



**PERFORMANCE APPRAISAL OF PHILIPPINE  
MUTUAL FUNDS USING DEA APPROACH**

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**Abstract**

The paper focuses on the performance appraisal of Philippine mutual fund industry from 1999-2003 using Data Envelopment Analysis (DEA) – Malmquist productivity index. It calculates efficiency and productivity growths in a sample of bond and stock funds, balanced funds, and in the industry. DEA is a mathematical programming technique to evaluate the relative efficiency of production units and can accommodate multiple inputs and outputs. Malmquist productivity index has decomposed total factor productivity (TFP) into two components: technological change and technical efficiency change. Results show that bond and stock funds have the highest TFP growth, owing much to technical efficiency change. Bond and stock funds are technically efficient units in the production frontier as compared with balanced funds. Our findings reveal that the Philippine mutual funds industry is technologically and technically efficient. These findings have an important policy implication. Despite that the Philippine mutual funds are found to be technologically and technically efficient, they are still underdeveloped due to poor public perception, lack of information about investment funds, and the absence of proper legislative framework.

*Keywords:* Philippines mutual funds; Data Envelopment Analysis; Total factor productivity.

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**1. Introduction**

An investment company is a company that pools money from numerous investors through the issuance of its shares to the public. The pooled funds are then invested by professional managers in various securities according to the investment objectives and policies of the company. There are two classifications of investment companies: the open-end company and the closed-end company (Study Guide for ICRCP Examination, 2000: 34).

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An open-end investment company continuously sells its shares and stands ready to redeem such shares from its investors at the prevailing Net Asset Value per Share (or NAVPS). This type of investment company is also referred to as a mutual fund. Mutual fund shares represent an undivided interest in the fund. This means that each investor effectively owns a proportional part of every portfolio security of the fund. A closed-end investment company, on the other hand, issues a limited number of non-redeemable shares usually during an offering period (much like an Initial Public Offering). Shortly after the offering period, the shares of a closed-end company are usually listed on the stock exchange to provide liquidity to its shareholders.

Investment companies may be categorized according to their investment objectives or the instruments that they are primarily invested in. There are four basic types of funds – stock funds, bond funds, balanced funds, and money market funds. Stock funds (also called equity funds) invest primarily in shares of stock. Bond funds invest mainly in long-term debt instruments (or bonds). Balanced funds invest in both shares of stock and debt instruments. Finally, money market funds invest purely in short-term (one year or less) debt instruments.

In the Philippines, the existing funds are classified in three broad categories: stock funds, balanced funds, and bond funds. The reason why there are no specialized funds is that the Philippine equity and debt markets are still relatively undeveloped. For instance, in the United States, there are hundreds of technology companies listed on the New York Stock Exchange, the American Stock Exchange, and NASDAQ. That is why they have technology sector fund. An equity growth fund, likewise, has thousands of companies to choose from. In contrast, the Philippine Stock Exchange has over 200 listed companies only and not all of these are being actively traded (Study Guide for ICRCP Examination, 2000: 37).

In the United States, mutual funds have grown rapidly in the last decade. At present, their combined net assets account for 43.3 percent of the total US stock market capitalization of \$5.1 trillion. Mutual funds in Japan, India and Thailand also account for a substantial portion, ranging from 5.6 percent to 13.3 percent, of their respective stock market capitalization. While mutual funds in other countries have grown rapidly, there can hardly be said of the mutual fund industry in the Philippines. Mutual fund industry in the Philippines began to flourish only in the 1990's decade. As of September 2003, the industry is composed of twenty five mutual funds. However, nine of the twenty five funds have stopped selling shares. Although, there are still sixteen active funds in the market, it can be described as having only three major industry players: BPI Asset Management and Trust Group, Philam Asset Management Inc., and Sunlife Asset Management Inc.

It is the aim of this study to compare the performance of the Philippine mutual funds. Specifically, it has three major objectives: First, to determine the factors that result in efficiency and productivity of Philippine mutual funds based on balanced funds, stock and bond funds, and for the full sample of Philippine mutual funds; second, to evaluate the annual performance of mutual funds against each category of funds and third, to determine the most efficient and productive mutual funds.

The paper is organized as follows: Section 2 discusses the methodology and data sample. Section 3 reports empirical results and conclusion follows in Section 4.

## 2. Methodology and Data Sample

### 2.1 DEA-Malmquist Productivity Index

Data Envelopment Analysis (DEA) is the non-parametric mathematical programming approach to frontier estimation (Coelli, 1996). The DEA technique defines an efficiency measure of a fund by its position relative to the frontier of the best fund performance established mathematically by weighted sum of outputs to weighted sum of inputs (Galagedera and Silvapulle, 2002). DEA involves the use of linear programming methods to construct a non-parametric piecewise surface (or frontier) over the data, so as to be able to calculate efficiencies relative to this surface.

