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Assessing Performance of Mutual Funds in Indonesia

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This study empirically assesses the relative efficiency of mutual funds in Indonesia during the period 2004 to 2007. To measure their efficiencies, the output-input data consisting of a panel of 23 mutual funds are empirically examined based on the most commonly used non-parametric approach, namely, Data Envelopment Analysis (DEA). The study finds that, on average, the mutual funds experienced a decrease in total factor productivity (TFP) growth. It is mainly caused by a declining in both efficiency and technical efficiencies, where the efficiency change is largely contributed by the changes in pure efficiency rather than scale efficiency. The findings of the study suggest that the mutual funds' industry in Indonesia has a great opportunity to promote its TFP by constantly optimizing and upgrading the educational and training programs intended to improve managerial ability and to speed up the adoption of new technologies.

1. Introduction

Assessing the performances of mutual funds has become a main concern for investors and managers in the finance industry.[3] Information about the performances of mutual funds is one of the major considerations taken into account by investors in the fund-selection decision. Meanwhile, by referring to mutual funds' performances, it enables fund managers towards better pricing, attracting greater inflow of funds and improving their profitability. Thus, knowing their performances, fund managers can design a proper strategy and policy to improve their competitive ability against their competitors.

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[3] Mutual Funds are also generally called 'Reksadana' in the Indonesia. As the term mutual funds are commonly used in Indonesia rather than the term unit trusts, thus this study adopts this terminology.

Despite there have been many empirical studies assessing the performances of conventional mutual funds in advanced economies, the study on the performance of mutual funds in Asian emerging markets has been meagre. Among the studies on the performances of mutual funds in Asian markets were conducted by Annuar et al. (1997), Hayat (2006), Md. Taib and Isa (2007), Abdullah et al. (2007). By using the model developed by Treynor and Mazuy (1966), Annuar et al. (1997) examined the performances of 31 mutual funds in Malaysia for the period 1990-1995. They found evidence that these Malaysian funds outperformed their benchmark but were poor at timing the market. Furthermore, they also found a positive correlation between the market timing ability and security selection ability. Meanwhile, Hayat (2006) utilized the Sharpe Ratio (SR), the Treynor Ratio (TR), the Information Ratio (IR), the Modigliani and Modigliani measure (MM), and the TT measure (TT) to empirically assess the performances of 44 mutual funds in Malaysia during the period from August 17, 2001 to August 25, 2006. He found that during the normal market condition, there were no significant different between the performances of Islamic and conventional funds. During the bear market of 2002, the Islamic equity funds however significantly outperformed the conventional markets. Furthermore, Islamic equity funds seemed to be the most attractive as part of a larger fully diversified portfolio as they have good systematic risk-to-return ratios.

Md. Taib and Isa (2007) employed seven different performance measures: raw return, market adjusted return, Jensen (1968)'s alpha, adjusted Jensen (1972)'s alpha, Sharpe Index, adjusted Sharpe Index, and Treynor Index to assess 110 unit trusts in Malaysia over the period 1991-2001. They found that, on average, the performance of Malaysian unit trusts fell below the market portfolio and risk free returns. However, the variance of unit trust monthly returns was less than the market. The performance by type of funds indicates that bond funds show relatively superior performance, over and above the market and equity unit trusts. By using the Sharpe (1965) index and adjusted Sharpe (1966) index, Jensen (1968)'s Alpha, Timing and selectivity ability, Abdullah et al. (2007) empirically explored the performances of 65 mutual funds in Malaysia during the period from January 1992 to December 2001. The Islamic funds were documented to perform better than the conventional funds during bearish economic trends, while conventional funds showed better performance than Islamic funds during bullish economic

conditions. From the methodological perspectives, all the above reviewed studies have used traditional methods to investigate the performances of mutual funds.

In general, there have been two major traditional indexes used to measure mutual funds performance, i.e., the Treynor index (Treynor, 1965) and Sharpe index (Sharpe, 1966). The former is the spread between the fund's unadjusted total return and the risk free rate which is divided by the beta of the fund while the latter is the spread between the fund's unadjusted total return and the risk free rate which is divided by the standard deviation of the fund's unadjusted total return. Since the introduction of these indexes, studies on the performance of mutual funds have focused on two dimensions; the risk and return by relying on the Capital Asset Pricing Model (CAPM). The results of these studies relied mainly upon the benchmark portfolio used and the measurement of the risk. Basso and Funari (2001) discovered that although these indexes were potentially very useful, but they did not take into account the subscription and redemption costs in determining the overall return on the investment.

Better methods have been introduced to measure the performance of mutual funds. One recent approach to the evaluation of mutual funds performance is by measuring its efficiency. Two approaches have been used to measure efficiency, namely parametric and nonparametric. The former approach includes the Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA) and Tick Frontier Approach (TFA), while the latter approach includes the Data Envelopment Analysis (DEA), Free Disposal Hull (FDH), Index Number (IN) and Mixed Optimal Strategy (MOS). These two approaches use different techniques to envelope a data set with different assumptions for random noise and for the structure of production technology.

Among those methods, SFA (parametric) and DEA (nonparametric) have been widely used in the literature to measure the efficiency of mutual funds. The SFA is an econometric frontier approach which specifies a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and allows for random error. The benefit for this method is a composed error model where inefficiencies are assumed to follow an asymmetric distribution, which is usually the half-normal, while random errors follow a

symmetric distribution, usually the standard normal (Berger and Humphrey, 1997). However, there are several limitations when measuring the production efficiency using the SFA method. Although the statistical noise can be distinguished from the random error, the SFA may suffer from strong assumptions, particularly when econometrics has to deal with the hypothesis required on the distribution of the inefficiency component and its independence from other factors determining producer behavior.

On the other hand, the DEA is a non-parametric method that has been widely employed in operations research to compute relative measures of efficiency. For example, the DEA has been used to measure the relative efficiency of public sector activities [e.g., educational programs by Charnes et al. (1978)] and non-profit organizations [e.g., hospitals by Banker et al. (1984)]. Hitherto, the DEA has been extended its application to measure efficiency of many profit oriented companies such as the airlines by Alam and Sickles (1995), the telecommunication industry by Asai and Nemoto (1999), the banking industry by Omar et al. (2006); Mohd. Zamil and Abdul Rahman (2007); and the insurance industry by Md. Saad et al. (2007).

