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# Optimization Strategies for Pension Funds: *A Test of Efficiency*

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## Abstract

This article combines the results of previous papers dealing with the efficiency of Namibian pension funds based on the application of three research methodologies covering Data envelopment Analysis (DEA), Confirmatory Factor Analysis (CFA) and Structural Equations Modeling (SEM). A cross-model approach using correlation and One-way analysis of variance (ANOVA) was used test the significance of associations emerging from the SEM/CFA results and financial efficiency represented by DEA. The findings confirmed the four factors describing organizational efficiency under SEM and revealed goodness of fit of the measurement model. However, the correlation weights and ANOVA results showed that no significant association could be established between financial and organizational efficiency. The study outcome confirms supremacy of DEA and SEM and contributes to management theory and practice.

## Keywords

Financial Efficiency, Organizational Efficiency, Structural Equation Modeling, Confirmatory Factor Analysis, Data Envelopment Analysis, Governance, Ethics, Investment and Compliance

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## 1. Theoretical Background/Literature Review

Contemporary thinking in performance management is that organizations must not only increase resources, but makes better use of it (Canadian Institute for Health Information, 2014). This requires organizations, including pension funds, to be efficient and focus on those management activities that are within their control whilst using minimal resources (Sarkis, 2002). Efficiency is defined in production economics as the ability of an organization to maximize resources to deliver products and services on a cost-effective basis without compromising on its objectives (Hackman, 2008). Pension funds are required to be efficient since they operate in a trust or fiduciary relationship with beneficiaries and expected to deliver adequate and optimized retirement benefits (Barrientos & Boussofiane, 2005). Globally pension funds have attracted attention due to volatile markets and the consequent erosion of member's retirement values. Therefore, understanding the relationship between these factors and efficiency is important for trustees of pension funds to make informed decisions with a view to optimizing member retirement values.

This article is grounded on published articles (Zamuee, 2015 and Zamuee, 2016) and seeks to expand on the knowledge economy around pension fund efficiency by discussing the results of empirical studies carried out using DEA and SEM as well as a cross-model methodology between the two. Although the two-stage analysis may offend regression assumptions, backward and forward step-wise regression methodology is used to overcome this, as can be seen in the final regression results (Simar & Wilson, 2007).

Both the Kenyan (Njuguna, 2010) and Canadian studies

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(CIH, 2014) used DEA and SEM to estimate the relative efficiency of organizations with positive results. Given the non-parametric nature of DEA, researchers have been grappling with the task of statistically testing the hypothesis for goodness of fit or strength of relationships between variables and hence the cross-model approach has received praise as a more reliable method to overcome this challenge (Sohn & Moon, 2004). Against this background, the empirical findings of the study have wide reaching implications for theory and practice.

# 2. Methodology

## 2.1. Data Collection

Questionnaire survey was used collect data since the study rank quantitative in nature (Saunders *et al*, 2007). A 5-point Likert scale with choices ranging from (1) Not very important, (2) Less important, (3) Moderately important, (4) Important and (5) Very important was used in the survey. Each question was aligned to the hypothesized measuring instruments covering governance, investment strategy, compliance, risk management, ethics and regulations as suggested in the comparative literature review.

## 2.2. Sample

Since the unit of analysis is pension funds, the study population and sample covers all the registered and active pension funds with the Namibian Financial Institutions Supervisory Authority (NAMFISA). Therefore, a total of 158 questionnaires were mailed to the Principal Officer and the Trustees of each registered pension fund. The collected responses were 105 fully completed questionnaires covering a rate of response of 66%. A sample of 100 items or more carries adequate statistical power to carry out SEM analysis (Hair, Black, Babin, & Anderson, 2010).

## 2.3. Data Analysis

The data analysis for the study was informed by various statistical methods using SPSS and AMOS software. First, the survey ordinal data was treated to numeric to aid parametric analysis using a statistical method of scaling as will be discussed below. The test for internal consistency and reliability of data was carried out using the Cronbach alpha. CFA and SEM were used to validate and test the measurement model using AMOS. Since the study was testing theory, the SEM analysis was conducted using covariance as the input matrix (Hair, Black, Babin, & Anderson, 2010). A cross-model approach between DEA and SEM results was used to explain and analyze the association between financial and organizational efficiency. The ANOVA analyses of the four factors explaining organizational efficiency under SEM/CFA were held to be in a non-significant relationship to financial efficiency (Zamuee, 2016).