DEA- Malmquist method is applied to calculate the indices of total factor productivity (TFP) change; technological change and technical efficiency change. Following Fare *et al.* (1994: 71), productivity change index is:

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

where

$M_0$  = Malmquist productivity index

$D_0$  = Distance function

$x^t$  = Input from the current period technology

$x^{t+1}$  = Input in the next period technology

$y^t$  = Output from the current period technology

$y^{t+1}$  = Output in the next period technology

The ratio outside the brackets measures the change in relative efficiency between years  $t$  and  $t + 1$ . The  $x$  and  $y$  represent inputs and outputs respectively. The geometric mean of the two ratios inside the brackets captures the shift in technology between the two periods evaluated at  $x^t$  and  $x^{t+1}$ , that is

$$\text{Efficient change} = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (2)$$

and

$$\text{Technical Change} = \left\{ \left[ \frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right] \left[ \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right] \right\}^{1/2} \quad (3)$$

All indices are relative to the previous year. Therefore, the estimated result begins with year 2. If  $x^t = x^{t+1}$  and  $y^t = y^{t+1}$  (i.e., there has been no change in input and output between the periods, the productivity index signals no change:  $M_0 = 1$ ). In this case, the component measures of efficiency change and technical change are reciprocals, but not necessarily equal to 1 (Fare *et al.*, 1994: 71). The DEA criteria are as follows: If any of the Malmquist indices is below one, this means that there is a decline in performance of the firm. If any of the Malmquist indices is above one, this means that there is an increase in performance of the firm. If any of the Malmquist indices is equal to one, this means that there is no change in the performance of the firm.

The DEA-Malmquist has five indices, to measure the following:

- (i) Technical efficiency change (relative to a constant returns to scale, CRS technology),
- (ii) Technological change,
- (iii) Pure technical efficiency change (relative to a variable returns to scale, VRS technology),
- (iv) Scale efficiency change,
- (v) Total factor productivity (TFP) change.

All these five indices are tested in the DEA model for the Philippine mutual funds. Technical efficiency is further decomposed into pure efficiency change and scale efficiency change.

## **2.2 Data Sample and Variables**

The data for this study were taken from the company's financial reports for the years 1999-2003. The financial reports are available from the database of Securities and Exchange Commission, Philippines. Other data were taken from the mutual funds' individual prospectus, and from the Investment Company Association of the Philippines (ICAP).

The data sample consists of ten Philippine mutual funds that are classified into stock and bond funds, balanced funds, and the full sample of mutual funds. Money market funds and index funds are not included in the study due to unavailability of data. Stock and bond funds are combined to conform to the standard that the sample must be greater than the variables used. There are seven bond funds. However, three of the bond funds are already inactive, the other two bond funds were launched after 1999, and thus, were not included. Only two bond funds were included in the study. With stock funds, there are six funds; one is already inactive. The other two stock funds were launched after 1999. Therefore, there are only three stock funds included in the sample. The final sample consists of five stock and bond funds in the first category and five balanced funds in the second category, with the total ten funds.

This study has used two inputs and three outputs. The Philippine mutual fund's outputs are (i) total assets; (ii) number of accounts; and (iii) total sales. The inputs are (i) total redemptions; and (ii) operating expenses. Total asset includes cash,

receivables, inventory, property, plant and equipment of the company. Total asset is an output because it maximizes stockholders' wealth since all funds are listed companies. Number of accounts is the number of shares outstanding. Total sale is the total amount of the shares sold. Total redemption is the total amount of the shares redeemed. Operating expenses are the sum of all the fund's annual operating costs. Input-output variables are taken to measure the fund's efficiency and productivity for the test period of 1999-2003.

### 3. Empirical Results

#### 3.1 Bond and Stock Funds

The five bond and stock funds included in this study are Philam Strategic Growth Fund, Philequity Fund, United Fund, Ayala Life Fixed Income Fund and Philam Bond Fund. The EFFCH, TECHCH, PECH, SECH and TFPCH indices measuring technical efficiency change, technological change, pure technical efficiency change, scale efficiency change and total factor productivity (TFP) change respectively are reported in Table 1.

Results in Table 1 reveal that the TFP growth of bond and stock funds was due mainly to technical efficiency, with an index score of 1.107. This means that bond and stock funds have managerial efficiency of utilizing well their redemptions and expenses to increase their sales and number of accounts. Bond and stock funds are also technologically efficient, with an index score of 1.018. As shown in Table 1, not all of the bond and stock funds in the sample are in the efficient frontier.