Among the superiorities of the DEA in measuring mutual funds efficiency is its ability to take into account many factors that are associated with the funds' performance. The DEA also allows us to define mutual funds' performance indexes that can take into account different risk measures and the investment costs. Moreover, the DEA does not require any theoretical models such as CAPM or Arbitrage Pricing Theory (APT) as a measurement benchmark. As an alternative, the DEA measures how well a fund performs relative to the best set of funds within the objective settings. The DEA enables the identification of the relative importance among the inputs (transaction costs); for example, we can observe the marginal contribution of each input in affecting returns (Jemric and Vujcic, 2002). Since the DEA does not take into account random errors, we can assume that the underlying distributional form for the error term (Pallegrina, 2005). Therefore, the mathematical programming procedures used by the DEA for efficient frontier estimation is comparatively robust (Seiford and Thrall, 1990). In addition, the DEA also provides robust finding when the sample size of a firm was small (Maghyereh, 2004; and Neal, 2004).

In assessing performances of mutual funds both in the developed and emerging economies, the DEA have been adopted by few studies. Murthi et al. (1997) and Choi and Murthi (2001) measured performances of mutual funds in the US, while Basso and Funari (2001) and Galagedera and Silvapulle (2002) investigated performances of mutual funds in Italy and Australia, respectively. On the other hand, Chen and Lin (2006) assessed the performance of mutual funds in emerging economy of China. While the study of mutual funds' performance is gaining attention in the developed countries and some other emerging economies, research on an open-big developing country of Indonesia has been inexistence. Despite the mutual funds' industry having experienced phenomenal growth in Indonesia, the study on performance and efficiency of the Indonesian mutual funds is highly important and timely. Thus, this study attempts to fill this gap by assessing selected mutual funds in Indonesia using the DEA. The findings of this study will shed some lights for investors to select the right funds and for managers to improve their funds performances and gain their competitive advantages against their contenders.

Specifically, this study empirically measures the performances of selected mutual funds in Indonesia during the period 2004 – 2007. It also attempts to empirically assess the relative efficiency of the mutual funds in Indonesia.

The rest of this study is structured as follows. Section 2 provides a brief overview of the Indonesian mutual funds' industry. Data and methodology framework are in turn discussed in Section 3. The discussion and some implications of the study are presented in Section 4. Finally, Section 5 concludes the paper.

2. An Overview of Mutual Funds' Industry in Indonesia

According to the Capital Market Act No. 8 (1995), mutual fund is referred to an investment company that has been approved by the Supervisory Capital Market of Indonesian Agency (BAPEPAM),[4] which pools money from shareholders and invests in a diversified portfolio of

[4] BAPEPAM – Badan Pengawas Pasar Modal is a capital market supervisory agency which reports and is responsible to the Minister of Finance. BAPEPAM shall provide guidance, regulation, and day to day supervision of the capital market.

securities.[5] Mutual fund investment is simple, accessible, and affordable. There are many advantages of investing through mutual funds such as professional management, diversification, variety, liquidity, affordability, convenience, and ease of record keeping as well as strict government regulations and full disclosure (Investment Company Institute, 2004). Mutual funds were first introduced in Indonesia within the framework of the Capital Market Act No. 8 (1995). After the first mutual fund, BDNI Reksadana was instituted in 1996, in the same year there were 25 mutual funds were established with the total amount of funds managed of Rp 2.78 trillion (see Table 2.1). In 1997, the number of mutual funds has significantly increased to 77 (208 percent) from 1996 with the total funds managed of Rp 4.91 trillion.

The development of mutual funds' industry in Indonesian has been very much influenced by macroeconomic conditions. When the 1997 financial turmoil hit the country, the growth of mutual funds has slowed down. In 1998, the number of issuers only grew by 5.19 percent and the value of issuers decreased dramatically by 39.22 percent from the year 1997. The worse condition occurred in the bond market where there was virtually no new issue during this period (BAPEPAM Master Plan, 2005-2009).

However, the industry grew more rapidly after 2002, due to the dramatic increase in fixed-income funds, which was invested mainly in the Rupiah-denominated government securities. Declining interest rates (and rising bond prices) provided a favourable environment for launching recap bond funds. At the end of 2004, mutual funds were amounting to Rp 104 trillion or US$10.4 billion (see Table 2.1). In 2005, BAPEPAM reported that the number of managed funds dramatically fell by 72 percent from Rp 104.04 trillion in 2004.

[5] UU Pasar Modal RI, No.8 (1995), Bab IV (Capital Market Law Republic of Indonesia No.8 (1995) Chapter IV), See http://www.BAPEPAM.go.id/pasar_modal/regulasi_pm/uu_pm/index.htm.

Table 2.1:Net Asset Value of Mutual Funds, 1995-2006
(in billion Rupiahs)

Indicator	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Net Asset Value											
Money Market Fund	16	25	38	575	1,244	2,217	7,181	7,856	9,439	2,080	3,799
Fixed-Income Fund	1,898	3,439	1,894	2,744	3,062	4,661	37,336	57,485	88,059	13,924	19,542
Balanced Fund	350	862	522	729	650	635	1795	3734	4648	5,468	8,483
Equity Fund	519	590	539	927	560	491	302	402	1892	4,934	8,249
Protected Fund										3,008	11,327
Index Fund											29
Total	**2,782**	**4,917**	2,992	4,974	5,516	8,004	46,614	69,478	**104,038**	**29,415**	**51,991**
No of products											
Money Market Fund	6	21	22	23	26	29	31	20	31	33	-
Fixed-Income Fund	12	31	32	31	35	46	61	116	146	170	160
Balanced Fund	1	3	4	5	8	10	17	30	46	78	-
Equity Fund	6	22	23	22	25	23	22	20	23	30	34
Protected Fund	-	-	-	-	-	-	-	-	-	18	76
Index Fund											**1**
Total	25	**77**	**81**	81	94	108	131	186	246	**329**	**403**

Source: BAPEPAM-LK[6] (2006).

