

Performance of Malaysian bond funds: A DEA approach

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Abstract: This study investigated the performance of the Malaysian Bond Funds during the period of 2009-2014. Several efficiency estimates of individual funds were evaluated by using non-parametric Data Envelopment Analysis (DEA). Other than that, two different approaches were employed to examine the variation of efficiency scores with changes in inputs and outputs. Hence, the DEA was used to estimate technical efficiency, pure technical efficiency, and scale efficiency for each fund. As a result, the findings retrieved from the research indicated that the RHB Asian Total Return was the leader by appearing the most on the efficiency frontier.

Key words: Bond fund; Efficiency; Data envelopment analysis

1. Introduction

The performance of mutual fund in Malaysia has become the main concern for both local and foreign investors in the finance industry. Information pertaining to the performance of mutual funds is one of the major considerations taken into account by investors in the fund-selection decision. Furthermore, referring to mutual fund performances enables the fund to be managed towards better pricing; improving their profitability and attracting greater inflow of funds. Somehow, comprehending their performances may allow the fund managers to develop a proper strategy and policy in improving their competitive ability against their competitors.

Besides, many investors choose bond funds to invest for they hold down fees while offering a proven investment philosophy that seeks to maximize returns and reduce risk. As the bond market becomes more complex, many experienced professionals carefully assess investment opportunities across the globe for one's portfolio.

On the other hand, the DEA approach is a non-parametric method that has been widely employed in operation research to compute a relative measure of efficiency. The superiorities of the DEA in measuring mutual fund efficiency are its ability to take into account many factors associated with the performance of funds. The DEA approach, in addition, allows one to define the mutual fund performance indexes that can be taken into account for different risk measures and investment costs. However, the DEA approach does not require any theoretical model, such as CAPM or Arbitrage Pricing Theory (APT), as a measurement benchmark.

Furthermore, the DEA approach enables the identification of the relative importance among the

inputs (transaction costs); for example, one can observe the marginal contribution of each input in affecting returns (Jemric and Vujcic, 2002). With that, this study empirically measured the performances of selected bond funds in Malaysia during the period of 2009-2014.

In fact, the progress of the mutual fund situation offers the impression that one of the funds is a bond fund. The Bond market, nonetheless, is an integral part of the global financial system (Altman, 1990). Moreover, several handbooks did examine credit analysis. However, no explicit link had been made with regard to bond ratings. For instance, Boutti (2014) focused on the performances of Sukuk and Bond in Malaysia, while Mohamad (2007) looked into the performance of Islamic unit trust in Malaysia. Hence, studies concerning bond funds are indeed limited. In addition, as claimed by investors, the profits depend on both the return and the risk of the bonds in certain situations. Hence, it is a well-known fact that an efficient fund is important for long term growth and crucial for financial development.

2. Literature review

Many authors have carried out researches by employing a variety of indicators to examine the performances of bond funds. Nevertheless, only a handful of researches have applied the non-parametric method of DEA to evaluate the relative performance of such bonds.

DEA has been a popular optimization tool with its theoretical basis in linear programming. As an extreme point method, DEA identifies the best practice of decision-making units, measures relative efficiency, and projects improvement level for each inefficient decision-making unit to become efficient (Roh, 2016). For instance, Roh (2016) looked into

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innovative performance modelling system by jointly using data envelopment analysis (DEA) and artificial neural network (ANN). DEA was used as a pre-processor to measure the relative performance of decision-making units and to generate test inputs for subsequent ANN prediction modules. The study found that the DEA model had successfully captured a number of notable characteristics and efficiency trends of the Japanese electronics manufacturing industry, other than extending its utility as a pre-processor to neural network prediction modules. Thus, DEA has been proven to demonstrate promising estimation capability in predicting efficiency scores and better performance benchmarks for DMUs under evaluation.

