Measuring Performance Efficiency of listed Real Estate Investment Trust (REITs) in Sub-Saharan Africa

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Abstract
This paper examines performance efficiency of thirty real estate investment trusts in Sub-Saharan Africa for a three year period of 2014-2016. The study employs the Data Envelopment Analysis (DEA) approach to measure and evaluate the performance efficiency of the REITs. The outcomes show that 23.3% was variable returns (VRS) efficient, 3.33% was constant returns to scale (CRS) efficient and 6.67% was SCALE efficient. These results indicate that listed REITs are not performance efficient primarily because they are a new investment channel that is relatively unpopular amongst investors in sub-Saharan Africa. The study recommends that inefficient REITs should benchmark the efficient ones and the governments should entrench institutional regulations to deepen REIT business.

Keywords: REITs, Performance Efficiency, Data Envelopment Analysis

JEL Classification: G11, G23

Paper Classification: Research Paper

Introduction
Real Estate Investment Trusts (REITs) are investment tools that generate conduit of funds from corporate stockholders to the real estate and property segment of every economy (Corgel, Mcintosh & Ott, 1995). Wong (2004) posits that real estate investment trusts are organizations or a trust that pools investible money or funds from distinct stockholders, procures and controls income spawning real estate, and allots the revenue generated from their own properties as proceeds to members of the trust. REITs are a modern investment channel that are exempted from tax payments on the income made available or distributed to its shareholders (90%). However, these REITs are estimated to invest about 75% of its fund in real estate properties to benefit from tax exclusion (Onyema, 2017). REITs have experienced phenomenal growth within the last decade with international market capitalization of $1.7 trillion in 2016 compared to $734 billion in 2010 (Ernest and Young, 2016). The United States REITs market has grown by almost 150%, while the market capitalization of non-United States REITs has more than doubled. The two fastest-growing markets have been Australia and Japan, both are presently ahead of France and United Kingdom who now occupy second and third largest global REIT markets respectively. Onyema (2017) posits that in Africa, the real estate investment trust market is...
valued at about $29 billion and is predominantly obtainable in only four (4) nations (Ghana, Nigeria, South Africa and Kenya). Presently there are about 32 REITs in Africa with South Africa having 27 REITs and Nigeria with three listed REITs. There is a significant surge in the REITs business because higher proportion of investing individuals are beginning to develop and take amplified interest and involvement in real estate sector business. Real estate exchanges are well situated for a durable growth segment given the substantial supply shortfall across the continent (Wong, 2004).

Past studies in REITs research like Yusof and Bin Mohd Nawawi (2012), San and Malaysia (2012) and Alias and SoiTho (2011) focused on conventional performance measurements based on Portfolio theory. Assessing market efficiency is based centrally on the mean variance theory of portfolio which entails the Capital Asset Pricing Model (CAPM). It has been often viewed as deficient and inadequate (Sengupta, 2003). Hence, the use of non-parametric method of Data Envelopment Analysis (DEA) in REITs efficiency evaluation provides novel intuition into the precarious decision-making by the REITs managers and investors. This study therefore seeks to determine the efficiency of REITs in SSA using DEA.

Literature Review

Theoretical Framework

The classical economics cost minimization theory also known as the traditional efficiency theory states that an organization is cost efficient if it is able to use its allotted resources (input), to achieve a higher level of output without incurring incremental cost of operation or if such a firm uses the least possible cost to generate the same level of output (Lehmann, 1990; Iyoha, 2004). Thus, the traditional efficiency theorem follows an input-output oriented approach. In line with this normal efficiency postulation, the REIT is presumed to select a production blueprint that decreases cost, given its output combination and input prices or that maximizes profits given the prices of its inputs and output (Coelli, Rao, O’Donnell & Battese, 2005; Kokkinou, 2012). A REIT is thus regarded as performance-efficient if it is able to generate an optimum mix of output from a given level of inputs (resources) (Boudry, Kallberg & Liu, 2010). Embedded in this theory is the structural approach to REIT efficiency, which has three strands; cost minimization, profit maximization and managerial utility maximization (Lehmann, 1990).