[6] BAPEPAM-LK is a merger of Capital Market Supervisory Agency with the General Director of Financial Institution (DJLK–Direktorat Jenderal Lembaga Keuangan) that approved by the Government of Indonesia with the enactment of the President's Rule No. 62 (2005). The merger of these two units of Ministry of Finance of the Republic of Indonesia would subsequently produce a single new unit simply called BAPEPAM-LK.

Moreover, when the world fuel price increased which lead to cost-push inflation, the interest rate which called the Central Bank Certificate Rate (SBI – Sertifikat Bank Indonesia) rose to 12.75 percent. As a result, the banking industry has to increase its deposit interest in order to attract more customers. This condition might cause the investors to withdraw their funds from the mutual funds to the bank depository. Finally, in line with the Indonesian economic recovery agenda to lower interest rates, inflation, and to increase the stock market composite index, the mutual funds become again more attractive for investors. The number of managed funds has significantly increased from Rp 29.40 trillion in 2005 to Rp 51.62 trillion at the end of 2006.

In terms of their types, mutual funds in Indonesia is generally divided into five types, namely equity, fixed-income, money market, balanced-mixed and protected funds. As of 2005, fixed income holds the largest portion which reached 47.3% of total net asset value, followed by balance fund is 18.5%, while money market fund recorded the lowest which only 0.7%. The biggest portion of fixed income was mainly invested on debt/securities issued by government (2.4 percent of total) and corporate (45.1 percent of total). Since interest rate set by Bank of Indonesia increased to around 12% as to maintain currency and inflation rate was badly affected the bond price. High interest rates made the investment in bond less attractive, and it drove the investor to redeem their investment in fixed income fund. This situation made a decrease significantly in Net Asset Value of funds as fixed income holds the biggest portion of the portfolio at the end of 2005.

Hitherto, the mutual funds industry in Indonesia has been playing an important role in promoting economic growth of the country. As reported by BAPEPAM, in 2006, mutual fund industry experienced a positive increase after suffered a massive redemption in 2005. It can be seen from the increasing of the Net Asset Value from Rp29.40 Trillion in 2005 to Rp51.43 Trillion in 2006 which contributed 2.4 percent of total financial assets and 1.5 percent of GDP or increased 0.4 percent of GDP from 2005 (see Table 2.2).

Table 2.2: Structure of Financial Sector

Type of institution	**Assets (Rp trillion)**		**Asset (%)**		**GDP *(%)**	
	2005	2006	2005	2006	2005	2006
Banks	1,470	1,693.5	78.8	80	52.7	51.3
Non-bank financial institutions	*393.9*	*425.4*	*21.1*	*20*	*14.1*	*13.4*
Finance Companies	67.7	108.9	3.6	5.1	2.4	3.2
Insurance Companies	75.1	94.7	4.0	4.4	2.6	2.8
Pension funds	63.4	77.4	3.4	3.7	2.2	2.3
Pawnshops (Pegadaian)	4.8	6.0	0.2	0.3	0.1	0.1
Rural institutions	20.3	23.0	1.0	1.0	0.7	0.6
Mutual funds	29.4	51.6	1.5	2.4	1.1	1.5
Venturecapital companies	2.7	2.3	0.1	0.1	0.1	0.1
Outstanding corporate bonds	62.8	61.5	3.3	3.0	2.2	1.8
Total	\1863.9	2118.9	100	100.0	66.9	63.4
Equity market capitalization	801	1,249	n.a	n.a	28.7	37.4

Source: Bapepam-LK, Bank Indonesia, Indonesia Stock Exchanges (IDX), 2006.
Note: *GDP 2005:2,785.0 trillion and GDP 2006: 3,338.2 trillion

3. Methodology Framework and Data

3.1. Data Envelopment Analysis (DEA)

The methodology used the Data Envelopment Analysis (DEA) approach to measure the relative performance of selected mutual funds in Indonesia. It is a suitable method to be used in this study as our sample size is small (Maghyereh, 2004; and Neal, 2004). Additionally, DEA is not vulnerable to the disproportion of small sample error as in the econometric model (Dogan and Fausten, 2003). We specifically uses the generalized output-oriented Malmquist index, developed by Fare et al. (1989) to measure the contribution from the progress in technology (technical change) and improvement in efficiency (efficiency change) to growth of productivity of the Indonesian mutual funds' industries. The

Malmquist indexes are constructed using the DEA and estimated using a program developed by Coelli (1996).

Following Fare et al. (1989), the Malmquist productivity index is written as follows:

$$M_0\left(x^t, y^t, x^{t+1}, y^{t+1}\right) = \frac{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{D_0^t\left(x^t, y^t\right)} \times \left[\left(\frac{D_0^t\left(x^{t+1}, y^{t+1}\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}\right)\left(\frac{D_0^t\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t y^t\right)}\right)\right]^{\frac{1}{2}} \quad (3.1)$$

where the notations $D_0\left(x^{t+1}, y^{t+1}\right)$, represents the distance from the period *t+1* observation to the period *t* technology. The first ratio on the right hand side of the equation (3.1) measures the change in relative efficiency (i.e., the change in how far observed production is from the maximum potential production) between year *t* and *t+1*. The second term inside the brackets (geometric mean of the two ratios) captures the shift in technology (i.e., movements of the frontier function itself) between the two periods evaluated at x^t and x^{t+1}. That is,

$$\text{Efficiency Change} = \frac{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{D_0^t\left(x^t, y^t\right)} \quad (3.2)$$

$$\text{Technical Change} = \left[\left(\frac{D_0^t\left(x^{t+1}, y^{t+1}\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}\right)\left(\frac{D_0^{t+1}\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t, y^t\right)}\right)\right]^{\frac{1}{2}} \quad (3.3)$$

Essentially, the former investigates how well the production process converts inputs into outputs (catching up to the frontier) and the later reflects the improvement in technology. According to Fare et al. (1994), improvements in productivity yield Malmquist index values greater than unity. Deterioration in performance over time is associated with a Malmquist index less than unity. The same interpretation applies to the values taken by the components of the overall TFP index. An improvement in the efficiency component yield index values greater than one and is considered to be evidence of catching up (to the frontier). Values of the technical change component greater than one are considered to be evidence of technological progress.