# 3. Results of the Study

As indicated before, various statistical techniques were used to analyze the data and the findings are as follows:

## 3.1. Data Preparation

Since ordinal data was obtained from the Likert-styled survey, it was necessary to convert the data into numeric to aid parametric analysis. Therefore, an algorithmic optimization method of scaling was applied which uses algorithmic discretization transformation techniques to analyze ordinal data. This means that ordinal data is transformed into numeric values based on Gaussian distribution to aid analysis without an assumption of it being numeric (Stacey, 2015). Although there seem to be no global consensus on the most effective method to treat analysis of ordinal data from a Likert-scale, the scaling method is novel in approach and robust enough to deliver reliable and valid analysis without the need to apply the traditional non-parametric tests to the data. Scaling has been implemented using SPSS. The result of scaling shows the values of the standard deviation below or above the average and the variance in the results making it more convenient to conduct the parametric analysis.

## 3.2. Internal Consistency Reliability Tests

Internal consistency reliability tests were implemented using Cronbach's alpha coefficient with a minimum benchmark of 0.7 (Hair, Black, Babin, & Anderson, 2010). The Cronbach alpha coefficients of all the variables showed an adequate score above 0.70, meaning that the data meaningfully measured organizational efficiency (Gliem & Gliem, 2003). Equally the Cronbach alpha coefficients for the revised model post EFA and CFA also shows strong internal reliability.

# 4. Empirical Findings and Discussion

The empirical results reveal that despite some admirable efficiency gains for a small number of pension funds, many require management interventions to improve efficiency ranking (Zamuee, 2015). As illustrated in Figure 1 below, only 20% of pension funds in Namibia are financially efficient. Similarly, four factors covering governance, ethics, operational efficiency and regulatory compliance were held to be determinants of organizational efficiency under the CFA model.

Although the empirical findings did not establish a significant relationship between financial and organizational efficiency, some relationships were revealed among the factors presented in the SEM model. For example, the interaction between size and efficiency evoked some interesting ideas around the potential conflict between economies and diseconomies of scale in the context of measuring efficiency. Whilst the traditional thinking was that fund size leads to better efficiencies (Dyck & Pomorsky, 2011) it turns out that the empirical findings in the Namibian study revealed an opposite finding (Zamuee, 2015). Therefore, an important criterion has been set to help pension funds decide on whether to remain private or join umbrella schemes.

Therefore, the study outcome is useful to both academics and industry practitioners in that it enhances a reasonable understanding of those issues that are considered positive features of financial and organizational efficiency (Zamuee, 2015). More than just creating a seductive theoretical idea, implicit in the findings is a knowledge fountain that can be untapped in decision-making and policy formulation.

The approach to the discussion of the study findings and implication is premised on a synthesized relationship between the four articles. The first part of the discussion contextualized the implication of using DEA to measure financial efficiency whilst the second part covers the organizational aspect of efficiency based on factor analysis and structural equation modeling (SEM). Whilst the study outcome does not offer a silver bullet or universal solution, the set of principles emanating from the results are linearly proportional and have wider practical appeal to challenges facing many pension funds globally.

## 4.1. Financial Efficiency

Since efficiency is about optimization, contributions, investment returns and costs were held to be key ingredients in the input/output dynamic under DEA; hence a crystallized discussion of this proves useful. Under the Pension Funds Act 24 of 1956, pension funds collect contributions from members and employers and invest the same with the objective of providing maximized retirement values for members. Based on the descriptive statistics as illustrated in Table 1 below, there's a visible discrepancy between the fund credits (representing accumulated contributions) and the invested assets of pension funds.

**Table 1.** Descriptive statistics of Namibian pension funds.

| Factor | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|
| Net Assets | US$ 1.5bn | US$1.8bn | US$1.5bn | US$2bn | US$2.5bn |
| Fund credit | US$ 1.2bn | US$1.4bn | US$1.2bn | US$1.9bn | US$2.2bn |
| Returns | 9.52% | 8.54% | 16.19% | 17.83% | 9.71% |

Source: Own construct

This means that investment returns are not fully credited to member credits as is the case with some smoothed bonus portfolios where interests are retained as reserves for market volatilities (Ruscony, 2008). To enhance efficiency, more outputs must be produced using few inputs (Bui, 2013). Therefore, pension funds must adopt a more progressive interest declaration policy and maximize member credits without a concomitant increase in contributions. This underscores the test of financial efficiency (Davis, 2005).