In addition, the DEA has been proven to be a well-suited method for best practice benchmarking, which is widely used within a variety of organizations, business sectors, banking, hotels, and others. Other than that, Norma Md. Saad (2010) examined the efficiency of selected conventional and Islamic unit trust companies in Malaysia during the period of 2002 to 2005 via DEA method. By considering 2 inputs and 1 output that consisted of the inputs used in this study, the management expense ratio, the portfolio turnover ratio, and the output were obtained. Furthermore, this study indicated that technical efficiency emerged as the main contributor in enhancing the efficiency of the Malaysian unit trust industry. In addition, the larger the size of the unit trust companies, the more inefficient is the performance. Moreover, by comparing the efficiency of unit trust companies, the study discovered that some Islamic unit trust companies performed better than their conventional counterparts.

On top of that, in order to examine the performance of mutual fund, various researchers have used different methods. For example, Boutti (2014) examined the performances of Sukuk portfolios and compared them with bond portfolio. In this paper, a series of indices, known as TR BPAM ALL BOND INDEX, had been employed. Those indices covered the whole Sukuk and the Malaysian bond market. The historical data of those indices were retrieved from the website of the bond Pricing Agency of Malaysia (BPAM) for a period of six years; from 2007 to 2012. First, the significance of the difference in the mean return portfolio was determined. Second, the return correlations of the portfolio were assessed. Comparing those indices showed that the Sukuk index outperformed both the bond index and the market index. The result exerted a significant and a positive correlation between the returns of Sukuk and bond portfolio.

Meanwhile, Silvapulle (2002) carried out a study that applied the DEA to measure the relative efficiency of 257 Australian mutual funds and logistic regression in order to examine the dependence of efficiency on fund attributes, management strategy, and the operational environment. The researcher used four output variables and seven input variables to assess the sensitivity of the results to various

combinations of input and output variables. The results showed that (i) fund ranking based on the DEA relative efficiency scores was robust to the time horizon over which the input-output variables were measured; (ii) an efficient fund in the DEA that ran with short-term performance characteristics was likely to be efficient in the DEA that ran with long-term performance characteristics as well; and (iii) the DEA runs that captured long-term fund performance seemed to reveal a high number of efficient funds.

On top of that, a study concerning unit trust performance in Malaysia over the period of 1991-2001 was conducted by Isa (2007). The research used seven different performance measures: raw return, market adjusted return, Jensen's alpha, adjusted Jensen's alpha, Sharpe Index, adjusted Sharpe Index, and Treynor Index, to measure the performance. The research results showed that on average, the performance of Malaysian unit trusts fell below the market portfolio and risk free returns. Moreover, performance by type of funds indicated that bond funds exhibited relatively superior performance, over and above the market and equity unit trusts. This had been due to the high interest rate kept during the crisis period.

In a similar vein, Manuel Ammann (2010) examined the performance of US mutual funds that invested primarily in convertible bond. The study examined the factors that affected the returns of convertible bond funds using US convertible-bond funds in the period of 1985-2004. As a result, the multivariate cross-sectional analyses displayed a significant relationship between the performance of a fund and its asset composition: the higher the difference in the percentage of assets invested in convertible bonds compared to the percentage invested in stocks; the higher the performance, on average.

Other than that, Moneta (2015) examined the performance of US bond mutual funds using a measure constructed from a novel data set of portfolio weights. The paper offered a more optimistic picture for the value of active management in the fixed-income market relative to the approaches used in the existing bond fund literature. The results indicated that fund managers were able to earn their fees and costs.

Lastly, Artakis (2004) evaluated the performance of thirty-nine domestic bond mutual funds that were operated in the Greek financial market over a short period of time. The results portrayed a significant association between bond index and bond fund return.

3. Methodology

Data Envelopment Analysis (DEA) is a management and benchmarking technique employed with a variable return to evaluate input-oriented technical efficiency. DEA involves constructing a non-parametric production frontier based on the actual input-output observations to

determine the efficiency of each bank measured (Coelli, 1996). Besides, DEA shows that the more the output produced from given inputs, the more efficient is the production.

As such, this study examined the technical performance in 39 selected Bond Funds in Malaysia. The data selected for this study had been from year 2009 until 2014. Furthermore, the variables used in this study were collected from various sources.

According to Cooper et al. (2007), a rule is required for observation with the number of inputs and outputs. Evaluation based on the efficiency score is directly affected by the input and the output variables. An efficient bond, therefore, can enjoy

higher rating scores of unity, while an inefficient bond would receive DEA scores with less unity.