In empirical applications, the distance measures that appear in (3.1) above are calculated for each operator in each pair of adjacent time periods using the mathematical programming technique. We assume

that there are $k = 1,\ldots, K$ firms that produce $m = 1,\ldots, M$ outputs $y^t_{k,\,m}$ using $n = 1,\ldots, N$ inputs $x^t_{k,\,n}$ at each time period $t = 1, \ldots, T$. Under DEA, the reference technology with constant returns to scale (CRS) at each time period t from the data can be defined as

$$G^t = \left[\left(x^t, y^t\right): y^t_m \le \sum_{k=1}^{k} z^t_k y^t_{k,m} \right] \quad m = 1,\ldots, M,$$

$$\sum_{k=1}^{k} z^t_k x^t_{k,n} \le x^t_n \qquad n = 1,\ldots,N, z^t_k \ge 0 \qquad K = 1,\ldots, K, \tag{3.4}$$

where z^t_k refers to the weight on each specific cross-sectional observation. Following Afriat (1972), the assumption of constant returns to scale may be relaxed to allow variable returns to scales by adding the following restriction:

$$\sum_{k=1}^{k} z^t_k = 1 \quad (VRS) \tag{3.5}$$

Following Fare et al. (1994), this study used an enhanced decomposition of the Malmquist index by decomposing the efficiency change component calculated relative to the constant returns to scale technology into a pure efficiency component (calculated relative to the VRS technology) and a scale efficiency change component which captures changes in the deviation between the VRS and CRS technology. The subset of pure efficiency change measures the relative ability of operators to convert inputs into outputs while scale efficiency measures to what extent the operators can take advantage of returns to scale by altering its size toward the optimal scale.

To construct the Malmquist productivity index of firm k' between t and $t+1$, the following four distance functions are calculated using the DEA approach: $D^t_0\left(x^t, y^t\right), D^{t+1}_0\left(x^t, y^t\right)$, $D^t_0\left(x^{t+1}, y^{t+1}\right), D^{t+1}_0\left(x^{t+1}, y^{t+1}\right)$. These distance functions are the reciprocals of the output-based Farrell's (1957) measure of technical efficiency. The non-parametric programming models used to calculate the output-based Farrell (1957) measure of technical efficiency for each firm $k' = 1,\ldots, K$, is expressed as:

$$\left[D^t_0\left(x^t_k, y^t_k\right)\right]^{-1} = \max\ \lambda^{k'} \tag{3.6}$$

subject to

$$\lambda^{k'} y^t_{k,m} \le \sum_{k=1}^{K} z^t_k y^t_{k,m} \qquad m = 1,\ldots, M,$$

$$\sum_{k=1}^{K} z_k^t x_{k,n}^t \le x_{k',n}^t \qquad n = 1,\ldots, N, \tag{3.7}$$

$$\sum_{k=1}^{K} z_k^t = 1 \qquad (VRS) \qquad z_k^t \ge 0 \qquad K = 1,\ldots, K.$$

The computation of $D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)$ is similar to (3.7), where *t+1* is substituted for *t*.

Construction of the Malmquist index also requires calculation of two mixed-distance functions, which is computed by comparing observations in one time period with the best practice frontier of another time period. The inverse of the mixed-distance function for observation *k*' can be obtained from

$$\left[D_0^t\left(x_{k'}^{t+1}, y_{k'}^{t+1}\right)^{-1}\right] = \max\ \lambda^{k'} \tag{3.8}$$

Subject to:

$$\lambda^{k'} y_{k,m}^t \le \sum_{k=1}^{K} z_k^t y_{k,m}^t \qquad m = 1,\ldots, M,$$

$$\sum_{k=1}^{K} z_k^t x_{k,n}^t \le x_{k',n}^t \qquad n = 1,\ldots, N, \qquad \sum_{k=1}^{K} z_k^t = 1 \qquad (VRS)$$

$$z_k^t \ge 0 \qquad K = 1,\ldots, K. \tag{3.9}$$

To measure changes in scale efficiency, the inverse output distance functions under the VRS technology are also calculated by adding (3.5) into the constraints in (3.7) and (3.9). Technical change is calculated relative to the CRS technology. Scale efficiency change in each time period is constructed as the ratio of the distance function satisfying CRS to the distance function under VRS, while the pure efficiency change is defined as the ratio of the own-period distance functions in each period under VRS. With these two distance functions with respect to the VRS technology, the decomposition of (3.1) becomes:

$$M_0\left(x^t, y^y, x^{t+1}, y^{t+1}\right) = \left(\frac{D_0^{t+1}\left(x^t, y^t\right)}{D_0^t\left(x^t, y^t\right)}\right)\left(\frac{D_0\left(x^{t+1}, y^{t+1}\right)}{D_0^t\left(x^t, y^t\right)}\right)^{\frac{1}{2}} \times \left(\frac{D_0^t\left(x^t, y^t\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}\right) \times$$

$$\left(\frac{D_{oc}^{t+1}\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t, y^t\right)} \frac{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{D_{oc}^{t+1}\left(x^{t+1}, y^{t+1}\right)} \frac{D_{oc}^t\left(x^t, y^t\right)}{D_0^t\left(x^t, y^t\right)} \frac{D_0^t\left(x^{t+1}, y^{t+1}\right)}{D_{oc}^t\left(x^{t+1}, y^{t+1}\right)}\right)^{\frac{1}{2}} \quad (3.10)$$

Where

$\left(\frac{D_0^{t+1}\left(x^t, y^t\right)}{D_0^t\left(x^t, y^t\right)}\right)\left(\frac{D_0\left(x^{t+1}, y^{t+1}\right)}{D_0^t\left(x^t, y^t\right)}\right)^{\frac{1}{2}}$ = Technical Change

$\left(\frac{D_0^t\left(x^t, y^t\right)}{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}\right)$ = Pure Efficiency Change

$\left(\frac{D_{oc}^{t+1}\left(x^t, y^t\right)}{D_0^{t+1}\left(x^t, y^t\right)} \frac{D_0^{t+1}\left(x^{t+1}, y^{t+1}\right)}{D_{oc}^{t+1}\left(x^{t+1}, y^{t+1}\right)} \frac{D_{oc}^t\left(x^t, y^t\right)}{D_0^t\left(x^t, y^t\right)} \frac{D_0^t\left(x^{t+1}, y^{t+1}\right)}{D_{oc}^t\left(x^{t+1}, y^{t+1}\right)}\right)^{\frac{1}{2}}$ = Scale Efficiency Change

Note that when the technology in fact exhibits CRS, the scale change factor equals to one and it is the same decomposition as (3.1).

