

Data Envelopment Analysis to Measure Efficiency of Namibian Pension Funds

Manfred Rii Zamuee*

The Research Department, Maastricht School of Management, Maastricht, the Netherlands

Abstract

This research uses Data Envelopment Analysis (DEA) to measure and evaluate the relative financial efficiency of pension funds in Namibia. The study conceptualizes financial efficiency as the ability of pension funds (Boards of Trustees) to convert (through decision-making) inputs (contributions and expenses) into outputs (member fund credits and investment returns) in a manner that maximizes these scarce resources (Davis, 2005). The DEA model used for the study is input-based and expense driven and hence assumes input reductions whilst holding outputs constant. The study conducted a desktop survey of 79 registered pension funds with the Namibia Financial Institutions Supervisory Authority (NAMFISA), representing 100% of the Namibian private pension fund industry. The research findings reveal that most of the Namibian pension funds are operating below the efficiency frontier set by the efficient peers. Furthermore, the efficiency results also indicate that Namibian pension funds have relatively low efficiency scores compared to Kenya and Australia. This finding not only highlights the importance of efficiency in the management of pensions funds in Namibia, but richly contribute to the current literature on the use of DEA as more reliable tools to measure pension fund financial efficiency.

Keywords

Financial Efficiency, Data Envelopment Analysis (DEA), Pension Funds, Investments, Costs

Received: September 8, 2015 / Accepted: October 21, 2015 / Published online: November 12, 2015

© 2015 The Authors. Published by American Institute of Science. This Open Access article is under the CC BY-NC license.

<http://creativecommons.org/licenses/by-nc/4.0/>

1. Introduction

One of the most important functions of management is to evaluate and measure performance on an ongoing basis in order to identify shortcomings and devise strategies for improvement. The unit of assessment in the study is pension funds in Namibia. Pension funds deploy resources to convert into a retirement benefit over time. The study seeks to decompose the elements of inputs and outputs required to provide members with an optimized retirement benefit. According to Thanassoulis (2000), the measure of performance is a reflection of the estimation of potential resource conservation or output augmentation.

Pension fund efficiency is functionally defined as the ability to carry out its underlying purpose with minimum resources (Davis & Stein, 2001). It is important to note that the study

measures only those variables that are within the control of the decision-making units like in this case the board of trustees of pension funds (Sarkis, 2002). Therefore, the efficiency scores are generated using linear programming tools on an in-put based DEA model.

The comparative studies of Kenya and Australia have shown interesting similarity in efficiency scores in that only about 7% of pension funds achieved an efficiency score of 100% targeting more or less the same in- and outputs. This is significant since Kenya is a developing African country benchmarked to a developed Western country.

The findings are important for three reasons:

First, NAMFISA is busy with legislative reform to repeal the existing Pension Funds Act 24 of 1959 and replace with a new law called the Financial Institutions and Markets Bill.

* Corresponding author

E-mail address: Zamuee@msm.nl

The result of this study provides a useful basis to take into account efficiency consideration in policy formulation around the prudential standards.

Second, the result creates an effective performance benchmarking framework that can be emulated by less efficient funds. Such a benchmark will be conducive to risk-based supervision of the regulator and create a sound basis for net replacement ratios.

Third, the relationship between assets and costs created in this study provide further evidence that the management of pension funds is not efficient and intervention strategies are required to remedy the situation.

2. Methodology of the Study

The current study is quantitative and deductively grounded on previous studies on application of DEA to evaluate and measure pension fund efficiency. Therefore, the study seeks to test the application of an existing theory on efficiency using DEA and Namibian specific data to conduct a non-parametric analysis (Leedy, 1997).

Regression analysis was used to analyse the initial factors impacting on pension fund efficiency (Ruggiero, 2005). The study used an in-put based DEA model anchored on a constant return to scale (CRS) methodology to analyse the data. This approach is motivated by the fact that the study uses only those factors over which managers have control in the management of pension funds (Bui, 2013).

In terms of the DEA model, efficiency is achieved by those sample funds targetting a score return of 100%. Meaning that those funds below a 100% score are inefficient since they are operating below the performance benchmark set by the efficient ones (Serrano, 2001).

To validate the results, the Cronbach alpha was used to determine possible errors in the data to enhance reliability (Gliem & Gliem, 2003). The Cronbach alpha co-efficient scores varies between 0 and 1. In practice, an alpha co-efficient score between 0.50 and 0.70 is satisfactory for a general research of this nature (Santos, 1999).