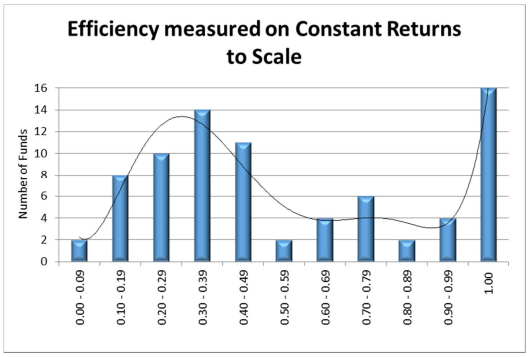


**Figure 1.** Graphical illustration of efficiency scores Source: Own construct.

The efficiency scores in figure 1 shows a wide variation between the most efficient funds and the least efficient ones. This ranking variation in Figure 1 is not a positive development and can be explained by exorbitant costs structures and poor investment strategy (Njuguna, 2010). Therefore, pension funds are required to evaluate cost structures and investment policy. The above empirical findings are in consonance with the literature, which suggests a linear relationship between costs and financial efficiency (Bikker & De Dreu, 2007). Only those pension funds with lower cost structures yielded higher efficiency scores under the DEA model, which clearly suggest that cost efficiency enhancing initiatives must be undertaken by trustees of pension funds. Clearly implicit in this finding is that 80% of Namibian pension funds must review the cost of administration, investments, consulting and actuarial services in line with the overall objective of retirement income maximization. Total pension costs have increased by almost 25% in 2014 (NAMFISA, 2014), due to poor market competition and regulatory oversight (Steele, 2006). This undesirable situation poses a serious efficiency challenge and explains the poor ranking. These requirements must be considered in conjunction with findings in previous studies that highlight governance challenges around transparency and ethics in the selection of service providers to pension funds (Zamuee, 2016).

Based on the literature, investment returns and strategy seem to be a key driver of financial efficiency. Therefore, the defined contribution nature of Namibia pension funds makes it imperative to review investment strategy. Investment strategy is about portfolio diversification and member investment choice (Zamuee, 2015). As we have

seen from the literature inquiry, most of the Namibian pension funds do not offer flexible investment choice at member level and hence decisions are merely left to the vagaries of trustee discretion (NAMFISA, 2015). Therefore, the investment strategy of pension funds must be consistent with risk profile in terms of financial literacy and age demographics (Byrne, 2015). This means that members who are investment literate should be allowed to make investment choices from the boutique of options offered by the pension fund. Investment strategy must also take into account the age profile of members allowing a life stage type of investment choice where older members can choose risk-averse products, whilst younger members can choose more aggressive portfolios since they have a longer duration to retirement (Klaasen & Eeghen, 2009). This will reduce the efficiency score variation between most efficient and least efficient pension funds in Namibia.

Furthermore, most of the Namibian pension fund assets are invested outside Namibia and not used to adequately mobilize local economic development (Uanguta *et al*, 2004). This poses a threat to local market efficiency and denies members an opportunity to earn good investment returns from flourishing local economic conditions. Therefore, in line with Regulation 28 to the Pension Funds Act 24 of 1956, pension funds must make use of local unlisted assets and get exposure to private equity and venture capital growth opportunities.

Under the DEA model above, it was interesting to note that smaller pension funds in terms of asset values were more efficient than larger funds. This can be explained by the fact that most of the pension funds in Namibia are small to medium size anyway and have adopted pooled investment strategies rather than segregated portfolios that expose them to individual investment risk. The other possible scenario might be that some pension funds with larger asset values might be bureaucratic in decision-making (Hess *et al*, 2008) and using inappropriate investment strategy that leads to lower investment returns and hence operating below the efficiency frontier. Smaller pension funds might be more prone to manage resources optimally given the size limitation and not squander with reckless investment decisions (Njuguna, 2010). Therefore, pension funds must carefully tread on the decision continuum around economies and diseconomies of scale and rather focus on imperatives of efficiency and sustainability.