3.2 Data

A total of 23 selected funds consisting of 11 fixed income, 9 balanced fund and 3 equity funds are investigated in this study. The data for this study are collected from the annual report and prospectus of the selected mutual funds. Data for inputs and output are mainly gathered from the Bloomberg Database (2007) for the period from 2004 to 2007. Three inputs and one output are used to examine performances of mutual funds in Indonesia. Following Galagedera and Silvapulle (2002) and Murthi et al. (1997), front-end load/entry fee, redemption/exit fee and expense ratio are used as the inputs, while total return is used as an output, following (Dorm and Walker, 1996).

Table 3.1 shows the descriptive statistics of inputs and outputs of the 23 mutual funds' industry across categories in Indonesia during the period of study. Si Dana Fleksi was found to have the highest amount of front-end loads within the period of study, while Manulife Phnisi Dana Saham

(equity), Manulife Dana Campuran (balanced funds) and Manulife Pendapatan Bulanan (debt) were recorded to have the lowest front-end loads to the investors. As for redemption fees, Mahanusa Phnisi Dana Saham seems to have the highest, while BNI Dana Berbunga Dua, BNI Dana Plus and BNI Berkembang have the lowest redemption fees, respectively.

In terms of expense ratio, AAA Bond Fund seems to have the lowest expense ratio to the investors, while Manulife Phnisi Dana Saham recorded the highest expense ratio. As for the output, Mahanusa Dana Kapital (balanced funds) has the highest output; return within the period of analysis, while Mandiri Pendapatan Tetap (debt) has the lowest return compared to the others. On average, the amount of front-end loads, redemptions fee and expense ratio were Rp 16.17, Rp 27.67 and Rp 45.92, respectively. Meanwhile, the average of return was 113.21%.

Table 3.1:
Descriptive Statistics of Inputs and Outputs, 2004-2007

Input	Mean	Median	Maximum	Minimum	S.D
Front-end loads (Rp/unit)	16.174	13.395	73.980	0.000	14.740
Redemptions fee (Rp/unit)	27.672	13.665	473.060	0.000	70.204
Expense ratio (Rp/unit)	45.915	30.850	279.110	7.940	43.029
Output					
Total return (%)	113.207	111.715	164.090	75.760	15.956

4. Empirical Results, Discussion and Implications

In this section we will report the findings of production frontier and efficiency level of mutual funds, the productivity performance of individual mutual funds, and the productivity performance for the entire industry.

4.1. Productivity Performance of the Individual Mutual Funds' Industry

In assessing the productivity performance of 23 mutual funds, we used the Malmquist Total Factor Productivity (TFP) index which provides

two types of productivity and efficiency measures, i.e., relative technical change and mutual funds relative efficiency change. However, change in efficiency consists of two components, i.e., pure efficiency change and scale efficiency change. It is noted that the value of the Malmquist TFP index and its components being less than one implies a decrease or deterioration. Values greater than one indicate improvements in the relevant aspects. Subtracting 1 from the number reported in the Tables 4.1 through 4.5 indicates an average increase or decrease per annum for the relevant time period and the relevant performance measurement.

4.1.1. Mutual Funds Relative Malmquist TFP Change

Table 4.1 presents changes in the Malmquist-based Total Factor Productivity (TFP) index. During the period of 2004-2005, none of the mutual funds were found to have a positive TFP change. AAA Bond Fund, Big Dana Liquid, Bhakti Big Nusantara, BNI Dana Berbunga Dua, BNI Dana Plus, Mandiri Dana Pendapatan Tetap, Manulife Pendapatan Bulanan, Mega Dana Kombinasi, Mega Dana Obligasi and Mahanusa Obligasi Pemerintah have positive productivity changes for the years of 2005-2006. However, all funds except Bhakti Big Nusantara and Mega Dana Kombinasi experienced deterioration in TFP for the period 2006-2007. Moreover, only Bhakti Big Nusantara experienced some improvements consistently in TFP change from 2004-2007. Since Bhakti Big Nusantara and Mega Dana Kombinasi have asset class in equity and in balanced funds, respectively, thus no surprise if this funds were still relatively stable in 2005-2007. The funds were not directly affected by a rise in interest rates, depreciation of the rupiah and higher world fuel prices which can cause massive redemption in fixed-income mutual funds by investors.

Table 4.1:
Mutual Funds' Industry Relative Malmquist TFP Change, 2004-2007

No	Funds Name	2004-2005	2005-2006	2006-2007	Mean
1	AAA Bond Fund	0.898	1.209	0.764	0.940
2	Bhakti Big Nusantara	0.973	1.071	1.117	1.052
3	Bhakti Big Palapa	0.858	0.997	0.773	0.871
4	Big Dana Liquid	0.892	1.105	0.857	0.946
5	BNI Berkembang	0.777	0.911	0.673	0.781
6	BNI Dana Berbunga Dua	0.896	1.112	0.819	0.935
7	BNI Dana Plus	0.905	1.119	0.830	0.944
8	Dana Tetap Optima	0.902	0.999	0.871	0.923
9	Danareksa Anggrek	0.761	0.881	0.672	0.767
10	Danareksa Mawar	0.695	0.848	0.657	0.729
11	Mahanusa Danakapital	0.609	0.838	0.761	0.730
12	Mahanusa Obligasi Pemerintah	0.892	1.103	0.840	0.938
13	Mahanusa PDPTAN Tetap Negara	0.883	0.986	0.796	0.885
14	Mandiri Dana Pendapatan Tetap	0.889	1.320	0.817	0.986
15	Manulife Dana Campuran	0.742	0.869	0.708	0.770
16	Manulife Pendapatan Bulanan	0.946	1.157	0.807	0.959
17	Manulife Phnisi Dana Saham	0.682	0.789	0.625	0.696
18	Mega Dana Kombinasi	0.860	1.117	1.000	0.987
19	Mega Dana Obligasi Medali	0.870	1.105	0.873	0.943
20	Nikko Bond Nusantara	0.887	0.901	0.875	0.888
21	Nikko Bunga Nusantara	0.885	0.914	0.877	0.892
22	Nikko Gebyar Indonesia	0.927	0.936	0.876	0.913
23	Si Dana Fleksi	0.761	0.872	0.793	0.807
	Mean	**0.839**	**0.985**	**0.803**	**0.872**

