Abstract

This study uses data envelopment analysis (DEA) approach to benchmark the performance of thirteen thrifts and mortgage finance companies against one another for the period 2008 to 2011. We cover the period of start of the economic crisis and the consequent passing to new law to regulate the financial services industry. We find that, at the height of the economic crisis in 2008, only five companies out of thirteen were efficient and the number of efficient companies actually declined to four only in 2010. In 2011, the number of efficient companies increased to eleven. We illustrate the use of data envelopment analysis (DEA), an operations research technique, to evaluate the relative financial strength of thirteen thrift and mortgage firms by benchmarking them on the basis of four variables against their peers. DEA clearly brings out the firms that are operating more efficiently in comparison to other firms in the industry, and points out the areas in which poorly performing firms need to improve.

I. INTRODUCTION

Given the significance of financial institutions in economic growth, financial institutions including banks, thrifts, and mortgage companies are considered private companies with a public purpose. They seek to create value for all the stakeholders and maximize shareholder wealth subject to the constraints of risk, market competition, social, and the legal/regulatory framework. The private nature of these institutions requires them to be viable through profitability and the public nature of these institutions emphasizes safety and soundness of their operations. Profitability is important for the viability of a financial institution, but safety and security is also critical for the survival of the financial system. Financial institutions make a trade-off between
the profitability level they strive to achieve and the risks they are willing to take. If a bank achieves loan growth and, consequently, higher profitability by engaging in excessively risky lending, it may be vulnerable to high loan defaults that would hurt its earnings or even threaten its survival over time as the world saw under the current economic crisis. Since 2008, the US mortgage industry has clearly been in a state of duress due to an overwhelming number of nonperforming home loans and as a result it had a severe negative impact on the profitability and viability of the financial system in the United States.

On July 21, 2010, President Obama signed into law an act of Congress entitled the “Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010” (H.R. 4173), (hereafter, “Dodd-Frank”). This act is intended to curb excessive risk by banks by making them responsible lenders.

The new law makes provisions for better risk monitoring and capital requirements to build a cushion to prevent future banking crisis of the magnitude that hit the United States in 2008. Under the new act, financial institutions will be discouraged from engaging in predatory lending activities.

The act also poses a special challenge to the long-term viability of thrifts and thrift holding companies through a direct or indirect impact on the income or cost of doing business for the thrift and banking industry. Profit margins for all financial institutions are expected to decline under the new regulations. For example, larger institutions will no longer be able to generate profits from risky bets using their own money and will have to rely more on the traditional low-margin banking business.
In addition, the cost of doing business in the banking industry will go up, because smaller banks will be required to increase staff levels in their credit departments and compliance functions as the rules will apply to the same extent to both large and small institutions.

The objective of this paper is to benchmark the performance of thirteen thrifts and mortgage finance companies against one another for the period 2008 to 2011. In this paper, we use data envelopment analysis (DEA), an operations research technique, to benchmark these thirteen thrift and mortgage companies. DEA clearly brings out the companies that are operating more efficiently in comparison to other firms in the industry. DEA also points out the areas in which poorly performing firms need to improve. By using the existing good companies as a “role model,” DEA not only helps differentiate well performing (efficient) firms from poorly performing (inefficient) firms, but also brings out the reasons why a company may be underperforming. This helps investors and creditors justify their decisions to invest or not to invest their funds in a particular company. This will also help regulators identify areas of weakness for a thrift or mortgage firm so that management plans can focus on plugging the weaknesses or taking steps to counter the weaknesses.

The rest of the paper is organized along the following lines. In section II, we provide a review of previous studies. Section III discusses the model that we use in this study. Section IV provides empirical analysis of our results. Section V summarizes and concludes our study.

II. LITERATURE REVIEW

Use of data envelopment analysis in analyzing the efficiency of banks and banking industry are well documented in previous studies. According to Thanassoulis (1999), data envelopment analysis, a linear-programming technique, is increasingly being used to assess performance in the banking industry. The unit of assessment is normally the bank branch. Studies are mostly
centered on deriving a summary measure of the efficiency of each unit, on estimating targets of performance for the unit, and on identifying role-model units of good operating practice.