3. Motivation for Using DEA

Various methods have been traditionally used to measure the performance of pension funds. This varies from investment performance ratios (like Jensen's, Sharpe's and Treynor's), risk adjusted returns to artificially constructed benchmarks (Choi & Murthi, 2001). None of these measurement tools have the unique quality of optimisation on a non-parametric transformation basis like DEA (Madhanagopal & Chandrasekaran, 2014). Therefore, DEA offers an alternative

benchmarking tool to the traditional method of using investment returns as the only measure of pension fund performance (Bui, 2013).

Therefore, DEA is more reliable and unique in the following aspects:

- DEA is a renowned optimisation tool (Fields & Murphy, 1989)
- DEA can handle multiple inputs and outputs at the same time with different units of analysis (Chen, 2008) (Adler & Golany, 2001).
- DEA has been applied in financial services with credible results in the banking sector (Fields & Murphy, 1989) (Ferrier & Lovell, 1994). DEA has also been applied to test efficiency of pension funds in Kenya (Njuguna, 2010), Chile (Barrientos & Boussofiane, 2005), USA (Choi & Murthi, 2001) and Australia (Bui, 2013).
- DEA measures relative performance of decision-making units against an efficiency frontier enveloped by best-performing units that can be emulated to improve output augmentation (Coelli, O'Donnell, Rao, & Battese, 2006).

DEA like any other research method has limitations especially in respect of measurement which can be reduced by plotting and further analysing data outliers (Anderson *et al*, 2002). Since DEA is about optimisation, the method does not accommodate inefficiency of units of measurement as opposed to other measurement methods like stochastic frontier (Thanassoulis, 2000).

Therefore, for the purpose of the study, DEA, as one of the measurement tools is robust enough to achieve our research objective.

4. The Sample Selection

The financial data of some 79 active pension funds was retrieved from the Namibia Financial Institutions Supervisory Authority (NAMFISA) database and used to run the DEA analysis. The funds under analysis accounts for 100% of pension funds registered with NAMFISA. Therefore, the sample of the study is the full population of the Namibian private pension fund landscape. The financial data is for a period of 5 years.

Compared to DEA studies in other territories, this study sample is relatively smaller, but reflects the size of the Namibian pension fund industry in terms of number of funds and membership.

The Namibian pension fund industry is highly concentrated with the largest five funds accounting for more than 60% of the membership. This analysis excludes the Government

Institutions Pension Fund (GIPF) which was created by a special Government decree and is defined benefit in nature. The sample also includes umbrella or multi-employer funds which are regarded as individual funds for purposes of analysis and in accordance with NAMFISA registration and classification.

About 99% of the pension funds surveyed are defined contribution funds and have outsourced all the administration and investment functions to third party service providers.

5. Input and Output Selection

One of the most important consideration in the application of DEA is the selection of appropriate input and outputs (Thanassoulis, 2000). Therefore, to evaluate performance of pension funds means the study must estimate input and outputs levels at which pension funds could have operated if they were efficient. A basic rule of thumb is that only those inputs and outputs that render themselves easily measurable can be selected depending also on the size of the sample (Barrientos & Bousofiane, 2005).

However, the comparative literature on DEA reveal that various instruments have been applied to past cases in selecting inputs and outputs and this ranges from statistical experiments, step-wise approach, principal component analysis to expert judgement (Adler & Golany, 2001), (Morita & Avkiran, 2008). In this study, the selection process was based on literature review, industry knowledge and analysis of NAMFISA data on pension funds.

Although DEA admits of multiple inputs and outputs as indicated above, it is important to select the appropriate number to achieve adequate differentiation between efficient and inefficient pension funds (Sarkis, 2002). Although, it is ideal to produce more outputs using few inputs, many studies using DEA in financial services have on average used five inputs and three outputs (Bui, 2013), (Njuguna, 2010). Therefore, this study selected four input and three output variables as per Table 1 below as follows:

Table 1. DEA inputs and outputs Source: Researcher's own construct.

| INPUTS | OUTPUTS |
|-------------------------------------|-----------------------------------|
| 1. Retirement Funding Contributions | 1. Fund Credits at end of 5 years |
| 2. Administration Costs | 2. Investment Returns |
| 3. Investment Costs | 3. Average Fund Assets |
| 4. Total Fund Expenses | |

The motivation for the selection of inputs is based on the fact that costs and fund assets constitute one of the most important indicators of the efficiency of pension funds (Bikker & De Dreu, 2007). As per the 2014 NAMFISA Quartely Bulletin, total pension fund expenses increased by 24.5% (of which about 60% is mainly due to administration

and investment expenses). The total pension fund expenses covers the full array of management expenses from actual benefit administration, auditing, consulting, re-insurance premiums and actuarial costs (Bui, 2013). Costs considerations and expenses are important since it reduces the investment returns to members with a negative impact on the overall cost of retirement safety (Bikker & De Dreu, 2007). Expenses is a generic term to denote costs required for the performance of management functions at fund level (South African National Treasury, 2013).