Comparing to other funds, Bhakti Big Nusantara has the highest average TFP growth at an annual average rate of 5.2 percent, while all other funds generally have experienced deterioration in their TFP for the period of 2004-2007. Furthermore, the funds' industry in Indonesia experienced the highest deterioration between 2006 and 2007 at -19.7 percent. Once again, this may be due to the increase in the SBI rate at the end of 2005 which caused many investors to withdraw their funds from mutual funds (especially in fixed income funds) and switch them into the depository bank. Therefore, many mutual funds experienced losses. Indeed, the Indonesian macroeconomic condition at that time was relatively unstable, with a high rate of inflation, higher fuel prices, a depreciation of rupiah and a high interest rate.

4.1.2 Mutual Funds Relative Technical Change

The Malmquist TFP index is decomposed into its two sub components namely technical change and efficiency change.

Table 4.2:
Mutual Funds' Industry Relative Technical Change, 2004-2007

No	Funds Name	2004-2005	2005-2006	2006-2007	Mean
1	AAA Bond Fund	0.898	1.209	0.764	0.940
2	Bhakti Big Nusantara	0.859	1.046	0.777	0.887
3	Bhakti Big Palapa	0.881	1.087	0.804	0.916
4	Big Dana Liquid	0.904	1.115	0.781	0.934
5	BNI Berkembang	0.777	0.911	0.673	0.781
6	BNI Dana Berbunga Dua	0.896	1.112	0.819	0.935
7	BNI Dana Plus	0.905	1.119	0.830	0.944
8	Dana Tetap Optima	0.907	1.130	0.789	0.932
9	Danareksa Anggrek	0.890	1.157	0.795	0.935
10	Danareksa Mawar	0.890	1.155	0.796	0.935
11	Mahanusa Danakapital	0.893	1.166	0.789	0.937
12	Mahanusa Obligasi Pemerintah	0.898	1.210	0.764	0.940
13	Mahanusa PDPTAN Tetap Negara	0.903	1.172	0.775	0.936
14	Mandiri Dana Pendapatan Tetap	0.903	1.179	0.775	0.938
15	Manulife Dana Campuran	0.927	1.130	0.807	0.945
16	Manulife Pendapatan Bulanan	0.927	1.130	0.807	0.945
17	Manulife Phnisi Dana Saham	0.927	0.953	0.861	0.913
18	Mega Dana Kombinasi	0.900	1.192	0.775	0.940
19	Mega Dana Obligasi Medali	0.904	1.161	0.779	0.935
20	Nikko Bond Nusantara	0.910	1.105	0.798	0.924
21	Nikko Bunga Nusantara	0.915	1.060	0.815	0.924
22	Nikko Gebyar Indonesia	0.927	0.953	0.861	0.913
23	Si Dana Fleksi	0.901	1.172	0.790	0.941
	Mean	**0.896**	**1.114**	**0.792**	**0.925**

Table 4.2 displays the index values of technical progress/regress as measured by the average change in the best-practice frontier from period *t* to *t+1*. All funds except BNI Berkembang, Manulife Phnisi Dana Saham and Nikko Gebyar Indonesia experienced technical progress in period of 2005-2006 and Mahanusa Obligasi Pemerintah had the highest technical progress at 21 percent. However, for the periods of 2004-2005 and 2006-2007, all funds have technical regress. BNI Berkembang had the highest technical regress of -22.3 percent and -32.7 percent for the

respective periods. In addition, on the average, the years 2004-2005 and 2006-2007 were found to be the years of technical regress (-10.4 percent and -20.8 percent, respectively), while in the year 2005-2006, the funds in Indonesia experienced technical progress of 11.4 percent. Over the period of the analysis, on the average, all funds experienced technical regress and BNI Berkembang was found to be the most technical regressive funds (-21.9 percent).

4.1.3 Mutual Funds Relative Efficiency Change

Table 4.3:
Mutual Funds' Industry Relative Efficiency Change, 2004-2007

No	Funds Name	2004-2005	2005-2006	2006-2007	Mean
1	AAA Bond Fund	1.000	1.000	1.000	**1.000**
2	Bhakti Big Nusantara	1.132	1.023	1.439	**1.186**
3	Bhakti Big Palapa	0.975	0.917	0.962	**0.951**
4	Big Dana Liquid	0.987	0.957	1.098	**1.012**
5	BNI Berkembang	1.000	1.000	1.000	**1.000**
6	BNI Dana Berbunga Dua	1.000	1.000	1.000	**1.000**
7	BNI Dana Plus	1.000	1.000	1.000	**1.000**
8	Dana Tetap Optima	0.994	0.884	1.104	**0.990**
9	Danareksa Anggrek	0.855	0.762	0.846	**0.820**
10	Danareksa Mawar	0.781	0.734	0.826	**0.780**
11	Mahanusa Danakapital	0.682	0.719	0.963	**0.779**
12	Mahanusa Obligasi Pemerintah	0.993	0.921	1.100	**0.999**
13	Mahanusa PDPTAN Tetap Negara	0.978	0.842	1.027	**0.946**
14	Mandiri Dana Pendapatan Tetap	0.985	1.120	1.054	**1.052**
15	Manulife Dana Campuran	0.800	0.769	0.878	**0.814**
16	Manulife Pendapatan Bulanan	1.020	1.024	1.000	**1.015**
17	Manulife Phnisi Dana Saham	0.736	0.827	0.726	**0.762**
18	Mega Dana Kombinasi	0.956	0.937	1.291	**1.050**
19	Mega Dana Obligasi Medali	0.963	0.952	1.121	**1.009**
20	Nikko Bond Nusantara	0.975	0.815	1.097	**0.955**
21	Nikko Bunga Nusantara	0.967	0.862	1.077	**0.965**
22	Nikko Gebyar Indonesia	1.000	0.982	1.018	**1.000**
23	Si Dana Fleksi	0.844	0.744	1.003	**0.858**
	Mean	**0.937**	**0.884**	**1.014**	**0.944**