Additional uses for DEA in banking include the measurement of efficiency in light of resource and output prices, the estimation of operating budgets that are conducive to efficiency, the assessment of financial risk at the bank-branch level, and the measurement of the impact of managerial change initiatives on productivity.

Previous studies that use data envelopment analysis in the context of the banking industry can be broadly classified into three categories:

- Studies that focus on benchmarking banks against each other in a particular country;
- Studies that focus on analyzing the branch efficiencies; and
- Studies that focus on economies of scale in the banking industry.

Malhotra, Poteau, and Malhotra (2012) developed a multidimensional framework using data envelopment analysis to benchmark the performance of 35 commercial banks in India on the basis of eight performance variables. Kao and Liu (2004) computed efficiency scores based on the data contained in the financial statements of Taiwanese banks. They used this data to make advanced predictions of the performances of 24 commercial banks in Taiwan. Pille and Paradi (2002) analyzed the financial performance of Ontario credit unions. They developed models to detect weaknesses in Credit Unions in Ontario, Canada. Halkos and Salamouis (2004) explored the efficiency of Greek banks with the use of a number of suggested financial efficiency ratios for the time period 1997-1999. They showed that data envelopment analysis could be used as either an alternative or complement to ratio analysis for the evaluation of an organization's performance. The study found that the higher the size of total assets the higher the efficiency. Neal (2004) investigated X-efficiency and
productivity change in Australian banking between 1995 and 1999 using data envelopment analysis and Malmquist productivity indexes. The study differed from earlier studies by examining efficiency by bank type, and found that regional banks were less efficient than other bank types. The study concluded that diseconomies of scale set in very early, and hence are not a sufficient basis on which to allow mergers between large banks to proceed. Paradi and Schaffnit (2004) evaluated the performance of the commercial branches of a large Canadian bank using data envelopment analysis. Chen, Sun, and Peng (2005) studied the efficiency and productivity growth of commercial banks in Taiwan before and after financial holding corporations' establishment. They employed a data envelopment analysis approach to generate efficiency indices as well as Malmquist productivity growth indices for each bank.


Sanjeev (2007) evaluated the efficiency of the public sector banks operating in India for a period of five years (1997-2001) using DEA. The study also investigated if there is any relationship between the efficiency and size of the banks. The results of the study suggested that no conclusive relationship could be established between the efficiency and size of the banks. Lin, Shu, and Hsiao (2007) studied the relative efficiency of management in the Taiwanese banking system through DEA. The goal was to estimate the competitiveness of each bank and managerial efficiency is to show the efficiency variation of each bank through
Malmquist index. Bergendahl and Lindblom (2008) developed principles for an evaluation of the efficiency of a savings bank using data envelopment analysis as a method to consider the service orientation of savings banks. They determined the number of Swedish savings banks being "service efficient" as well as the average degree of service efficiency in this industry.

No study has specifically analyzed the thrifts and mortgage companies in the United States. This study extends previous literature by analyzing the performance of the thrifts and mortgage industry at a point in time when the industry is going through much turmoil.

III. MODEL

The Data Envelopment Analysis Model

Data envelopment analysis (DEA) is a linear programming technique that was developed by Charnes Cooper (1978) to assess the relative performance of homogenous organizational units. Further, this generalized optimization technique measures the relative performance of different decision-making entities (called decision-making units or DMUs) that have multiple objectives (outputs) and multiple inputs structure. Since, in this study, we analyze thirteen thrift and mortgage companies, these companies are the DMUs. DEA measures the efficiency with which a DMU uses the resources available (inputs) to generate a given set of outputs. The DEA methodology defines efficiency as a ratio of total outputs to total inputs and uses this to evaluate the relative performance of a DMU. Further, the DEA model estimates relative efficiency, which is with reference to the best performing DMU or DMUs (in case multiple DMUs are most efficient). The DEA allocates an efficiency score of unity

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1 The main sources of the DEA Model description are Ramanathan (2003) and Zhu (2003).
or 100 percent to the most efficient unit. The low-performing DMUs’ efficiency can vary between 0 and 100 percent in comparison to the best performance.