**Table 1**  
**Malmquist Index Summary of Firm Means for Bond and Stock Funds**

No.	Company Name	EFFCH	TECHCH	PECH	SECH	TFPCH
1	Philam Strategic Growth Fund	1.420	1.109	1.000	1.420	1.574
2	Philequity Fund	1.000	0.978	1.000	1.000	0.978
3	United Fund	1.000	0.899	1.000	1.000	0.899
4	Ayala Life Fixed Income Fund	1.000	1.108	1.000	1.000	1.108
5	Philam Bond Fund	1.171	1.014	1.000	1.051	1.187
<b>Geometric Mean</b>		1.107	1.018	1.022	1.083	1.127

Note: EFFCH, TECHCH, PECH, SECH and TFPCH are indices measuring technical efficiency change, technological change, pure technical efficiency change, scale efficiency change and total factor productivity (TFP) change respectively.

Table 1 presents that out of the five bond and stock funds in the sample, three bond and stock funds are performing well in terms of productivity. It is worth pointing out that Philam Strategic Growth Fund got the highest TFP score of 1.574. This may be due to the fact that Philam Strategic Growth Fund is under the management of Philam

Asset Management Incorporation, which is a multinational company, and it may have acquired technological and technical competence through foreign direct investments.

Table 2 presents the bond and stock funds' Malmquist index summary of annual means. There have been variations in the TFPCH, EFFCH and TECHCH scores of bond and stock funds over the test period. There has been a 35.06 percent increase in technical efficiency of bond and stock funds from the year 2000 to the year 2003. In technological change, there was a -62.51 percent decrease, which means that bond and stock funds firms did not acquire new technologies in their sales and assets during the test period. TFP also decreased by -49.37 percent. Bond and stock funds may have been exposed to market risk. Stock prices rise and fall during the period of analysis. They may have invested in high-beta stocks, which yielded not good returns. Eventually, no investment was made for technological innovations. TFP growth of bond and stock funds was 1.127, which is above the efficient level.

**Table 2**  
**Malmquist Index Summary of Annual Means of Bond and Stock Funds**

<b>Year</b>	<b>EFFCH</b>	<b>TECHCH</b>	<b>PECH</b>	<b>SECH</b>	<b>TFPCH</b>
2000	1.021	1.563	1.089	0.938	1.596
2001	1.010	0.988	0.982	1.028	0.997
2002	1.057	1.187	1.003	1.054	1.254
2003	1.379	0.586	1.016	1.356	0.808
<b>Mean</b>	1.107	1.018	1.022	1.083	1.127

Note: 1999 indices are not defined.

### *3.2 Balanced Funds*

The balanced funds that are included in this study are Citisec Growth and Income Fund, First Galleon Family Fund, GSIS Mutual Fund, MFCP Kabuhayan Fund and Philam Fund, Inc. Results as shown in Table 3 reveal that TFP growth of balanced funds was due to technical efficiency, with an index score of 1.010. However, their technological change score of 0.915 or 8.5 percent fell below the efficient level. As shown in Table 3, only two firms out of the five balanced funds in the sample are performing well in terms of productivity. Specifically, Citisec Growth and Income Fund and MFCP Kabuhayan Fund are the two balanced funds firms that are operating productively and efficiently. Balanced funds firms need to inject new technologies in order for them to be technologically efficient. The technical efficiency of balanced funds appears to be dominated by the scale efficiency as compared to pure technical efficiency. Though, technical efficiency was greater than 1, productivity was pulled down by lower technological progress. This means that lower capital expense and redemptions were utilized by these funds and failed to increase its technological innovation in sales and accounts.

**Table 3**  
**Malmquist Index Summary of Firm Means for Balanced Funds**

<b>No. Company Name</b>	<b>EFFCH</b>	<b>TECHCH</b>	<b>PECH</b>	<b>SECH</b>	<b>TFPCH</b>
1 Citisec Growth and Income Fund	1.000	1.016	1.000	1.000	1.016
2 First Galleon Family Fund	1.026	0.814	1.026	1.000	0.835
3 GSIS Mutual Fund	1.000	0.964	1.000	1.000	0.964
4 MFCP Kabuhayan Fund	1.000	1.062	1.000	1.000	1.062
5 Philam Fund, Inc.	1.024	0.760	1.024	1.000	0.778
<b>Geometric Mean</b>	1.010	0.915	1.000	1.010	0.925

Table 4 presents the Malmquist index summary of annual means for balanced funds. There have been variations in the TFP scores of balanced funds over the test period. TECHCH and EFFCH also have variations in their index scores. There has been a 185 percent increase in the technical efficiency of balanced funds, which means that they gained managerial competence over the test period. However, their technological change declined, with a percentage change of -86.63 percent. Balanced funds firms may have shifted their focus on managerial efficiency rather than acquiring new technologies. There was also a decline of TFP with percentage change of -61.86 over the test period. TFP growth posted at 0.925, which is below the efficient level of one. Balanced funds firms need a 7.5 percent growth in order for them to be efficient and productive. They can achieve this required growth by increasing their technological change by means of acquiring new technologies in sales, investments, and shares.