Table 4.3 shows the relative efficiency change for each individual mutual fund. The outcomes explain considerable variation across funds and time periods. There were four mutual funds, i.e., AAA Bond Fund,

BNI Dana Berbunga Dua, BNI Dana Plus and BNI Berkembang and they were found no changes in their efficiency in the period from 2004-2007. For the other funds, there were positive and negative changes in efficiency within the 2004-2007 period.

Furthermore, many funds showed improvements in their efficiency during the period 2006-2007. During the period of study, on the average, Bhakti Big Nusantara recorded the highest efficiency change (18.6 percent), followed by Mandiri Dana Pendapatan Tetap (5.2 percent), and Manulife Pendapatan Bulanan (1.5 percent). Although there was an increase in deterioration in relative efficiency from -6.4 percent (2004-2005) to -11.6 percent (2005-2006), however, it generally experienced an improvement of efficiency of 1.4 percent (2006-2007). In addition, there were 17 mutual funds which recorded the mean efficiency changes that were above average, while 6 mutual funds were below average including Si Dana Fleksi, Danareksa Anggrek, Danareksa Mawar, Manulife Phnisi Dana Saham, Mahanusa Danakapital, and Manulife Dana Campuran.

4.1.4. Change in the Efficiency Components by Mutual Funds

In order to identify the sources of change in the efficiency component, the study reports the two sub-components of efficiency change, i.e., pure efficiency change and scale efficiency change. In Table 4.4 there are four mutual funds (i.e., AAA Bond Fund, BNI Dana Berbunga Dua, BNI Dana Plus and BNI Berkembang) which have documented no changes in annual growth for both the scale efficiency and pure efficiency during the period 2004-2007. Comparing to the other funds, Mandiri Dana pendapatan Tetap recorded the highest deterioration of pure efficiency with -17.5 percent, while Mahanusa Danakapital has the highest deterioration of scale efficiency by -31.8 percent in the period 2004-2005. Interestingly, Si Dana Fleksi recorded the highest growth in pure efficiency with 19.5 percent in this period.

Table 4.4:
Changes in Efficiency Components by Firms 2004-2007

No	Funds Name	2004-2005		2005-2006		2005-2007	
		Pech	**Sech**	**Pech**	**Sech**	**Pech**	**Sech**
1	AAA Bond Fund	1.000	1.000	1.000	1.000	1.000	1.000
2	Bhakti Big Nusantara	1.094	1.035	0.801	1.278	1.491	0.965
3	Bhakti Big Palapa	1.001	0.973	1.035	0.886	1.038	0.926
4	Big Dana Liquid	0.922	1.070	1.058	0.905	1.117	0.983
5	BNI Berkembang	1.000	1.000	1.000	1.000	1.000	1.000
6	BNI Dana Berbunga Dua	1.000	1.000	1.000	1.000	1.000	1.000
7	BNI Dana Plus	1.000	1.000	1.000	1.000	1.000	1.000
8	Dana Tetap Optima	1.004	0.991	0.948	0.933	1.118	0.988
9	Danareksa Anggrek	1.032	0.828	1.013	0.752	0.863	0.981
10	Danareksa Mawar	1.000	0.781	1.000	0.734	0.864	0.956
11	Mahanusa Danakapital	1.000	0.682	0.863	0.833	0.959	1.004
12	Mahanusa Obligasi Pemerintah	0.996	0.996	0.921	0.991	1.110	0.991
13	Mahanusa PDPTAN Tetap Negara	1.023	0.956	0.957	0.879	1.045	0.983
14	Mandiri Dana Pendapatan Tetap	0.825	1.194	1.282	0.873	1.057	0.998
15	Manulife Dana Campuran	1.000	0.800	1.000	0.769	1.000	0.878
16	Manulife Pendapatan Bulanan	1.000	1.020	1.000	1.024	1.000	1.000
17	Manulife Phnisi Dana Saham	1.000	0.736	1.000	0.827	1.000	0.726
18	Mega Dana Kombinasi	0.990	0.965	0.916	1.023	1.430	0.903
19	Mega Dana Obligasi Medali	0.918	1.049	1.030	0.925	1.120	1.001
20	Nikko Bond Nusantara	1.003	0.972	0.867	0.940	1.134	0.697
21	Nikko Bunga Nusantara	1.038	0.931	0.871	0.990	1.121	0.961
22	Nikko Gebyar Indonesia	1.000	1.000	1.000	0.982	1.000	1.018
23	Si Dana Fleksi	1.195	0.707	0.861	0.865	1.018	0.986
	Mean	**1.009**	**0.929**	**0.964**	**0.917**	**1.052**	**0.964**

Nevertheless, Mandiri Dana Pendapatan Tetap documented the highest growth in scale efficiency by 19.4 percent in the same period. Bhakti Big Nusantara experienced the highest growth in scale efficiency as it recorded the highest scale efficiency in 2005-2006. Meanwhile, in terms of pure efficiency, AAA Bond Fund, BNI Berkembang, BNI Dana Berbunga Dua, BNI Dana Plus, Manulife Pendapatan Bulanan, Manulife Phnisi Dana Saham and Nikko Gebyar Indonesia experience to have remained stable in annual growth during the period 2004-2007. On average, only the year between 2005 and 2006 was identified as the year of pure efficiency deterioration, while the average of scale efficiency experienced deterioration during the entire period of study, 2004-2007.