## 4.2. Organizational Efficiency

The World Bank conceptualized organizational efficiency as the optimal mobilization of a mix of processes, systems and people required to manage an organization (Carmichael & Palacios, 2003). However, the study outcome has summarized organizational efficiency in terms of four variables, namely governance; ethics, compliance and operational efficiency (Zamuee, 2015). These factors forms a pivotal part of the SEM model and offers a practical solution to pension funds in resolving the efficiency challenge as highlighted in figure 2 below.

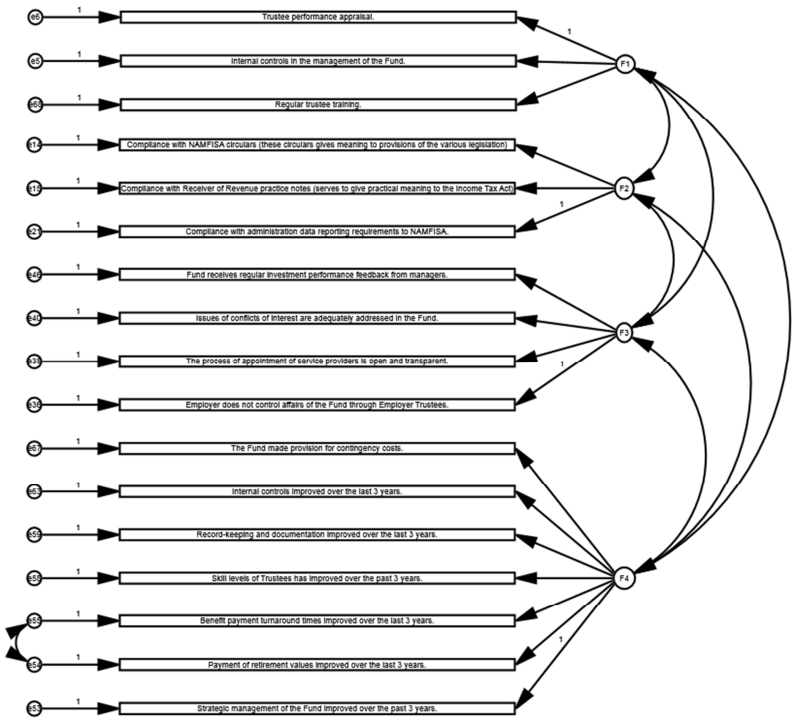


**Figure 2.** Path analysis diagram Source: Own construct.

Figure 2 above illustrates the summary of CFA results into four factors. Factor 1 represents governance as separate and distinct predictor of organizational efficiency in tandem with literature. Factor 2 interestingly covers only scale items of compliance and has no empirical association with regulations. This can be explained by the collegial logic that compliance refers to adherence with regulations (OECD, 2009) (IOPS, 2011). Factor 3 mainly represents scale items of ethics and only includes only one item of investments that in the final literature analysis also relates to ethics. Factor 4 virtually covers 50% of all the scale items of operational efficiency and is only closely associated with one scale item of risk which in itself points to an operational aspect of risk management. The latent variables as represented by the factors are highly correlated as shown by the double-edged arrows. This represents the revised measurement model for organizational efficiency.

The concept of governance is new to Namibia and covers all aspects of fund leadership from trustee performance appraisals, internal controls and regular trustee meetings (Namcode, 2011). Performance appraisals refer to an assessment of how pension funds are doing relative to benchmarks (Stewart & Yermo, 2008). The reality in Namibia is that most pension funds do not have a formal performance evaluation criteria and the focus has always been on evaluation of external service providers rather than the trustees themselves (NAMFISA, 2014). Therefore, the study results supports the literature that trustee evaluation must be formalized and done at least annually by independent experts based on agreed criteria and industry benchmarks (Stewart & Yermo, 2008).