In Namibia, pension fund contributions constitute the only form of personal savings for more than 90% of pension fund members and hence it becomes important to manage it efficiently. Since efficiency is about optimization (Cooper, Seiford, & Tone, 2007), the efficiency of contributions to the pension funds becomes a key performance indicator. In other words, the test of performance is how efficient contributions are converted into maximised retirement benefits for members (Bikker & De Dreu, 2007). Furthermore, the 2014 NAMFISA Quartely Bulletin, also records a 27.5% increase in pension fund contributions, mainly due to a 25% increase in active members and salary increases.

The ratio of assets to expenses is a reliable indicator of pension fund performance (Bui, 2013). At the end of 2014, Namibian pension fund assets values increased by about 13.6% to approximately N\$120 billion or USD10 billion (NAMFISA Quartely Statistics Bulletin, 2015). This increase is in line with the average increase of pension fund assets of more than one third of OCED countries who reported real return growth rates of above 5% (OECD, 2015). It is not clear whether this increase in assets was caused by efficient management activities or the vagaries of the financial markets that showed a 5.5% increase in terms of the MSCI World Index over the same period and a favorable fixed interest rate environment. For purposes of analysis, the study uses the average value of net assets over the five-year period.

Therefore, the input and output selection of asset values constitutes an important measurement tool to decipher the real predictors of efficiency in the management of pension funds.

6. Data Analysis

Financial efficiency for each pension fund has been analysed using financial data for the last 5 years. The study applied DEA to obtain the efficiency scores and determine the level of efficacy for the various pension funds over the period based on weighted inputs and outputs. Data Envelopment Analysis Frontier version 4 was used for data analysis since it a commonly used software package for this kind of study (Hair, Black, Babin, & Anderson, 2010).

7. Findings

7.1. Descriptive Statistics

The pension fund assets in Namibia have grown on average by 13.3% per annum over the last five years compared to an average annual inflation rate of 5.52% over the same period as measured by the 2015 World Bank Country Index. However, the fund credits of members in the pension funds have only grown by 12.6% as illustrated by Table 2 below.

Table 2. Summary of descriptive statistics Source: Researcher’s own construct.

| Factor | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Membership | 147 793 | 173 299 | 190 823 | 195 939 | 237 322 |
| Net assets | N\$20.9bn (US\$1.5bn) | N\$24.9bn (US\$1.8bn) | N\$28.1bn (US\$1.5bn) | N\$30.8bn (US\$2.0bn) | N\$33.9bn (US\$2.5bn) |
| Fund credits | N\$16.6bn (US\$1.2bn) | N\$20.2bn (US\$1.4bn) | N\$26.2bn (US\$1.9bn) | N\$30.3bn (US\$2.2bn) | N\$30.9bn (US\$2.3bn) |
| Returns | 9.52% | 8.54% | 16.19% | 17.83% | 9.71% |
| Expenses | N\$453.0m (US\$33.5m) | N\$387.9m (US\$28.7m) | N\$397.2m (US\$29.4m) | N\$488.6m (US\$36.1m) | N\$610.7m (US\$45.2m) |

7.2. Sample Funds DEA Scores

The results of the DEA analysis based on the input and outputs factors for the period 2010 to 2015 reveals that only 16 funds or 20% of the total sample funds achieved a 100% efficiency score. Therefore, these efficient sample funds now serves as performance comparator for the balance of the 80% of funds which scored below the efficiency frontier.

The average DEA efficiency score for the sample funds was 0.552 with 0.08 as the lowest efficiency score obtained by the sample funds. This means that there is wide variation between the least efficient sample funds and the ones operating at an average efficiency level. This disparity in efficiency levels may be explained by the diverse benefit and contribution structures as well as the investment strategy of the sample funds.