To develop a DEA model, we consider “n” Decision-making units (DMUs). Further, we define the following variables:

\[ j = 1, 2, \ldots, n \] (DMU variable).

\[ i = 1, 2, \ldots, m \] (inputs variable).

\[ r = 1, 2, \ldots, s \] (outputs variable).

Therefore, each DMU \(_j\), \( j = 1, 2, \ldots, n \), uses the following variable factors:

\[ x_{ij} \] – amount of input \( i \) for the unit \( j \), \( i = 1, 2, \ldots, m \) and \( j = 1, 2, \ldots, n \).

\[ y_{rj} \] – amount of output \( r \) for the unit \( j \), \( r = 1, 2, \ldots, s \) and \( j = 1, 2, \ldots, n \).

\[ u_r \] – weight assigned to the output \( r \), \( r = 1, 2, \ldots, s \)

\[ v_i \] – weight assigned to the input \( i \), \( i = 1, 2, \ldots, m \).

Further, for each DMU, we form the virtual input and output using the weights (to be determined) \( v_i \) and \( u_r \):

Virtual input = \( \sum_{i=1}^{m} v_i x_{ij} \)

Virtual output = \( \sum_{r=1}^{s} u_r y_{rj} \)

Where \( j = 1, 2, \ldots, n \) (DMU variable). We want to determine the weights, using linear programming so as to maximize the ratio

\[ \frac{Virtual \ Output}{Virtual \ Input} \]
The DEA methodology gives a measure of efficiency that is defined as the ratio of weighted outputs to weighted inputs. The most important issue in this method is the assessment of the weights. Charnes et. al., define the efficiency measure by assigning to each unit the most favorable weights. In general, the weights will not be the same for different units. Further, if a unit happens to be inefficient, relative to the others, when most favorable weights are chosen, then it is inefficient, independent of the choice of weights. Thus, given a set of weights, we define the efficiency with which a DMU processes the inputs to produce outputs as the ratio of the weighted sum of outputs to the weighted sum of inputs.

\[
\text{Efficiency} = \frac{\sum_{j=1}^{s} u_{r} y_{rj}}{\sum_{i=1}^{m} v_{i} x_{ij}}
\]

(1)

IV. DATA AND METHODOLOGY

We used the data available from the financial statements of thirteen thrift and mortgage companies for the period 2008 to 2011. The data is from Mergent Online. Thirteen financial services firms that we include in our study are: Aastoria Financial Corporation, Bank Mutual Corporation, Brookline Bancorp Inc., Dime Community Bancshares, Hudson City Bancorp Inc., New York Cmnty Bancorp Inc., Northwest Bancshares Inc., Oritani Financial Corporation, People's United Finl Inc., Provident Financial Svcs Inc., Trustco Bank Corp/Ny, Viewpoint Financial Group, and Washington Federal Inc. These thrift and mortgage companies have been identified as competitors by Standard & Poor’s Netadvantage. Therefore, in order to benchmark the performance of thirteen thrifts and mortgage companies, we consider the following four broad sets of ratios that capture the private-public nature of banking:

- Efficiency ratio
- Net Interest Margin
- Return on Assets
- Loan Loss Reserve Ratio

**Efficiency ratio** is based on noninterest expenses divided by operating revenue. Noninterest expenses include operational expenses such as personnel and occupancy costs (salaries, technology, building, supplies, and administrative expenses). Operating revenue includes net interest income (interest revenue less interest expense) plus fees income. Efficiency ratio measures costs required to generate each dollar of revenue and reflects the productivity of a bank. If the costs required to generate every dollar of revenue are low, it means lower operational costs. Lower operational costs translate into greater operational efficiency.

