162	-2.3670	-0.0167	-0.0049	0.0154
21	Kresna Fleksima	1	0.9738	1.0346	0.3708	-0.7514	16.7599	0.5427	1.2235	3.5542	0.1190	0.0406	0.0627
22	Nikko BUMN Plus	1	0.9055	0.9554	0.2889	-0.6106	12.0181	1.1026	1.5248	2.1385	0.0977	0.0257	0.0468
23	SAM Syariah Berimbang	1	1.0146	1.0856	0.4064	-0.5018	5.7718	0.0439	0.8455	1.6108	0.0636	0.0220	0.0444
24	Schroder Syariah Balanced Fund	1	0.8042	0.8798	0.3073	-0.6192	12.4160	0.0074	0.3063	1.5899	0.0726	0.0194	0.0409

25	AAA Balanced Fund	0.9992834	0.8065	0.8756	0.3365	-0.5734	8.4052	0.0245	9.5266	0.1036	0.0308	0.0072	0.0289
26	Sucorinvest FF	0.868504	1.1261	1.2144	0.4823	-0.5006	9.0413	0.3882	1.1471	1.6782	0.0589	0.0238	0.0470
27	AAA Amanah Syariah Fund	0.8488197	0.6900	0.7359	0.2992	-0.5454	6.9778	0.2579	0.6948	-1.3247	0.0013	-0.0025	0.0189
28	Cipta Balanced	0.843292	0.7751	0.8162	0.2069	-0.7393	12.3814	0.0649	0.6433	-4.0346	-0.0522	-0.0257	-0.0032
29	Schroder Providence Fund	0.8426695	0.9593	1.0744	0.6335	-0.7736	9.0461	0.1245	0.8459	0.7379	0.0343	0.0120	0.0352
30	PNM Syariah	0.8331479	0.8019	0.8906	0.3661	-0.7359	7.8124	0.1480	0.7641	-4.3031	-0.0682	-0.0285	-0.0064
31	Mandiri Investa Aktif	0.8229906	0.8629	0.9380	0.3983	-0.5207	7.5577	0.1225	0.7563	-1.0710	0.0007	-0.0035	0.0188
32	MNC Dana Kombinasi	0.8144570	0.8394	0.8719	0.4513	-0.4272	15.6540	0.2738	0.8762	0.9690	0.0391	0.0134	0.0362
33	Mega Dana Kombinasi	0.8109136	0.7305	0.7992	0.1794	-0.5304	17.5749	0.0809	0.6549	-4.6744	-0.1373	-0.0263	-0.0061
34	Aberdeen Indonesia Balanced Growth Fund	0.806394	0.9099	0.9791	0.4414	-0.5546	9.1946	0.0712	0.7996	-0.7783	0.0055	-0.0018	0.0210
35	First State MS	0.8054054	1.1066	1.1833	0.5454	-0.5275	7.8481	0.1026	0.8597	0.1393	0.0203	0.0059	0.0296
36	Pratama Berimbang	0.8014459	1.2147	1.3137	0.6174	-0.5886	9.6610	1.0996	1.7701	1.5281	0.0455	0.0222	0.0466
37	Manulife Dana Tumbuh Berimbang	0.7624023	0.9225	1.0168	0.4477	-0.7476	8.5128	0.1550	0.8212	-1.0079	0.0005	-0.0040	0.0188
38	Panin Dana Unggulan	0.7490813	0.8388	0.8936	0.4341	-0.6421	10.0574	1.2026	1.5593	0.6315	0.0341	0.0107	0.0334
39	AXA Maestro Berimbang	0.747319	0.9032	0.9719	0.4488	-0.5559	8.2445	0.2581	0.8691	-0.2312	0.0166	0.0032	0.0260
40	Schroder Dana Terpadu II	0.7335748	0.7750	0.8417	0.2944	-0.5571	6.8515	0.8500	1.1919	-1.3483	0.0099	-0.0010	0.0215
41	Danareksa Anggrek	0.7232320	0.8644	0.9694	0.3898	-0.8950	9.2479	0.1802	0.8344	-1.9235	-0.0182	-0.0108	0.0115
42	SAM Dana Berkembang	0.6742662	1.0672	1.1430	0.5181	-0.6419	7.9615	0.2568	1.0332	-0.8915	0.0000	-0.0049	0.0186
43	Cipta Syariah Balance	0.6512066	0.8761	0.9164	0.4652	-0.3391	14.0594	0.3416	0.9134	-0.5231	0.0106	0.0005	0.0235
44	Batavia Dana Dinamis	0.6235856	1.0182	1.1191	0.4840	-0.7905	9.5692	0.3462	21.3640	-0.5220	0.0087	-0.0004	0.0228
45	BNP Paribas Dana Investa	0.6075214	0.9909	1.0713	0.4936	-0.6324	9.6359	0.3954	1.0307	-0.6402	0.0061	-0.0018	0.0217
46	CIMB Principal Balanced Growth	0.5646115	1.0605	1.0818	0.5357	-0.4667	10.6000	0.3056	0.9911	-1.9228	-0.0203	-0.0160	0.0077
47	BNP Paribas Spektra	0.5087302	0.9452	1.0684	0.4936	-1.1556	12.4311	0.7476	1.2849	-1.6010	-0.0114	-0.0103	0.0129
48	Star Balanced	0.4596858	0.8531	0.9548	0.5214	-0.8289	15.8029	0.5853	1.0777	-2.9069	-0.0293	-0.0202	0.0033
49	Kresna IPB	0.4552320	1.1382	1.5051	0.4969	-0.6106	12.0694	0.4921	1.2789	-5.3226	-0.1028	-0.0558	-0.0325
50	Prospera Balance	0.3785889	1.3430	1.4970	0.6373	-1.1685	14.3182	0.6730	1.4750	-3.9320	-0.0679	-0.0494	-0.0247