Interestingly, the total asset values of the relatively efficient sample funds accounts for 17.5% of the total value of assets of sample funds. Meaning that the most efficient funds are not necessarily the largest funds in terms of assets. Contrary to the bulk of the literature, this finding suggests that smaller funds in Namibia are more efficient than larger funds.

The data analysis also reveals that pension fund membership does not impact on the levels of financial efficiency since the most efficient funds only accounts for 17% of the membership of the total sample funds.

The DEA scores of sample funds are summarised in Table 3 below:

This discrepancy may be explained by the lack of transfers or portability of fund credits at member exits prior to retirement and the impact of expenses on fund returns.

The data reveals that an average pension fund in Namibia has N\$429m (or US\$ 31.8m) assets whilst the fund credits are averaging N\$391m (or US\$ 29m). The average membership of the sample funds are 2700 members per fund. The descriptive statistics of sample funds is represented in Table 2 below as follows:

Table 3. DEA efficiency scores for Namibian Pension Funds Source: Researcher’s own construct.

| Scores % | Number of funds | % |
|----------|-----------------|-------|
| 0 – 9 | 2 | 2.5 |
| 10 – 19 | 8 | 10.1 |
| 20 – 29 | 10 | 12.7 |
| 30 – 39 | 14 | 17.7 |
| 40 – 49 | 11 | 13.9 |
| 50 – 59 | 2 | 2.5 |
| 60 – 69 | 4 | 5.1 |
| 70 – 79 | 6 | 7.6 |
| 80 – 89 | 2 | 2.5 |
| 90 – 99 | 4 | 5.1 |
| 100 | 16 | 20.3 |
| Total | 79 | 100.0 |

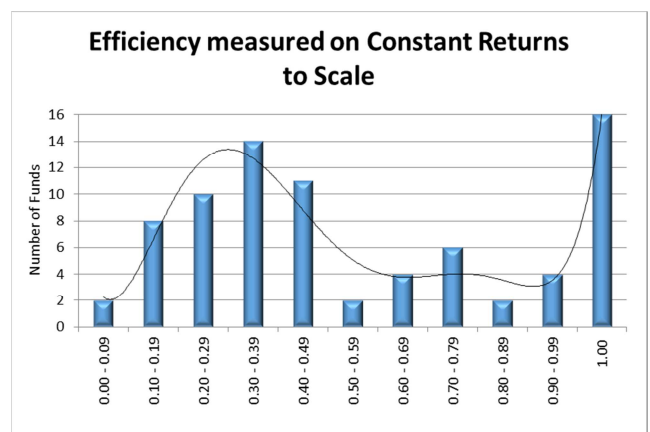


Figure 1. Graphical illustration of DEA scores Source: Researcher’s own construct.

An analysis of Table 3 above shows that only 20% of the sample funds are efficient whilst the remaining 80% are inefficient. On further analysis of the inefficient funds, it is clear that 60% of the sample funds are operating at a 60%

efficiency level, whilst the remaining 20% are positioned at efficiency levels of between 61% to 99%. The result is a serious cause for concern for trustees since

Based on figure 1 above, 2.5% of the sample funds are operating at an efficiency level below 0.09. The mean efficiency score is 0.552 with a standard deviation of 0.313. This means that there is a wide spread between efficient and inefficient funds making it possible for the former to serve as performance comparator to the latter. As indicated before in the study, the low uniformity can be explained by divergent benefit structures, contributions rates and fund expense variations across pension funds in Namibia.

7.3. Validity and Reliability

To validate the results, Cronbach alpha was used to determine possible errors in the data to enhance reliability (Gliem & Gliem, 2003). The Cronbach alpha co-efficient score varies between 0 and 1. In practice, an alpha co-efficient score between 0.50 and 0.70 is satisfactory for a general research of this nature (Santos, 1999). The Cronbach Alpha co-efficient score of 0.78 was achieved giving the results a stamp of approval for internal consistency and reliability. This means that the efficiency scores from DEA are 78% representative of the underlying measures of financial efficiency.