4.2. Productivity for the Entire Industry

Table 4.5:
Summary of Means' Malmquist Productivity Index, 2004-2007

No	Funds Name	TFPch	EFFch	TECHch	PEch	SEch
1	AAA Bond Fund	0.940	1.000	0.940	1.000	1.000
2	Bhakti Big Nusantara	1.052	1.186	0.887	1.093	1.085
2	Bhakti Big Palapa	0.871	0.951	0.916	1.025	0.928
4	Big Dana Liquid	0.946	1.012	0.934	1.029	0.984
5	BNI Berkembang	0.781	1.000	0.781	1.000	1.000
6	BNI Dana Berbunga Dua	0.935	1.000	0.935	1.000	1.000
7	BNI Dana Plus	0.944	1.000	0.944	1.000	1.000
8	Dana Tetap Optima	0.923	0.990	0.932	1.021	0.970
9	Danareksa Anggrek	0.767	0.820	0.935	0.966	0.848
10	Danareksa Mawar	0.729	0.780	0.935	0.952	0.818
11	Mahanusa Danakapital	0.730	0.779	0.937	0.939	0.830
12	Mahanusa Obligasi Pemerintah	0.938	0.999	0.940	1.006	0.993
13	Mahanusa PDPTAN Tetap Negara	0.885	0.946	0.936	1.008	0.938
14	Mandiri Dana Pendapatan Tetap	0.986	1.052	0.938	1.038	1.013
15	Manulife Dana Campuran	0.770	0.814	0.945	1.000	0.814
16	Manulife Pendapatan Bulanan	0.959	1.015	0.945	1.000	1.015
17	Manulife Phnisi Dana Saham	0.696	0.762	0.913	1.000	0.762
18	Mega Dana Kombinasi	0.987	1.050	0.940	1.090	0.963
19	Mega Dana Obligasi Medali	0.943	1.009	0.935	1.019	0.990
20	Nikko Bond Nusantara	0.888	0.955	0.924	1.005	0.960
21	Nikko Bunga Nusantara	0.892	0.965	0.924	1.005	0.960
22	Nikko Gebyar Indonesia	0.913	1.000	0.913	1.000	1.000
23	Si Dana Fleksi	0.807	0.858	0.941	1.015	0.845
	Mean	0.872	0.944	0.925	1.008	0.936

Note: TFPch = Total Factor Productivity Change; EFFch = Efficiency Change; TECHch = Technical Change; PEch = Pure Efficiency Change; SEch = Scale Efficiency Change

Table 4.5 shows the performance of the Malmquist TFP index of Indonesia's mutual funds' industry between 2004 and 2007. On the average, Bakti Big Nusantara recorded the highest growth in TFP index with 5.2 percent. Next, the efficiency and technical changes for this fund were 18.6 and -11.3 percent, respectively. However, Manulife Phnisi Dana Saham had the lowest TFP index with -30.4 percent, which was mostly contributed by efficiency regress (-23.8 percent). On the average, deterioration of the TFP index of mutual funds' industry in Indonesia

was mostly due to technical change (-7.5 percent) whereas efficiency also contributed a negative change (-5.6 percent). In a nutshell, the efficiency change was mostly contributed by pure efficiency (0.8 percent) rather than scale efficiency which experienced a deterioration of -6.4 percent. This shows that the larger the size of the funds, the lower their efficiency changes. These funds might experience diseconomies of scale during the period under study.

5. Conclusion

The study assesses the relative efficiency of the mutual funds in Indonesia. On average, the Total Factor Productivity (TFP) had decreased 12.8 percent within the period of 2004-2007 with 2006-2007 recording the lowest growth (-19.7 percent). However, the highest technical efficiency was recorded in the period of 2005-2006 at the rate of 11.4 percent, while 1.4 percent was recorded in the period of 2006-2007. It is necessary to note that the existence of a negative growth in TFP of the mutual funds' industry in Indonesia has been mainly caused by a negative change in efficiency (-5.6 percent), while technical efficiency also contributed a greater negative change (-7.5 percent) to the overall decrease in the TFP growth. The results indicate that the mutual funds' industry experienced diminished productivity and became more technically inefficient from 2004 to 2007. The study concluded that much of the inefficiency increased overtime which was due to the failure of the mutual funds to adopt technological advances made by a few efficient mutual funds. Although the efficiency change experienced a negative growth, the subcomponent of this change, namely pure efficiency, showed a slight improvement (0.8 percent). Thus, the finding indicates that the smaller the size of the companies, the larger the probability for the companies to be more efficient in using their inputs to generate more outputs.

In general, the TFP index experienced a negative growth (-12.8 percent) during the period of study 2004-2007. This indicates that the averages of selected mutual funds in Indonesia are inefficient in using their inputs to generate more outputs. This is not surprising since some mutual funds have experienced a crisis of massive redemption particularly at the end of 2005 which the Indonesian macro-economy condition was relatively unstable and had caused an increase in the interest rate (about 12.75%) as a consequence of a rise in world fuel price and higher inflation.

Moreover, the inefficiency of funds was also mainly caused by the failure of mutual funds to adopt technological advances. This study suggests that the mutual funds' industry in Indonesia has a great opportunity to promote its TFP through an improvement in the technical element such as optimizing the use of information technology in providing good services to customers (investors). Training and technical expertise should be constantly upgraded along with technological evolution. This can be done through education and training programs intended to improve managerial ability, or extension programs designed to speed up the adoption of new technologies. To further enhance the productivity of the mutual funds in the country, the government has to strengthen the macroeconomic stability, to provide competitive environment and transparent regulation, and to assist the industry with cheaper and efficient information and communication technology amenities.

Further study is suggested to adopt both parametric and non parametric approach, especially the Stochastic Frontier Approach (SFA) and DEA in order to arrive at more conclusive finding on the performance of mutual funds in Indonesia. Moreover, we also suggest that the future study to be conducted on mutual funds' industry in Indonesia should use more comprehensive variables such turnover ratio, risk (standard deviation or beta) and should also increase sample size of the study by incorporating as many as mutual funds in the analysis. Finally, we hope that in the future, there will be studies comparing the efficiency of the Indonesian mutual funds' industry with the mutual funds' industry from other countries and regions.

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