* Possessing slacks which are inefficient

(Source: Primary Data Calculation)

V. CONCLUSION

5.1. Conclusions

Based on the previous chapter's data collection and analysis, we can draw following statements of conclusion:

1. Indonesian managed funds averagely performed below than their weighted benchmark return as seen by their lower average of expected return. However, selecting best performers of these funds can be still profitable, even compared to the weighted benchmark return where the top 10 performers based on the covariance can generate 9.16%.annually.
2. 47 out of 50 funds are experiencing an increase in total risk measurement when wee apply the root of semi lower variance. This means that skeewness and kurtosis are able to be taken into account for most of Indonesian managed funds.
3. From only 2 among 50 funds which have invalid βj, we can see that Indonesian managed funds are positively influenced by the market. However, the market influence is still inelastic to the managed funds. Thus, this signifies that Indonesian managed funds are safely composed without exaggerating effect from the financial market.
4. There are only 16 Indonesian managed funds that are able to overcome the weighted benchmark return, risk-free rate asset, total risk, systematick risk, or the CAPM betha at the same time with 9.62% annualized expected return and the top performers based on merely covariance cannot measure this.
5. All Indonesian managed funds possess kurtosis and only 1 fund does not have the skewness. This proves that what Chen and Lin (2006) discuss is true to include more sophisticated performance evaluation to include variables which measure skewness and kurtosis.
6. 8 Indonesian managed outperformed others in terms of performance in the variables and efficiency among variables and DMUs. They are: (1) Semesta Dana Maxima, (2) TRIM Kombinasi II, (3) TRIM Syariah Berimbang, (4) Minna Padi Keraton, (5) Krena Flexima, (6) Nikko BUMN Plus, (7) SAM Syariah Berimbang, and (8) Schroder Syariah Balanced Fund, where three of them are syariah managed funds and on the other hand, except for kurtosis, VaR, and Sharpe, Indonesian managed funds should have performed better.

5.2. Research Limitations and Suggestions

This research has limitations due to several predicaments. Thus, several suggestions are also given for future research:

1. The inavailability of Indonesian managed funds' transaction cost. As suggested by Chen and Lin (2006), providing transaction cost information is necessary to describe more variables that directly affect investors' choice of investment. Subsciption and redemption costs are some examples of transaction costs that are going to so meaningful to be applied in DEA model.
2. STABLE program software. The expensive STABLE program software is also suggested by Chen and Lin (2006) to conduct the DEA fully. There are three advantages of having the STABLE program: (1) Standardizing the VaR and CVaR, (2) Conduct the DEA at weighted-standardized more than 1 runs, and (3) Overcoming the negative outputs in models by applying Translation Invariance Property.
3. For future researches, the author suggests several things concerning the topics that are:
    a. Using more DEA models
    b. Utilizing several other constraints of the linear program of DEA to analyze and comprehend the characteristics and results among decision making units

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