**Table 4**  
**Malmquist Index Summary of Annual Means of Balanced Funds**

<b>Year</b>	<b>EFFCH</b>	<b>TECHCH</b>	<b>PECH</b>	<b>SECH</b>	<b>TFPCH</b>
2000	0.600	2.214	0.623	0.962	1.327
2001	1.638	0.477	1.604	1.021	0.781
2002	0.619	2.248	0.665	0.932	1.392
2003	1.710	0.296	1.504	1.137	0.506
<b>Mean</b>	1.010	0.915	1.000	1.010	0.925

Note: 1999 indices are not defined.

### *3.3 Full Sample of Funds (Industry)*

Table 5 reveals that the TFP growth of 4.7 percent for the full sample of funds was due to technological change, with an index growth of 1.047 for the entire test period. The main source of TFP growth for Bond and stock funds was technical efficiency, with an index growth of 1.107. The productivity growth of balanced funds was also

due mainly to technical efficiency (1.010) but pulled down by technological regress (0.915). High technical efficiency scores for bond and stock funds and balanced funds were attributed to scale efficiency. This result implies that Philippine mutual funds are operating in optimal scale due to competition. This finding conforms to the results of Galagedera and Silvapulle (2002) on Australian mutual funds. They found out that the technical efficiency of mutual funds appears to be dominated by the effects of scale efficiency compared to pure technical efficiency.

**Table 5**  
**Malmquist Index Summary of Geometric Means of Sample Category of Funds**  
**1999-2003**

Category	EFFCH	TECHCH	PECH	SECH	TFPCH
Bond and Stock	1.107	1.018	1.022	1.083	1.127
Balanced	1.010	0.915	1.000	1.010	0.925
Industry	1.000	1.047	1.001	0.998	1.047

The Philippine mutual fund industry has been good at developing new technologies by investing more capital to increase number of accounts and sales. Though the mutual fund industry's main source of productivity was technological change, the results show that they have achieved a 100 percent technical efficiency over the test period.

All funds have technical efficiency scores of equal or greater than one (1). This means that all funds are technically efficient in utilizing its redemptions and expenses. This may be attributed to economies of scale and market power. Though all funds have EFFCH scores of equal or greater than one (1), only bond and stock funds have a technological change score of above one (1). Balanced funds have a low TECHCH score. This means that bond and stock fund firms are more innovative when it comes to acquiring new technologies than balanced funds.

Table 6 presents the mutual funds industry's Malmquist Index summary of annual means. There has been a variation in the TFP scores of the industry over the test period. TECHCH and EFFCH scores of the mutual funds industry over the test period have also shown a trend variation. There was an increase in the technical efficiency of the mutual funds industry from 2000 to 2003, with a percentage change of 131.95 percent. Though the industry has gained managerial competence over the test period, technological change decreased by -80.03 from 2000 to 2003. There was also a decrease of -53.68 in the TFP of mutual funds industry. The mutual funds industry may have been exposed to the various risks like market risk, credit risk, and currency risk. There has been variability in the stocks prices. They may have invested in securities that do not yield high returns, and a decline in the value of Philippine peso has affected their shares and sales during the period. TFP growth of stock funds is 1.047, which is above the efficient level.



**Table 6**  
**Malmquist Index Summary of Annual Means of Mutual Funds Industry**

Year	EFFCH	TECHCH	PECH	SECH	TFPCH
2000	0.651	2.169	0.799	0.814	1.412
2001	1.234	0.762	1.303	0.947	0.940
2002	0.823	1.682	0.858	0.959	1.385
2003	1.510	0.433	1.124	1.343	0.654
<b>Mean</b>	1.000	1.047	1.001	0.998	1.047

Note: 1999 indices are not defined.

Table 7 shows that six out of ten mutual funds were efficient and productive. Out of these six firms, two were from balanced funds, and four from bond and stock funds. A 60 percent of the mutual funds firms are in the efficient frontier, which means that a large number of funds are efficient. This is consistent with the study of Galagedera and Silvapulle (2002), wherein they found out that Australian mutual funds have a high number of efficient funds. This result also conforms to the findings of Murthi *et al.* (1997) study on the U.S. mutual funds. They found that there is strong evidence that the mutual funds are all approximately efficient.