7.4. Implication of Result for Managerial Practice

The results of the DEA analysis present a very useful guide to trustees to devise strategies to improve the performance of their funds. Some of the initiatives for the inefficient funds to improve efficiency includes the following in-put based reduction strategies:

- consolidation of the smaller sample funds to gain from the economies of scale. It goes without saying that funds with large membership have more assets and better chance for investment portfolio diversification and improved opportunities for cost-effectiveness. Although the empirical findings in Namibia seem to contradict this view on the specific data sets, the global literature abounds with examples that size in terms of assets and membership positively correlates to financial efficiency (Barrientos & Boussofiene, 2005) (Bikker & De Dreu, 2007). Consolidation can be achieved through joining umbrella or multi-employer funds that combines the resources of different funds of smaller employers. The benefit of this types of consolidation emanates from cost reduction strategies due to lower regulatory compliance costs and more bargaining powers with third party service providers to the funds since administration and investments costs are also pooled and cross-subsidized across scheme

participants (South African National Treasury, 2013).

- Reduction of administration costs through standardisation of services (Bikker & De Dreu, 2007). This implies a plain vanilla administration services offering made up of basic services like claim benefit payments, contribution handling and fiduciary investments with limited member level choice. This will obviate the need for complicated and costly administration offerings like pension-backed lending services, member level choice, ad hoc products add-ons.
- Reduction of investment costs through pooled investment products as opposed to segregated portfolios where investment managers earn asset-based performance fees. This cost-reduction strategy implies that no tactical asset allocation decisions can be taken by trustees and the investment of asset becomes a function of specialist managers on a discretionary basis as defined in the investment policy. In Nigeria it was held that cost-minimization strategies were critical in implementing a prudent investment strategy for pension funds (Ezirim, 2008).
- Increase out-put factors like assets under management and membership through automatic enrollments like the United Kingdom without concomitant cost increases (UK Department for Work and Pensions, 2014). This implies that eligible employees will be automatically enlisted for membership of pension funds without an application process.
- Create incentives for internal transfers of withdrawal benefits on exit prior to retirement and eliminating early access to cash payments. No reliable statistics are available on the rate of preservations in Namibia, but in South Africa, about 93.5% of members who took their withdrawal benefits in 2013 opted for cash payments (South African National Treasury, 2014). This massive exit of cash from pension funds can be avoided with compulsory preservation in tax free preservation funds created under the Namibian Income Tax Act 24 of 1981. Preservation funds are created by law to preserve and protect member withdrawal benefits against any adverse effects due to pre-retirement termination of employment.

Trustees should consider imposing minimum levels for benefit structures and contributions to allow adequate coverage and financial efficiencies. Benefit levels and contribution structures are not regulated and left to the providence of market product dynamics. The pension fund advisors in most cases design benefit structures that will maximise on statutory commission structures, instead of consideration of efficiency (South African National Treasury, 2013). In other jurisdictions like Australia and Germany, the

statutory minimum levels are imposed on benefits and contributions to ensure better coverage, redistributive equity and cost efficiencies (OECD, 2011)

8. Conclusion

The analysis has shown that the majority of pension funds in Namibia are operating below the efficiency frontier created by the efficient sample funds. As seen above, the mean efficiency score of Namibian pension funds is 55% compared to a mean score of 84.95% for pension funds in Kenya (Njuguna, 2010). Although the majority of pension funds in both countries have the same design characteristics, Kenya has a much bigger industry in terms of number of funds and membership. However, the efficiency ratios of best performing funds in Namibia is relatively better at 20% compared to 6.9% for Kenya and 7% for Australia. The result of the DEA analysis in the Australian study also showed low uniformity in the efficiency levels of their pension (Bui, 2013).

In general, the efficiency scores reveals that Namibian pension funds are not congruent in terms of performance and urgent management intervention is required to improve levels of efficiency. As indicated before, management efforts must be aimed at in-put reduction without a concomitant increase in out-puts. This means that Trustees may consider cost reduction strategies to gain better efficiencies from contributions and investment returns.

Therefore, the result of the study makes it an academic imperative to embrace further debate and analysis on efficiency of fiduciary financial institutions and pension funds in particular.