Thus, in order to calculate by using the DEA method, the efficiency frontier was generated by using 39 Bond Funds in Malaysia during the period of 2009-2014. This study utilized data in the form of three inputs and one output. The primary source of data for the analysis derived from the prospectus of each asset management company and the Securities Commission Library. The output was the Average Total Return (y1), while the three inputs were Management Stated Fee(x1), Management Expense Ratio [MER] (x2), and Portfolio Turnover Ratio [PTR] (x3).

Table 1: Summary Statistics of the Variables Employed in the DEA

Output	Mean	Min	Max	Std dev
Return	4.36	-12.27	17.14	5.48
Return	5.85	-4.86	25.05	4.70
Return	5.80	-1.81	12.19	2.91
Return	4.94	-0.40	13.76	2.58
Return	3.83	-16.40	25.55	5.96
Return	3.29	-2.86	10.78	2.84
Fund Management Stated Fee	0.88	0.02	1.50	0.30
Management Expenses Ratio (MER)	1.02	0.00	2.08	0.45
Portfolio Turnover Ratio (PTR)	2.45	0.00	69.99	11.11
Fund Management Stated Fee	0.89	0.02	1.50	0.30
Management Expenses Ratio (MER)	1.13	0.15	2.30	0.44
Portfolio Turnover Ratio (PTR)	1.21	0.00	15.43	2.45
Fund Management Stated Fee	0.92	0.02	1.50	0.31
Management Expenses Ratio (MER)	1.03	0.13	2.24	0.48
Portfolio Turnover Ratio	2.21	0.00	56.78	8.98
Fund Management Stated Fee	4.94	-0.40	13.76	2.58
Management Expenses Ratio (MER)	1.18	0.19	4.10	0.67
Portfolio Turnover Ratio (PTR)	2.20	0.00	51.01	8.04
Fund Management Stated Fee	0.91	0.02	1.50	0.27
Management Expenses Ratio (MER)	1.22	0.35	3.74	0.65
Portfolio Turnover Ratio (PTR)	1.66	0.01	35.13	5.52
Fund Management Stated Fee	3.29	3.29	-2.86	2.84
Management Expenses Ratio (MER)	1.18	0.36	4.57	0.70
Portfolio Turnover Ratio (PTR)	1.74	0.10	42.98	6.79

4. Results and findings

In this section, the technical efficiency change (TE) of the Malaysia Bond Funds, measured via the DEA method, as well as its decomposition into pure technical efficiency (PTE) and scale efficiency (SE) components, is presented. However, in the event of the existence of scale inefficiency, the researchers attempted to provide evidence on the nature of the returns to scale of each Bond Fund.

Table 1 presents the values of mean, minimum, maximum, and standard deviation of the Bond Funds technical efficiency (TE), as well as its mutually exhaustive pure technical efficiency (PTE) and scale efficiency (SE) components, derived from the DEA. Panels A, B, C, D, and E show the mean, the minimum, the maximum, and the standard deviation of TE, PTE, and SE of the Bond Funds for the years 2009, 2010, 2011, 2012, 2013, and 2014 respectively. Meanwhile, Panel G presents the Bond Funds mean, minimum, maximum, and standard deviation of TE, PTE, and SE scores for all years. The TE, PTE, and SE

scores were bounded between a lower limit of 0 and an upper limit of 1.

Next, Table 2 presents the mean efficiency scores of the Bond Funds for the years 2009 (Panel A), 2010 (Panel B), 2011 (Panel C), 2012 (Panel D), 2013 (Panel E), 2014 (Panel F), as well as All Years (Panel G). The results seemed to suggest that the mean technical efficiency of the Bond Funds displayed an increasing trend from 2009 to 2012, but a dip in 2013, before increasing again in the year 2014. Besides, Table 2 clearly depicts that from the period studied, the Bond Funds exhibited a mean technical efficiency of 40.5%. This further suggested that the Bond Funds could have saved 59.5% of the input to produce the same amount of outputs that they produced. In other words, the Bond Funds could have produced the same amount of outputs produced by using only 40.5% of the amount of inputs used. The decomposition of technical efficiency into its pure technical and scale efficiency components implied that pure technical inefficiency dominated the scale inefficiency of the Bond Funds

during all years, except for the year 2014, when the pure technical efficiency was higher compared to scale efficiency. Overall, the results exemplified that from the period studied, although the Bond Funds

were operating at a relatively optimal scale of operations, their managerial exhibited inefficiency in exploiting their resources to the fullest.