The REIT efficiency adopting the structural approach often depends on the economics of cost minimization, wherein the performance equation of REITS represents a cost function (Cannon & Vogt, 1995). The production utility which the structural performance equation depicts is an indication that a REIT is technically performance-efficient (Cannon & Vogt, 1995).

The input-oriented and output-oriented DEA relative efficiency postulate is an off-shoot of the technical efficiency approach. The estimation of technical efficiency can take the dimension of input-oriented or output oriented approach. The input-oriented technical efficiency evaluates the magnitude of input variables that can be proportionately condensed devoid of altering the output quantities produced (Kurkalova & Carriquiry, 2003). The output oriented technical efficiency measures the degree of output capacities which are proportionately stretched needless varying the input aggregates applied (Charnes, Cooper & Rhodes, 1978). A REIT is thus performance efficient if it follows the input oriented or output oriented tenets (Chuweni & Eves, 2017). Integrating both theories, a financial performance efficiency model is generated, in which three REIT performance efficiency scores are determined using a set of explanatory variables in order to explicitly assess the performance efficiency of REITS in Sub-Sahara Africa.

Empirical Review

Chiang, Tsaih and Hsiao (2016) in their study carried out in Singapore, to evaluate the real estate investment trusts efficiency adopted data envelopment analysis. The findings showed that none of the firms analyzed performed efficiently based on the average efficiency scores. Another study by Chuweni and Eves (2016) reveals insufficient value for technical efficiency for REITS in Malaysia. The average inefficiencies are confirmed by Anderson, Springer, Fok, and Webb (2002) who found very huge inefficiencies, oscillating around 45 to 60 percent.
Zheng, Chau and Hui (2011) in their paper on the measurement and evaluation of quoted real estate companies’ efficiency. The study adopted three variants of data envelopment analysis, which includes Charnes, Cooper and Rhodes (CCR-DEA), Berger, Cooper and Charnes (BCC-DEA) and Super-Efficiency-DEA models. The study focused on 94 REITs companies in China and the outcome of the study showed that operational efficiency, technical efficiency and scale efficiency are 0.78, 0.84 and 0.92 correspondingly which are all above average. And again, the study showed that 69% of inefficient REITs in China were classified in the area of increasing return to scale.

Ahmed and Mohamad (2017) used DEA to gauge the technical efficiency and performance of real estate investment trusts (REITs) for a period 2009 – 2013 in Singapore. They applied Malmquist Productivity Index to determine the productivity shift of the real estate investment trust over time. The outcome of the study revealed that real estate investment trusts’ efficiency has improved and there is also marginal productivity growth at the frontier within the time frame of the study. This is an indication that it is conceivable to advance the growth of REITs by further enhancing technological efficiency since technological lapse is perceived to be the central cause for the meagre output performance of REITs in Singapore.

In their study conducted in Malaysia, Harun, Tahir and Zaharudin (2012) used DEA to gauge the efficiency of Real Estate Investment Trust (REITs) of thirteen firms. The study made use of four inputs comprising of management fees, administrative expenses, interest expenses and operating expenses. The output variables considered in the study are total assets, net asset value and total revenue. The study revealed from the outcome of the analysis that out of 13 Malaysia REITs in their sample of study, the average efficiency of Malaysia REIT in 2007 is 66.53% then in 2008 and 2009 are 67.91% and 74.12% correspondingly. Their conclusion is that majority of firms showed that efficiency of Malaysia’s REIT skyrocketed owing to economic recovery. Harris (2012) in his study that spanned 21 years employing data envelopment analysis on Real Estate Investment Trusts (REITs) examined overall technical efficiency including its disaggregated measures of pure technical efficiency and Scale Efficiency. The study revealed that the real estate investment trust functioned at decreasing returns to scale over a substantive period covered by the study. The study carried out by Douglas (2006) evaluated 435 firms based on technical efficiency within the scope of 1998 to 2003. The finding of the study revealed a conceivable average of 67.1 per cent technical efficiency over the time frame of the study (indicating 32.9 per cent inefficiency). The conclusion of the study is that reductions in the inefficiencies in REITs could spur substantial enhancements in productivities and thus improve viability since technical efficiency is observed to correlate with firm value absolutely.