References

- [1] UK Department for Work and Pensions. (2014). Automatic enrolment: experiences of workers who have opted out: A qualitative study. London, UK: DWP Research.
- [2] Adler, N., & Golany, B. (2001). Evaluation of deregulated airline networks using data envelopment analysis combined with principal component analysis with an application to Western Europe (Vol. 132). *European Journal of Operational Research*.
- [3] Bui, Y. (2013). *Measuring Efficiency of Australian Superannuation Funds Using Data Envelopment Analysis*. Australia: Flinders University.
- [4] Barrientos, A., & Boussofiene, A. (2005). How efficient are pension funds in Chile? *Revista de Economia Contemporanea* (2), pp. 289-311.
- [5] Beasley J, E. (2012, July 9). OR Notes. Retrieved June 02, 2013, from OR Notes: <http://people.brunel.ac.uk/~mastjjb/jeb/or/dea.html>
- [6] Bikker, J., & De Dreu, J. (2007). *Operating costs of pension funds: The impact of scale, governance and plan design*. Amsterdam: Cambridge University Press.
- [7] Braglia, M., Zaroni, S., & Zavanella, L. (2003). Measuring the Benchmark Productive System Performances Using DEA: An industrial Case. *Production Planning and Control* Vol 27, 542-554.
- [8] Charnes, A., Cooper, W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research* 2 (6), 429-444.
- [9] Choi, Y., & Murthi, B. (2001). Relative Performance Evaluation of mutual Funds: A non-Parametric Approach (Vol. 28). USA: *Journal of Business Finance and Accounting*.
- [10] Coelli, T., O'Donnell, C., Rao, D., & Battese, G. (2006). *An Introduction to Efficiency and Productivity Analysis*. New York: Springer.
- [11] Cooper, W., Seiford, L., & Tone, K. (2007). *Data Envelopment Analysis*. New York: Springer.
- [12] Davis, E. (2005). The role of pension funds as institutional investors in emerging market economies. Korea: Korea Development Institute Conference.
- [13] Davis, E., & Stein, B. (2001). *Institutional Investors*. London, UK: MIT Press.
- [14] Ferrier, G., & Lovell, C. (1994). Measuring cost efficiency in banking: econometric and linear programming evidence. *Journal of Econometrics*, Volume 46, 229-245.
- [15] Fields, J., & Murphy, N. (1989). An analysis of efficiency in the delivery of financial services: the case of UK insurance agencies. *Journal of Financial Services Research* Volume 2, 343-356.
- [16] Gliem, J., & Gliem, R. (2003). Calculating, Interpreting and reporting Cronbach's Reliability Coefficient for Likert-Type Scales.
- [17] Golany B, B. (1996). Using Rank Statistics for Determining Programmatic Efficiency Differences In Data Envelopment Analysis. *Management Science*, 466-472.
- [18] Hair, Black, Babin, & Anderson. (2010). *Multi-variate data analysis into readings*.
- [19] Jablonsky, J. (2005). *Measuring Efficiency of Production Units by AAP Models*.
- [20] Kline, R. (2005). *Principles and Practice of structural Equation Modeling*. New York: Guilford.
- [21] Leedy, P. (1997). *Practical Research: Planning and Design*. Ohio: Prentice Hall.
- [22] NAMFISA Quarterly Statistics Bulletin. (2015). *Pension Fund Quarterly Statistics Bulletin*. Windhoek, Namibia: NAMFISA.
- [23] Njuguna, A. (2010). *Strategies to improve pension fund efficiency in Kenya*. South Africa: Unpublished.
- [24] Madhanagopal, R., & Chandrasekaran, R. (2014). *Selecting Appropriate Variables for DEA Using Genetic Algorithm (GA) Search Procedure* (Vol. 1). India, India: Madras Christian College.

- [25] Morita, H., & Avkiran, N. (2008). Selecting Inputs and Outputs in Data envelopment Analysis by Designing Statistical Experiments (Vol. 52). Japan, Japan: Journal of Operations Research.
- [26] OECD. (2011). Pension Fund Operating Costs and Fees in Pension at a Glance 2011: Retirement Income Systems in OECD and G20 Countries. OECD Publishing.
- [27] OECD. (2015). Pension Funds in Figures. Canada: OECD Press.
- [28] Santos, R. (1999). Cronbach's alpha: A Tool for Assessing the Reliability of Scales (Vol. 37). Texas, USA: Journal of Extension.
- [29] Sarkis, J. (2002). Productivity Analysis in the Service Sector with Data Envelopment Analysis (Vol. 7). Massachusetts, USA: Supply Chain Management: An International Journal.
- [30] Serrano, M. (2001). Discussion Papers in Management. University of Southampton.
- [31] South African National Treasury. (2013). Charges in South African Retirement Funds. Pretoria, South Africa.
- [32] South African National Treasury. (2014). Statement on the impact of the Proposed Retirement Reforms. Pretoria, South Africa.
- [33] Thanassoulis, E. (2000). Introduction to the Theory and Application of Data Envelopment Analysis. New York: Springer Science and Business.