**Net interest margin (NIM):** The NIM is calculated by dividing the net interest income by the earning assets. For Indian banks, it is measured by net interest income divided by total funds.

**Return on assets (ROA):** Return on assets is computed by dividing bank’s net income by its total assets. In general, the higher the ROA the better it is, provided it is not the result of excessive risk-taking. Banks will typically have a relatively low ROA in comparison to industrial organizations mainly because banks are highly leveraged.

**Loan Loss Reserve Ratio** is computed by dividing the loan loss reserves by the total non-performing assets of the institution. Higher ratio means that the bank has enough funds to cover the loan losses and the institution will remain sound. It is a measure of the safety of a thrift and mortgage firm.

Table 1 illustrates the pooled data of the thirteen companies used for analysis.

<Insert Table 1 about here>
In this paper, we have one input variable in the form of the efficiency ratio that needs to be minimized and three output measures in the form of the loan loss reserve ratio, net interest margin, and return on assets that need to be maximized. Since the number of output variables exceeds the number of input variables, we used the input oriented model.

Finally, the choice of the DEA model is also an important consideration. We should select the appropriate DEA model with options such as input maximizing or output minimizing, multiplier or envelopment, and constant or variable returns to scale. DEA applications that involve inflexible inputs or not fully under control inputs should use output-based formulations. On the contrary, for an application with outputs that are an outcome of managerial goals, input-based DEA formulations are more appropriate. In addition, for an application that emphasizes inputs and outputs, we should use the multiplier version. Similarly, for an application that considers relations among DMUs, envelopment models are more suitable. Furthermore, the characteristics of the application dictate the use of constant or variable returns to scale. If the performance of DMUs depends heavily on the scale of operation, constant returns to scale (CRS) is more applicable, otherwise variable returns to scale is a more appropriate assumption.

In our study, the comparative evaluation among the companies is an important consideration. Therefore, we select the envelopment models for our analysis. In addition, the outputs are an outcome of managerial goals. Therefore, input-based formulation is recommended for our study. The objective of the analysis is to suggest a benchmark for the thrift and mortgage firms. Furthermore, to investigate the effect of scale of operations, if any, among the thirteen companies, we consider both variable returns to scale and constant returns to scale DEA models. Also, the structure of the DEA model (in envelopment form) uses an equation and separate
calculation for every input and output. Therefore, all the input and output variables can be used
simultaneously and measured in their own units. In this study, we use the Input-Oriented
Variables Return to Scale (VRS) to evaluate the efficiency of thirteen thrifts and mortgage
companies for the period 2008 to 2011.

V. EMPIRICAL ANALYSIS

Using the DEA methodology, we compute an efficiency score for the thirteen companies
on a scale of 1 to 100 on the basis of the financial data for each year for the period 2008 to 2011.
Table 2 illustrates the efficiency scores for thirteen companies. Further, we also study the peers
(model companies) for inefficient companies.

<Insert Table 2 about here>

Table 2 shows the relative performance of the financial services companies benchmarked
against each other. Table 2 also shows that five out of thirteen companies were ranked as
efficient based on the data for the years 2008 and 2009. In 2010, only four companies were
100% efficient, and in 2011, the number of 100% efficient companies went up to six. Here is
summary of our findings:

- Only Hudson City Bancorp is 100% efficient throughout the sample period of
  2008 to 2011.
- Astoria Financial, Bank Mutual, Provident Financial Services, and Viewpoint
  Financial Group are not 100% efficient in any year during the period of 2008 to
  2011.
- Northwest Bancshares is 100% efficient in the years 2008 and 2009 only,
- Peoples United Financial is 100% efficient in 2008 and 2011,
• Trustco is 100% efficient in 2008 only,

• Washington Federal is 100% efficient in 2008, 2009, and 2011 only,

• Brookline Bancorp is 100% in 2009, 2010, and 2011.