Miller and Springer (2007), in their paper estimated the operating efficiencies of REITs via panel data and the stochastic frontier models. Findings of their study revealed no indication of scale economics and also some variants of scale diseconomies were readily noted. In their submission, they alluded that the tool (SFA) is not potent enough in multi decision making units’ analysis. Bers and Springer (1997), in their study precisely found that economies of scale may be existing in the REIT industry and that level of leverage and management structure can influence property type diversification and geographic concentration impact is marginal. Lewis, Springer and Anderson, (2003) discovered that management specific peculiarities do significantly influence efficiencies via property type. In their study, they made use of Bayesian stochastic frontier model and found that majority of REITs were moderately cost efficient in the face of increasing returns to scale.

Data and Methods

The study adopted the DEA method of analysis. In this study, the efficiency scores of the sampled companies were computed with STATADEA Software. Data envelopment analysis studies have been carried out majorly in the banking sector (Eriki & Osifo, 2014; Alkhathlan & Malik, 2010; Akhtar, Ali & Sadaqat, 2010; Becalli, Casu & Girardone, 2006), manufacturing sector (Ahmadi & Ahmadi, 2012; Osamwonyi & Imafidon, 2014; Memon & Tahir, 2011) and insurance sector (Ogieva, 2017; Mwangeti, 2012; Faruk & Rahaman, 2015; Owusu-Ansah, Dontwi, Seidu, Abudulai & Sebil, 2010). Again past studies adopted the use of DEA in financial firm’s performance efficiency evaluation especially in the areas of banks and insurance, it has been observed that very little or no attempt has been made to apply DEA in evaluating performance efficiency of REITs in Sub-Saharan Africa (SSA).
The data for this study were obtained from the financial statements of all listed REITS in Sub-Saharan Africa. The input variables adopted in this study are total assets and equity capital. The output variables for this study are operating income and total revenue as suggested by Ogieva (2017) and Harun, Tahir and Zarahudin (2012). All the figures for the data from different REITS in SSA were all converted to the same unit of currency (dollar) using average exchange rate of dollar to country’s currency which are South Africa, Nigeria, and Ghana. The exchange rates were sourced from Bloomberg.

The study made use of 2 input variables and 2 output variables to evaluate and analyze the relative efficiency of the sampled 30 listed REITS companies in Sub-Saharan Africa.

### Table 1: DEA Data and Variables

<table>
<thead>
<tr>
<th>Output</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Operating Income</td>
<td>Total Asset</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>Equity (Share capital)</td>
</tr>
</tbody>
</table>

Source: Authors’ (2017)

### MODEL: Efficiency Score

This study is linked to Data Envelopment Analysis (DEA) input-oriented Charnes Cooper and Rhodes model. The origination advanced by Charnes et al (1978) uses linear programming to extend Farrell’s (1957) single output/single input efficiency measure to the multi-output/multi-input case. The drive is to optimize the ratio of outputs to inputs by resolving for a group of weights that satisfy a system of linear equations.

Maximize \( \phi_i \),

\[
\phi_i \lambda_i \quad \text{subject to:} \\
\sum_{j=1}^{n} \lambda_{ij} = 1, \quad \lambda_i = 0 \text{ for } j \neq i, \text{ the } i-th \text{REITs lies on the frontier and is technically efficient.}
\]

Input and output slacks will always be zeros for the efficient REITs. For the REITs that are not efficient, \( \phi_i > 1, \lambda_i = 0, \) and \( \lambda_{ij} > 0 \text{ for } j \neq 1, \) here \( j \) represents the efficient REITs in the study. The REITs that are not efficient could also have selected positive output or/and input slacks. The output based technical efficiency index of the \( i \)-th REITs (Tej) can be computed as follows:

\[
Tej = 1 / \phi_i 
\]
The frontier production of the r-th revenues of the i-th REITS (dollar) can be calculated as follows:

$$Y_{ri} - \sum_{j=1}^{n} \lambda_j Y_{rj} = \Phi_i Y_{ri} + S_{ri} = 0$$

Equation (6) indicates that the estimated output consists of dual variants, one representing the proportional increase in all output ($f_{Yri}$) and the other depicts non-proportional growth or output slack ($S_{ri}$). In addition, assessing the prime output from static quantities of resources (inputs), the output driven DEA in equation (1) also evaluates the input slacks (excess inputs) that need to be protected for an inefficient reits to be fully efficient. Quantitatively, the proposed aggregate of the k-th resource of the ith REITs ($X_{ki}$) can be stated as follows:

$$\sum_{j=1}^{n} \lambda_j X_{kj} = X_{ri} - e_{ki} = 0$$

$k = 1$.

The REITs DEA model stated in equation (1) earlier conforms to the CRS technology. In line with Banker, Charnes and Cooper (1984), the equivalent model under variable returns to scale (VRS) can be expressed by imposing extra constraints on equation (1).

$$\sum_{j=1}^{n} \lambda_j = 1$$

The technical efficiency score got from constant returns to scale model (TECRS) is regularly denoted as “overall” technical efficiency and that achieved from the variable returns to scale model is called “Pure” technical efficiency (TEVRS). The variable returns to scale frontier is often more flexible and less rigid and envelops the data in a tighter way than the constant returns to scale frontier. Under the variable returns to scale condition, dominance is fragile in the sense that a scale inefficient REIT may qualify as a ‘best-practice’ as it is technically efficient. Subsequently, a REIT will display a lesser outcome under the CRS model than in the VRS model (i.e., $TE_{VRS} > TE_{CRS} \iff \emptyset_{CRS} \geq \emptyset_{VRS}$).

Thus relationship is often used to obtain a measure of scale efficiency (SE) as follows:

$$SE = \frac{TE_{CRS}}{TE_{VRS}} = \frac{\Phi_{VRS}}{\Phi_{CRS}}$$

Here SE = 1 depicts scale efficiency and SE <1 shows output based scale inefficiency. Scale inefficiency is manifested owing to the incidence of either increasing (IRS) or decreasing returns to scale (DRS), which can be ascertained by resolving non-increasing returns to scale (NIRS). DEA model which is achieved by switching the VRS constraint $\sum_{j=1}^{n} \lambda_j = 1$ with $\sum_{j=1}^{n} \lambda_j \leq 1$. Let $\Phi_{NIRS}$ represent the proportional increase in all outputs under NIRS DEA model. For scale inefficient observations, $\Phi_{CRS} = \Phi_{NIRS}$ depicts inefficiently small scale or operation in the region of increasing returns to scale and $\Phi_{CRS} \geq \Phi_{NIRS}$ indicates inefficiently large scale or decreasing returns to scale (Farell, Grosskopf, & Lovell, 1994), here three efficiency measures are examined: DEA Overall technical efficiency score (CRSE), DEA Pure Technical Efficiency Score (VRSE) and Scale Efficiency Score (SCALE).

**Presentation and Discussion of Results**

This study embraced input and output which is a clear indication that our emphasis is on performance efficiency of listed companies in terms of how sound these firms can transform total asset and equity input into profit evaluated as total revenue and net operating income. Table 2 below, shows the descriptive statistics of the sampled listed REIT companies’ output and input variables.
Table 2: Descriptive Statistics for DEA Input and Output Variables

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Total Asset</th>
<th>Equity</th>
<th>Net Operating Income</th>
<th>Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.52e+07</td>
<td>2.23e+07</td>
<td>2468746</td>
<td>3299999</td>
</tr>
<tr>
<td>Median</td>
<td>757763.8</td>
<td>280149.4</td>
<td>43673.3</td>
<td>73133.6</td>
</tr>
<tr>
<td>Minimum</td>
<td>9418.612</td>
<td>3947.533</td>
<td>974.1594</td>
<td>599.5967</td>
</tr>
<tr>
<td>Maximum</td>
<td>7.67e+08</td>
<td>5.47e+08</td>
<td>5.56e+07</td>
<td>8.43e+07</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Authors’ (2017)