Table 2: Summary statistics of efficiency scores

Efficiency Measure	Means	Min	Max	Std. Dev
Panel A: 2009				
Technical Efficiency (TE)	0.303	0.031	1.000	0.244
Pure Technical Efficiency (PTE)	0.460	0.056	1.000	0.329
Scale Efficiency (SE)	0.711	0.330	1.000	0.190
Panel B: 2010				
Technical Efficiency (TE)	0.348	0.022	1.000	0.246
Pure Technical Efficiency (PTE)	0.485	0.123	1.000	0.245
Scale Efficiency (SE)	0.684	0.048	1.000	0.233
Panel C: 2011				
Technical Efficiency (TE)	0.449	0.134	1.000	0.256
Pure Technical Efficiency (PTE)	0.569	0.183	1.000	0.292
Scale Efficiency (SE)	0.792	0.460	1.000	0.133
Panel D: 2012				
Technical Efficiency (TE)	0.530	0.000	1.000	0.271
Pure Technical Efficiency (PTE)	0.636	0.284	1.000	0.221
Scale Efficiency (SE)	0.815	0.000	1.000	0.226
Panel E: 2013				
Technical Efficiency (TE)	0.363	0.016	1.000	0.288
Pure Technical Efficiency (PTE)	0.548	0.241	1.000	0.222
Scale Efficiency (SE)	0.584	0.068	1.000	0.266
Panel F: 2014				
Technical Efficiency (TE)	0.435	0.051	1.000	0.271
Pure Technical Efficiency (PTE)	0.693	0.344	1.000	0.210
Scale Efficiency (SE)	0.596	0.102	1.000	0.253
Panel G: All Years				
Technical Efficiency (TE)	0.405	0.000	1.000	0.271
Pure Technical Efficiency (PTE)	0.565	0.056	1.000	0.267
Scale Efficiency (SE)	0.697	0.000	1.000	0.236

Meanwhile, the results presented in Table 3 showed that RHB Asian Total Return had been the most efficient Bond Fund in Malaysia, exhibiting a mean efficiency score of 100.0%, followed by KAF Bond and Public Institutional Bond with mean efficiency scores of 77.4% and 67.3% respectively. On the other hand, the results seemed to suggest that Eastspring Investments Dana Wafi was the least efficient, recording a mean efficiency of 17.6%, followed by Kenanga Oa Inv-Kenaga Bon Islam and Kenanga Bond with mean efficiency levels of 18.6% and 20.0% respectively.

Nonetheless, it is interesting to note that while pure technical inefficiency outweighed scale inefficiency for most of the Bond Funds, the results seemed to suggest that scale inefficiency outweighed pure technical inefficiency for Am Income Extra, Kaf Bond, PB Islamic Bond, Public Bond, Public Institutional Bond, and RHB Asian Total Return. In essence, these findings implied that the Bond Funds, in which pure technical inefficiency outweighed scale inefficiency, projected managerial inefficiency in controlling their operating costs, as well as in utilizing their resources to the fullest. Nevertheless, Am Income Extra, Kaf Bond, PB Islamic Bond, Public Bond, Public Institutional Bond, and RHB Asian Total Return were found to be operating at a relatively non-optimal scale of operations.

Table 3, on the other hand, shows the banks that emerged on the efficiency frontier. Moreover, from the period studied, it was also clear from the results that five Malaysian Bond Funds, namely, AMB Income Trust, AM Income Extra, Eastspring Investments Bond, KAF Bond, and RHB Asian Total Return were the leaders by appearing the most on the efficiency frontier. On the contrary, 26 Bond Funds never appeared on the efficiency frontier.

5. Conclusion

The study examined the performance of Malaysian Bond Funds during the period of 2009-2014. The efficiency estimates of individual banks were evaluated by using the non-parametric Data Envelopment Analysis (DEA) approach.