• DME Community Bancshares is 100% efficient in the years 2010 and 2011

• New York Community Bancorp is 100% efficient in the years 2009 and 2010

• In the years 2008 and 2009, Astoria Financial is the least efficient company with an efficiency score of 64% and 69%, respectively

• In 2010 and 2011, the least efficient company is Bank Mutual Corporation with an efficiency score of 40% and 68%, respectively.

• The 100% efficient companies (blue dots) are on the efficiency frontier, whereas the inefficient companies (red dots) are inside the efficiency frontier. The DEA Analyzer calculates the level of inefficiency by measuring the distance between the efficiency frontier and the inefficient companies. Therefore, a financial analyst can use this efficiency frontier to assess the relative efficiency of the firm in the industry. The DEA model compares the net interest margin, return on assets, loan loss reserves, and efficiency ratios.

<Insert Table 3 about here>

Table 3 shows that DIME Community Bancorp serves as a peer for Astoria Financial Corporation, New York Community Bancorp, Northwest Banc Shares, Provident Financial Services, Trustco Bank Corporation, Viewpoint Financial Group, and Viewpoint Financial
Group. People’s United Financial Services Company serves as a peer for Bank Mutual Corporation, Northwest Bancshares, Provident Financial Services, and Trustco Bank Corporation. Brookline Bankcorp is the peer for Trustco Bank Corporation. The efficient peer companies have a similar mix of input-output levels compared to that of the corresponding inefficient company, but at more absolute levels. The efficient companies generally have higher output levels relative to the company in question. The features of efficient peer companies make them very useful as role models that inefficient companies can emulate to improve their performance. Furthermore, DIME Community Bancorp is the immediate efficient peer for six companies in 2011, so its frequency of use as an efficient-peer, expressed as a percentage of the number of Pareto-inefficient companies, is more than 50%. Thus, we have enhanced confidence that DIME Community Bancorp is genuinely well-performing company as it outperforms all the other companies. Furthermore, these companies are more likely to be a better role model for less efficient companies to emulate as their operating practices and environment match the majority of the other companies quite closely.

After calculating the efficiency of a company and identifying the efficient peers, the next step in DEA analysis is the feasible expansion of the output or contraction of the input levels of a company within the possible set of input-output levels. The DEA efficiency measure tells us whether or not a given company can improve its performance relative to the set of companies to which it is being compared. Therefore, after minimizing the input efficiency, the next stage involves calculating the optimal set of slack values with an assurance that input efficiency will not decrease at the expense of slack values of the input and output factors. Once the input efficiency factor has been minimized, the model does seek the maximum sum of the input and output slacks. If any of these values is positive at the optimal solution to the DEA model, it
implies that the corresponding output of the company (DMU) can improve further after its output levels have been raised by the efficiency factor, without the need for additional input. If the efficiency is 100% and the slack variables are zero, then the output levels of a company cannot be expanded jointly or individually without raising its input level. Further, its input level cannot be lowered given its output levels. Thus, the companies are Pareto-efficient with technical output efficiency of 1. If the company is 100% efficient but one slack value is positive at the optimal solution then the DEA model has identified a point on the efficiency frontier that offers the same level on one of the outputs as company A in question, but it offers in excess of the company A on the output corresponding to the positive slack. Thus, company A is not Pareto-efficient, but with radial efficiency of 1 as its output cannot be expanded jointly. Finally, if the company A is not efficient (<100%) or the efficiency factor is less than 1, then the company in question is not Pareto-efficient and efficiency factor is the maximum factor by which both its observed input levels can be reduced without changing its output. If at the optimal solution, we have not only input efficiency < 1, but also some positive slack, then the output of company A corresponding to the positive slack can be raised by more than the factor’s output efficiency, without the need for additional input. The potential additional output at company A is not reflected in its efficiency measure because the additional output does not apply across all output dimensions.

Table 4 shows the slack variables for thrift and mortgage companies for the year 2011 only.