The descriptive statistics in Table 2 above shows that the sampled mean of the 30 listed Sub-Sahara African REITs for the periods of 2014 to 2016 fiscal year, in terms of total asset was above $3.52 billion, while equity is above $2.23 billion, total revenue was $329,999 while net operating income stood at $2468746. The sample mean results show that the sampled firm of DMU 23 (7.67e+08) had total asset that is far above the sampled peer companies average of $3.52e+07 billion during the period under review. This implies that DMU 23 in terms of asset base is very strong and any possible slack or under-utilization of its total asset can extremely mar its rating compared to its contemporaries in the industry. The minimum values as shown in Table 2, reveal that the company with the lowest total asset is DMU 29. On the output side, the average net operating income of the sampled 30 companies stood at $2468746. The company with the highest net operating income is DMU 23 ($6.42e+07 billion). This supports the view that the listed company of DMU 23 operates with the highest total asset. In terms of total revenue, DMU 27 ($468.4813) recorded the lowest. In the light of our analysis so far, it would be difficult to ascertain the efficiency of these firms in terms of how well they have used their assets and equity input to generate revenue and net operating income output. This single problem necessitated the need for DEA analysis since descriptive statistics cannot show their relative performance in the context of weighted inputs and outputs.

The performance efficiency scores that were generated from the DEA methodology is hinged on 3 efficiency processes; (1) DEA Overall Technical Efficiency Score (CRS): This is obtained when a constant return to scale for all the sampled firms is assumed. This implies increase in firms’ input (total asset and equity) by one percent would lead to a one percent increase in its output (total revenue and net operating income). This model neglects management skills in converting small inputs to large outputs. (2) DEA Pure Technical Efficiency Score (VRS): This is obtained when a variable return to scale for all the sampled firms is assumed. This implies that increase in firms’ input (total asset and equity) by one percent would lead to more than one percent increase in its output (total revenue and net operating income). This focuses on measuring the extent to which management skills was relevant in converting small inputs to large outputs and (3) Scale Efficiency Score (SCALE): This is the ratio of constant return to scale to variable return to scale (CRSE/VRSE).

CRS DEA Results

The DEA models concerned in measuring the performance of selected 30 listed Sub-Sahara African REITS companies were computed using STATA DEA software. The “overall” technical efficiency scores (i.e technical efficiency relative to the CRS DEA model) for the different 30 companies are presented in Table 3. Also presented in the table are the rank set for the sampled firms. The CRS DEA model is established on the postulation of constant return to scale for every sampled REIT companies in this study. This indicates an increase in company’s input (total asset and equity) by 1% would lead to a 1% increase in its output (total revenue and net operating income). The CRS DEA result is presented in Table 3 and discussed beneath;
### Table 3: Technical Efficiency Scores of the 30 Sampled Banks Based on CRS DEA Model