Another important governance highlight is internal controls, which is essentially a risk management issue. Since risk talks to the probability of adverse events happening (Bunge, 1989), trustees must ensure that all risks facing the pension fund are identified and mitigated through an effective intervention strategy (Randle & Rudolph, 2014). Interestingly, participants in the survey saw risk as part of governance as represented by internal controls. The survey also saw regular trustee meetings as an important predictor of governance and hence essential to achieve pension fund efficiency. The literature investigation has found that no formal law exists in Namibia that dictates the frequency of trustee meetings and hence the matter is left to the wishes of the trustees as pronounced in the rules of the fund. However, the proposed Financial Institutions and Financial Markets Bill (FIM Bill) is providing for at least two annual trustee meetings.

The second aspect of the study findings relates to compliance or adherence to regulations. Although the initial measurement model hypothesized regulations as a separate variable, the empirical findings showed that regulations and compliance are highly correlated and are measuring the same thing (Stewart, 2010). In this regard, the survey results reveals that compliance with NAMFISA and Receiver of Revenue directives is an important indicator of pension fund efficiency. Both NAMFISA and the Receiver of Revenue have issued a number of practice notes to aid the pension fund industry in the interpretation of legislation and regulations. This practice notes are not mandatory, but offers a persuasive position of the regulators perspective on regulatory issues. The survey results are not surprising given the active role that both regulators play in the industry and rigorous enforcement of penalties for non-compliance (Zamuee, 2016). Most of the levies for non-compliances against pension funds relates to non-submission of statutory returns including financial and actuarial valuations reports and non-reporting of late payments of contributions causing members loss (NAMFISA, 2014).

The findings also showed that ethics plays a pivotal role in operational pension fund efficiency (Zamuee, 2015). Although generally ethics is defined in terms of moral or behavioral standards (Bunge, 1989), the survey participants broadened the concept to include issues of conflicts of interest, transparency in the appointment of service providers and avoidance of control of the affairs of the pension fund by the employer, making ethics highly associated to governance. These empirical findings must be seen in the context of a local pension fund industry that is highly concentrated and monopolistic in terms of external service providers who offers vertically integrated products on a bulking basis (Rusconi, 2008). In other words, one service provider offers administration, consulting and actuarial services to the same pension fund creating an obvious opportunity for conflicts of interests and lack of transparency in service delivery. The significance of these findings is to encourage trustees to separate services between various independent service providers and promote transparency in the selection and appointment of these service providers (Yermo, 2008). This finding supports the recommendations in the King III Report that requires functional separation of services (King, 2009). The most surprising empirical result was the inclusion of regular investment feedback with ethics. This implies that regular investment feedback is an ethical standard that must be upheld by trustees if they were to be efficient in managing the affairs of the pension fund. Ordinarily the investment feedback calendar is part of the investment strategy and has never been seen as an ethical consideration (Bikker and Dreu, 2009). Under ethics, the empirical results also reveals that the pension fund must be free from employer control in all its

affairs. This finding is in line with the Namibian Income Tax Act 24 of 1981, which specifically prohibits the employer from controlling the affairs of the pension fund.

In support of the literature review, the study outcome demonstrated that operational efficiency significantly impacts on organizational efficiency (Zamuee, 2015). The survey respondents, made up of the majority of pension funds in Namibia, summarized operational efficiency in terms of adequate provision for contingency fees, improvement of internal controls, record keeping, trustee skill levels, benefit payment turn-around times and overall strategic management of the pension fund. The requirement under internal controls requires pension funds to introduce mechanisms to ensure an efficient control environment around systems and procedures (Carmichael & Palacios, 2003). Under the Pension Funds Act 24 of 1956, pension funds are required to maintain proper records of transactions and hence it was not surprising to see the survey respondents highlight this as an important issue describing operational efficiency. As part of risk management and good governance, pension funds must make adequate provision for contingency costs to lessen risks of unforeseen events (Sorsa & Roumpakis, 2012). This initiative is part of cost management and in tandem with the test of efficiency to optimize resources without increasing inputs (Bui, 2013).

Trustee education and development of skills is an important catalyst for efficient management of pension funds to avoid information inequity and undue intellectual domination by service providers (NAMFISA, 2014). This requires pension funds to acquire adequate information and knowledge to fulfill their fiduciary mandates through regular trustee training. Industry knowledge standards must be regulated by NAMFISA, similar to the Trustee Knowledge and Understanding standards introduced by the United Kingdom Pension Regulator in 2015. This will enable pension funds to acquire basic working knowledge and understanding of their fiduciary duties and relevant matters affecting pension funds. In specialized matters, pension funds can obtain independent professional expert advice whilst retaining accountability for their decisions (Rusconi, 2008). Therefore, the relationships between the four factors under the SEM model (is more than correlational and provide overwhelming evidence that organizational efficiency is crucial for management practice and theory.