The results showed that the RHB Asian Total Return was the most efficient Bond Fund in Malaysia. The empirical findings further revealed that pure technical inefficiency outweighed scale inefficiency in the Bond Funds sector; implying that the Bond Funds experienced managerial inefficiency in exploiting their resources to the fullest extent. Furthermore, from the period studied, it is recommended that pure technical inefficiency should be given a rather significant consideration as it had

displayed greater influence in determining the total technical inefficiency of the Malaysian Bond Funds.

Table 3: Evolution of efficiency scores over the years

Bank	2009	2010	2011	2012	2013	2014	Count Fund
Affin Hwang Aiiman Income Plus	DRS	IRS	DRS	IRS	IRS	IRS	0
Affin Hwang Select Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Amb Dana Arif	DRS	IRS	DRS	IRS	IRS	IRS	0
Amb Enhanced Bond Trust	IRS	IRS	DRS	IRS	IRS	IRS	0
Amb Income Trust	DRS	IRS	DRS	IRS	CRS	CRS	2
Am Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Am Dynamic Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Am Income Extra	CRS	CRS	CRS	IRS	IRS	IRS	3
Am Income Reward	DRS	IRS	DRS	IRS	DRS	IRS	0
Areca Enhanced Income	DRS	IRS	DRS	IRS	IRS	IRS	0
Areca Income Trust	DRS	IRS	DRS	IRS	IRS	IRS	0
Cimb Islamic Sukuk	DRS	IRS	IRS	CRS	IRS	IRS	1
Cimb-Principal Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Cimb-Principal Strategic	DRS	IRS	DRS	IRS	IRS	IRS	0
Eastspring Investments Bond	IRS	IRS	DRS	CRS	IRS	CRS	2
Eastspring Investments Dana Wafi	DRS	IRS	DRS	IRS	IRS	IRS	0
Eastspring Institutional Income	DRS	IRS	IRS	IRS	IRS	IRS	0
Hong Leong Global Bond	DRS	CRS	DRS	IRS	IRS	IRS	1
Hong Leong Islamic Income	DRS	IRS	IRS	IRS	IRS	IRS	0
Kaf Advantage Gem Bond	DRS	IRS	DRS	IRS	IRS	CRS	1
Kaf Bond	DRS	DRS	CRS	IRS	IRS	CRS	2
Kaf Enhanced Bond	DRS	DRS	DRS	IRS	CRS	IRS	1
Kenanga Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Kenanga Oa Inv-Kenanga Bon Islam	DRS	IRS	DRS	IRS	IRS	IRS	0
Kenanga Oa Inv-Kenanga Income	DRS	IRS	DRS	IRS	IRS	IRS	0
Libra Asnita Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Libra Bond Extra	DRS	IRS	DRS	IRS	IRS	DRS	0
Pacific Dana Murni	DRS	IRS	DRS	IRS	IRS	IRS	0
Pb Fixed Income	DRS	DRS	DRS	IRS	IRS	IRS	0
Pb Islamic Bond	DRS	DRS	DRS	CRS	IRS	IRS	1
Public Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Public Institutional Bond	DRS	IRS	DRS	CRS	IRS	IRS	1
Public Islamic Bond	DRS	IRS	DRS	DRS	IRS	IRS	0
Public Islamic Select Bond	DRS	IRS	DRS	IRS	IRS	IRS	0
Public Select Bond	DRS	IRS	DRS	DRS	IRS	IRS	0
Rhb Asian Total Return	CRS	CRS	CRS	CRS	CRS	CRS	5
Rhb Bond	DRS	IRS	DRS	CRS	IRS	IRS	1
Rhb Income 2	DRS	IRS	DRS	IRS	IRS	IRS	0
Rhb Islamic Bond	DRS	IRS	CRS	IRS	DRS	IRS	1
Count Year	2	3	4	6	3	5	

Note: CRS – (Constant Returns to Scale); DRS – (Decreasing Returns to Scale); IRS – (Increasing Returns to Scale)

The funds that corresponded to the highlighted regions had been efficient in the sample period (2009-2014) compared to the other funds.

'Count Year' denotes the number of banks that appeared on the efficiency frontier during the year.

'Count Funds' denotes the number of times a bank had appeared on the efficiency frontier during the period of study.

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