<table>
<thead>
<tr>
<th>DMU No</th>
<th>Firms</th>
<th>TEvrs</th>
<th>TECrs</th>
<th>Scale Efficiency</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DMU 1</td>
<td>0.279265</td>
<td>0.146669</td>
<td>0.525196</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>DMU 2</td>
<td>0.712213</td>
<td>0.206797</td>
<td>0.290359</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>DMU 3</td>
<td>0.306505</td>
<td>0.108240</td>
<td>0.353143</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>DMU 4</td>
<td>0.153890</td>
<td>0.053999</td>
<td>0.350895</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>DMU 5</td>
<td>1.000000</td>
<td>0.400732</td>
<td>0.400732</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>DMU 6</td>
<td>0.222049</td>
<td>0.103604</td>
<td>0.466583</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>DMU 7</td>
<td>0.383153</td>
<td>0.114070</td>
<td>0.297714</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>DMU 8</td>
<td>0.414124</td>
<td>0.139084</td>
<td>0.335851</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>DMU 9</td>
<td>0.441850</td>
<td>0.164882</td>
<td>0.373162</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>DMU 10</td>
<td>0.250779</td>
<td>0.104608</td>
<td>0.417132</td>
<td>22</td>
</tr>
<tr>
<td>11</td>
<td>DMU 11</td>
<td>0.319378</td>
<td>0.128899</td>
<td>0.403594</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>DMU 12</td>
<td>0.312019</td>
<td>0.107338</td>
<td>0.344011</td>
<td>18</td>
</tr>
<tr>
<td>13</td>
<td>DMU 13</td>
<td>1.000000</td>
<td>0.184311</td>
<td>0.184311</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>DMU 14</td>
<td>0.403606</td>
<td>0.143236</td>
<td>0.354891</td>
<td>13</td>
</tr>
<tr>
<td>15</td>
<td>DMU 15</td>
<td>0.250158</td>
<td>0.167433</td>
<td>0.669308</td>
<td>23</td>
</tr>
<tr>
<td>16</td>
<td>DMU 16</td>
<td>0.403838</td>
<td>0.163062</td>
<td>0.403782</td>
<td>12</td>
</tr>
<tr>
<td>17</td>
<td>DMU 17</td>
<td>0.234429</td>
<td>0.233476</td>
<td>0.995934</td>
<td>24</td>
</tr>
<tr>
<td>18</td>
<td>DMU 18</td>
<td>1.000000</td>
<td>0.546175</td>
<td>0.546175</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>DMU 19</td>
<td>0.167236</td>
<td>0.074046</td>
<td>0.442760</td>
<td>27</td>
</tr>
<tr>
<td>20</td>
<td>DMU 20</td>
<td>0.350602</td>
<td>0.105258</td>
<td>0.300221</td>
<td>16</td>
</tr>
<tr>
<td>21</td>
<td>DMU 21</td>
<td>1.000000</td>
<td>0.451781</td>
<td>0.451781</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>DMU 22</td>
<td>0.381556</td>
<td>0.136010</td>
<td>0.356462</td>
<td>15</td>
</tr>
<tr>
<td>23</td>
<td>DMU 23</td>
<td>1.000000</td>
<td>0.134228</td>
<td>0.134228</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>DMU 24</td>
<td>0.148563</td>
<td>0.043238</td>
<td>0.291044</td>
<td>29</td>
</tr>
<tr>
<td>25</td>
<td>DMU 25</td>
<td>0.176943</td>
<td>0.064099</td>
<td>0.362258</td>
<td>26</td>
</tr>
<tr>
<td>26</td>
<td>DMU 26</td>
<td>1.000000</td>
<td>1.000000</td>
<td>1.000000</td>
<td>6</td>
</tr>
<tr>
<td>27</td>
<td>DMU 27</td>
<td>0.129526</td>
<td>0.129526</td>
<td>1.000000</td>
<td>30</td>
</tr>
<tr>
<td>28</td>
<td>DMU 28</td>
<td>0.265961</td>
<td>0.170311</td>
<td>0.640361</td>
<td>21</td>
</tr>
<tr>
<td>29</td>
<td>DMU 29</td>
<td>1.000000</td>
<td>0.811709</td>
<td>0.811709</td>
<td>7</td>
</tr>
<tr>
<td>30</td>
<td>DMU 30</td>
<td>0.404074</td>
<td>0.213357</td>
<td>0.528014</td>
<td>11</td>
</tr>
</tbody>
</table>

*Source: Authors' (2017)*

From the Table above, it is found that on the ground of CRS Technical efficiency scores (TEcrs), none of the companies out of the 30 listed REITs is efficient except for DMU 26. This implies that most listed REITs in the Sub-Saharan African region are technically inefficient. It shows that they have not been able to use their total asset and equity input to produce superior outputs (i.e total revenue and net operating income). This in the long run implies that they used more inputs to produce relative few output. In the same result it is observed that the Mega REIT firms in terms of total assets are grossly inefficient in converting its large total asset and equity to income as compared to its peer that had small asset and equity inputs.