### 4.3. Financial Efficiency Versus Organizational Efficiency

The study concluded with an analysis of the strength of relationship between financial and operational efficiency. Therefore, the study outcome offers a useful fig leaf to resolve the practical dilemma of how to measure and explain efficiency. The results showed that although some of the important input/output variables predicting financial efficiency were similar to the issues driving organizational efficiency, the two measurement models are independent units of efficiency (Zamuee, 2016). Therefore, the cross-model approach was used to explain and analyze the association between financial and organizational efficiency. The ANOVA analyses of the four factors explaining organizational efficiency were held to be in a non-significant relationship to financial efficiency (Zamuee, 2016). This outcome quashes the traditional perspective that pension fund efficiency is purely about financial optimization.

The findings create a conceptual trajectory around a broader approach to efficiency. This has ushered the suggestion that pension funds must pursue both financial and organizational goals to achieve overall efficiency. At a practical level a case could be made that more than maximized investment returns, the investment policy of pension funds could include non-financial ethical criteria (Clark & Monk, 2010). This recommendation offers practical solution to the dilemma faced by many pension funds hovering on the periphery of the debate about whether pension funds should pursue return maximization at all cost or prefers a more socially conscientious attitude towards investments. In practice, considerations of governance, ethics, operational efficiency and compliance have an innate financial characteristic, which indicates the intertwining nature of association between financial and organizational efficiency as reliable and valid measurement models of efficiency. This finding suggest that although pension funds that comply with sound governance, ethical and compliance standards do not automatically guarantee financial efficiency, it is vital to adopt an incestuous attitude towards efficiency analysis of pension funds (Zamuee, 2016). In as much as the organizational factors under the SEM model are not significantly related to financial efficiency, the results create a dependence relationship in terms of the overall measurement of efficiency.

## 5. Conclusion

As the literature has indicated, the ability of pension funds to achieve their objective depends on the extent to which resources are optimized for the benefit of members. Therefore, efficiency gains can only be achieved if pension funds focus their agenda on ethical behavior, cost and risk management strategies, enhancing retirement funding contributions and review of investment strategies. Although financial and organizational efficiency were not significantly associated based on the empirical findings, the study found that both are valid and reliable measurements of efficiency and no analysis will be complete without both approaches.

Finally, overall efficiency may not necessarily be achieved with implementing some or all of these recommendations based on the study outcome alone and may require intervention at government level from a policy and regulatory point of view. This will broaden the efficiency agenda to cover pension funds and social security systems. As indicated, the study outcome has offered important insights in the theory of management and confirmed the use of DEA and SEM as indispensable tools in the analysis of efficiency, and especially in a cross-model situation.

## References


[1] Bui, Y. (2013). Measuring Efficiency of Australian Superannuation Funds Using Data Envelopment Analysis.

[2] Bunge, M. (1989). Treatise on Basic Philosophy: Ethics: The Good and the Right. Amsterdam: Kluwer.

[3] Byrne, A. (2015). Employee Saving and Investment Decisions in Defined Contribution Pension Plans: Survey Evidence from the UK. University of Strathclyde.

[4] Byrne, B. (1998). Structural Equation Modelling with LISREAL, PRELIS and SIMPLIS: Basic concepts, Applica.

[5] Barrientos, A., & Boussofiane, A. (2005). How efficient are pension funds in Chile? Revista de Economia Contemporanea (2), pp. 289-311.

[6] Bikker, J., & Dreu, J. (2009). Operating costs of pension funds: The impact of scale, governace and plan design. Journal of Pension Economics and Finance.

[7] Canadian Institute for Health information: Measuring the level and determinants of health systems efficiency in Canada. Ottawa, ON: CIHI, (2014).

[8] Carmichael, J., & Palacios, R. (2003). A framework for Public Pension Fund Management. World Bank. world Bank Press.