As shown in Table 7, GSIS Mutual Fund has the highest TFP of 1.383 and due mainly to technical efficiency. This could be attributed to the fact that the management of GSIS Mutual Fund was transferred to Philam Asset Management Inc. GSIS used to be managed by the state-owned GSIS. When GSIS Mutual Fund was transferred to Philam, they may have gained managerial competence; perhaps, this is the reason for its highest score obtained in technical efficiency.

The Philam Strategic Growth Fund has the highest technical efficiency score of 1.420. Seven out of ten mutual funds firms were technically efficient. The Citisec Growth and Income Fund recorded the highest technological score of 1.282. Seven out of ten mutual funds firms are technologically efficient.

**Table 7**  
**Mutual Funds Rankings of Malmquist Productivity Index and Its Components**

Rank	Company Name	EFFCH	Rank	Company Name	TECHCH	Rank	Company Name	TFPCH
1	Philam Strategic	1.420	1	Citisec Growth and Income	1.282	1	GSIS Mutual Fund	1.383
2	GSIS Mutual Fund	1.182	2	GSIS Mutual Fund	1.170	2	Philam Strategic	1.286
3	Philam Bond Fund, Inc.	1.171	3	First Galleon Family Fund	1.169	3	Philam Bond Fund, Inc.	1.189
4	MFCP Kabuhayan	1.106	4	Ayala Life Fixed Income	1.108	4	Ayala Life Fixed Income	1.108
5	Philequity Fund	1.000	5	United Fund	1.105	5	United Fund	1.105
6	United Fund	1.000	6	Philam Bond Fund, Inc.	1.015	6	Citisec Growth and Income	1.033
6	Ayala Life Fixed Income	1.000	7	Philam Fund	1.013	7	MFCP Kabuhayan	0.956
6	Philam Fund	0.831	8	Philequity Fund	0.920	8	Philequity Fund	0.920
7	Citisec Growth and Income	0.806	9	Philam Strategic	0.905	9	Philam Fund	0.842
8	First Galleon Family Fund	0.684	10	MFCP Kabuhayan	0.864	10	First Galleon Family Fund	0.800

#### 4. Conclusion

Our findings show that the main source of TFP growth for the Philippine mutual funds industry is technological change. This suggests that the Philippine mutual funds industry is innovative in acquiring new technologies. Though the TFP growth of the mutual funds industry is largely attributed to technological efficiency, the industry is also technically efficient. These findings have an important policy implication. Although the Philippine mutual funds are found to be technologically and technically efficient, they did not flourish the way it did in other Asian countries. The Philippine mutual funds are still underdeveloped due to poor public perception, lack of information about investment funds, and the absence of proper legislative framework. The public has a negative perception of mutual funds because of the scams that happened when mutual funds were initially introduced in 1950's. People are not aware of the mutual funds industry due to lack of knowledge about the benefits of investing in mutual funds. Investors are much more inclined to invest in common trust funds. The Investment Company Act (ICA) of 1960 was so outdated since it was more of a response to the mutual funds scam at that time. Since 1960, the Act has never amended.

The new development, perhaps, to the benefits of the mutual fund industry is a current bill in the Philippine Congress that seeks to replace the ICA of 1960. The salient features of the bill are: First, giving opportunities to foreigners to be members of the board of directors; second, increased capitalization requirements; third, greater

flexibility in changing investment policies; fourth, better investor protection; and fifth, exemption of mutual funds investor from capital gains tax. This should be given a priority by Philippine policymakers for its successful enactment to enhance the performance of mutual funds in the country.

By categorizing the Philippine mutual funds industry according to the types of funds: bond, stock and balanced, the results show that the sources of TFP growth differ among various types of funds. Bond and stock funds' source of TFP is technical change. The highest TFP growth was also found from bond and stock funds. These new findings indicate that most Filipinos have a low tolerance for risks. They would rather invest in funds that are safe and with stable income yields. Based on the findings, the TFP growth of Philippine mutual funds industry has been improving. There has been a TFP growth of 4.7 percent for the entire period of 2000-2003. This result reveals that the TFP growth of the mutual funds industry was boosted by development of new technologies and by the effective use of the factors of production.

For future research, it is recommended to conduct comparative analysis of mutual funds in the Philippines and other Asian countries to benchmark performance and productivity growth when data sets are available. This is the acknowledged present limitation of the study that is left for future investigation.

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