Following the above analysis, it is suggested that the null hypotheses of (All listed REIT firms in Sub-Saharan Africa are technically inefficient under a constant return to scale assumption) in this study should be rejected since only DMU 26 is efficient and this confirms the findings of Miller and Springer (2007).
VRS DEA Results

The “pure” technical efficiency score for each of the 30 REITS is equally presented in Table 3. The VRS DEA model is established on the postulation of variable return to scale for all the sampled firms. This implies increases in input by one percent can lead to a more than one percent escalations in its output (total revenue and net operating income). This implies that management skills in converting small inputs to large outputs are captured by the VRS DEA model. The VRS DEA results are presented in Table 3 and discussed below:

From Table 3, it is found that on the strength of VRS Technical efficiency scores (TEvrs), seven (7) REIT firms from the 30 sampled firms were efficient while 23 were discovered not to be efficient. The seven competent REIT firms that successfully employ their asset and equity input to spawn better productivities (i.e total revenue and net operating income) are; DMU 5, DMU 13, DMU 21, DMU 23, DMU 26, and DMU 29. This is an indication that the seven firms engaged minimal inputs to achieve proportional better yield when equated to other sampled companies. In the same result, it is found that some large companies in terms total asset base like DMU 23, and DMU 30, were not efficient in converting their given inputs to outputs, but large companies like DMU 18 and DMU 13 displayed their efficiency in translating their given inputs to outputs. This in other words, means that management of these two large companies were successful in using their relatively small input resources to generate income relatively better than other peer companies. This result negates the assumption that large companies in terms of asset base are more efficient than small asset based companies. However, this is beyond the scope of this research work. Hence, it is concluded that based on the VRS DEA model, some of the Mega REIT companies in Sub Saharan Africa were inefficient in converting their large total asset and equity to income as compared to some of their peers that had small asset and equity inputs, thereby creating slacks or under-utilization.

Following the above analysis, the paper therefore suggests that the null hypotheses of (All listed companies in Sub-Sahara Africa are purely technically inefficient under a variable return to scale assumption) in this study should be rejected since it is found that seven REIT companies among the sample are efficient which is in consonance with the findings of Harun, Tahir and Zaharudin (2012).

Scale Efficiency Results

Following the above, it is observed that constant return to scale DEA model is established on comparative efficiency in regards to using the correct scale of operation without consideration for management proficiency and in the same vain the variable returns to scale DEA model depicts the success of firms’ management of input to output “conversion”. The scale efficiency which is the ratio of overall technical efficiency (TEcrs) to pure technical efficiency (TEvrs) gauges to what extent a firm can advance its efficiency by being projected from VRS to CRS, which is an indication of the capacity to further increase its outputs. This mirrors the efficiency of the firm regardless of whether it functions its proper returns to scale or not. For a firm to become scale efficient, it should increase its output further to reach the most productive scale size. In Table 3, it is observed that on the basis of scale efficiency scores (TEcrs/TEvrs) that only DMU 26 and DMU 27 were scale efficient. This means that only these two companies were able to use their total asset and equity input to generate better outputs.

Following the above analysis, it is therefore suggested that the null hypotheses (All listed companies in Sub-Sahara Africa are scale inefficient) in this study should not be accepted since found two companies among our sampled companies are found to be efficient under both constant and variable return to scale assumptions, this result is in agreement with the submission of Miller and Springer (2007).

Conclusion and Recommendation

This study empirically assessed performance efficiency of listed real estate investment trust firms in sub-Sahara Africa using data envelopment analysis technique. Resource utilization of REIT firms in sub-Sahara Africa is grossly inefficient as only 23.3% were VRS efficient, 3.33% were CRS efficient and 6.67% were SCALE efficient which is a strong indication that Africa listed REIT firms are not doing pretty well owing to the fact that REIT is a new investment channel that is relatively unpopular amongst investors in

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the continent. The REIT firms in South Africa performed better than their contemporaries from Nigeria, Kenya and Ghana this can be adduced to the edge they have in terms of technological advancements, strong regulatory institutions and mortgage policies of the government in attracting private sector participation in real estate business.

This study therefore recommends that the inefficient firms should bench mark and bench race the efficient REIT firms in the sampled data set. The government of Nigeria, Kenya and Ghana should entrench institutional regulations to deepen REITs business in their various countries.

References


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