[9] Clark, G., & Monk, A. (2010). The Norwegian Government Pension Fund: Ethics over Efficiency. 3.

[10] Davis, E. (2005) The role of pension funds as institutional investors in emerging market economies. Korea Development Institute Conference, Korea.

[11] Dyck, A, & Pomorski, L (2011). Is bigger Better? Performance in Pension Plan Management. University of Toronto.

[12] Disney, R., & Johnson, P. (2001). Pension Systems and retirement Incomes across OECD Countries. Edward Elger.

[13] Goltz, J. (2006). Police Organizational Performance In the State of Florida: Confirmatory Factor Analysis of the relationship of the environment and design structure to performance. Florida. University of Central Florida:http://stars.library.ucd,edu/etd

[14] Gliem, J., & Gliem, R. (2003). Calculating, Interpreting and reporting Cronbach's Reliability Coefficient for Likert-Type Scales.

[15] Hess, D. & Warren, D. (2008). Ethical Theory and Business (Prentice-Hall, 8th edition.

[16] IOPS. (2011). Working Papers on Effective Pension Supervision No 14.

[17] Hackman, S. (2008). Production Economics: IntergratIng the Microeconomic and Engineering Perspectives. Springer.

[18] Hair, Black, Babin, & Anderson. (2010). Multi-variate data analysis into readings.

[19] King. (2009). King Code of Governance for South Africa. IOD. IOD.

[20] Klaasen, P., & Eeghen, I. (2009). Economic Capital: How it works and what every manager needs to know. Elsevier.

[21] NAMCODE. (2014). Namibian Code on Good Governance. Windhoek, Namibia.

[22] NAMFISA. (2014). NAMFISA Annual Report. Windhoek.

[23] NAMFISA Quartely Bulletin. (2014).

[24] Njuguna, A. (2010). Strategies to improve pension fund efficiency in Kenya. Nelson Mandela Metropolitan University. South Africa: Unpublished DBA Thesis.

[25] OECD. (2016). Net Pension Replacement Rates. Retrieved December 18, 2015, from OECD: www.oecd.org

[26] OECD. (2009). OECD Guidelines for Pension Fund Governance. OECD.

[27] SA National Treasury. (2012). Preservation, portability and governance for retirement funds.

[28] Salkind, N. (2012). Exploring Research. Pearson.

[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] Simar L, Wilson PW. Sensitivity analysis of efficiency scores: how to bootstrap in nonparametric models in production processes. Journal of Econometrics. 2007; 136: 31-64.

[31] Sohn, S & Moon, T. (2004) Decision-tree based on data envelopment analysis for effective technology commercialization. Expert Systems with Applications, 26 (2), 279-284.

[32] Sorsa, V., & Roumpakis, A. (2012). Contingency in risk management: A case of Sweden and Finland. White Rose Research Papers.

[33] Stacey, A. (2015). Algorithmic Estimation of Means and Variance-covariance Matrix and Numeric Scaling of Likert-type Data. University of Witwatersrand.

[34] Steele, J. (2006). The evolution of governance. Pensions, 43-47.

[35] Stewart, F. (2010). Pension Funds' Risk- Management Framework: Regulation and Supervisory Oversight. OECD. OECD.

[36] Stewart, F., & Yermo, J. (2008). Pension Fund Governance: Challenges and Potential Solutions. OECD. OECD Publishing.

[37] Rusconi, R. (2008). South African Insitutional Investments: Whose money is it anyway?

[38] Randle, T., & Rudolph, H. (2014). Pension Risk and Risk-based Supervision in Defined contribution Pension Funds. Wolrd Bank. World Bank.

[39] Robson, C. (2002). Real World Research (Vol. 2). Oxford, UK: Blackwell.

[40] Uanguta E, Haiyambo E, Kadhikwa G, Chimana S (2004), The Structure and nature of Savings in Namibia, BON Occassional Paper 8/4/1OP-1/2004, Bank of Namibia Research Department

[41] Zamuee, M. (2015). Data Envelopment Analysis to measure efficiency of Namibian pension funds. American Journal of Marketing Research.

[42] Zamuee, M. (2016). Structural Equation Modeling to Measure the Efficiency of Namibian Pension Funds. American Journal of Marketing Research.