<Insert Table 4 about here>

The slack variables for 100% efficient companies are zero. Therefore, Brookline Bancorp, DIME Community Bancshares, Hudson City Bancorp, Oritani Financial Corporation, Peoples
United Financial, and Washington Federal are Pareto-efficient as the DEA model has been unable to identify some feasible production point which can improve on some other input or output level. On the other hand, Astoria Financial Corporation needs to improve its efficiency ratio by reducing it by 0.11 units, loan loss reserve ratio and net interest margin by increasing them by 0.11 units and 0.49 units, respectively. Bank Mutual Corporation needs to improve its efficiency ratio by decreasing it by 0.04 units and improve its loan loss reserve ratio, and return on asset by increasing them by 0.13 units and 2.63 units, respectively. Similarly, Net York Community Bancorp needs to improve its efficiency ratio, loan loss reserve ratio, and net interest margin relative to its efficient peers. Also, Provident Financial Services needs to improve its efficiency ratio and loan loss reserve ratio, while Viewpoint Financial Corporation needs to improve its efficiency ratio and net interest margin relative to their 100% efficient peers. On the other hand, Northwest Bancshares and Trustco Bank Corporation need to improve its efficiency ratio (by minimizing nonoperating expense relative to operating revenue) only.

VI. SUMMARY AND CONCLUSIONS

The housing mortgage loans are being blamed for the current economic crisis. Since 2008, the US mortgage industry has clearly been in a state of duress due to an overwhelming number of nonperforming home loans; millions of homeowners owing more than their homes are worth, depressed home sales, and the ineffectiveness of mortgage modification and refinancing programs. As a result, the government introduced new legislation, Dodd-Frank Act, to regular the financial industry so that there is no repeat of the 2008 economic crisis. New regulation will have an impact on the financial performance of the entire financial industry. In this study, we
evaluated the relative performance of thirteen thrift and mortgage firms by benchmarking them against one another through the operations research technique of data envelopment analysis.

DEA employs relative efficiency, a concept enabling comparison of companies with a pool of known efficient companies. The DEA model compares a firm with the pool of efficient companies by creating an ‘efficiency frontier’ of good firms – a tolerance boundary created by establishing the efficiency of firms in terms of several sets of financial ratios. Companies lying beyond this boundary can improve one of the input values without worsening the others. We found that Hudson City Bancorp was the only company that was 100% efficient throughout the sample period of 2008 to 2011. On the other hand, Astoria Financial Corporation, Bank Mutual Corporation, Provident Financial Services, and Viewpoint Financial Group were inefficient for each year of the sample period of 2008 to 2011. We also illustrate the areas in which inefficient companies are lagging behind efficient firms.

This study also provides an insight into the benefits of DEA methodology in analyzing financial statements of firms. The DSS stores the company’s historical data, competitive firm’s data and other industry specific data and uses the DEA methodology to analyze a firm’s performance. Moreover, DEA modeling does not require prescription of the functional forms between inputs and outputs. DEA uses techniques such as mathematical programming that can handle a large number of variables and constraints. As DEA does not impose a limit on the number of input and output variables to be used in calculating the desired evaluation measures, it’s easier for the analyst to deal with complex problems and other considerations they are likely to confront. However, DEA does have certain limitations. As DEA is an extreme point technique, errors in measurements can lead to deviations in results. DEA efficiencies are very sensitive to even small errors, making sensitivity analysis an important component of the DEA-
procedure. In addition, as DEA is a non-parametric technique, statistical hypothesis tests are difficult. Further, DEA has been designed to compute efficiency scores only when one or more inputs and one or more outputs are used for the analysis. Finally, the application of DEA requires solving a separate linear program for each DMU. Hence the application of DEA to cases with a large number of DMUs can be computationally intensive. However, with the modern computing capacity, this is not a serious issue.

REFERENCES


Table 1. Summary statistics of the data used in this study

<table>
<thead>
<tr>
<th>Variables</th>
<th>Efficiency Ratio</th>
<th>Loan Loss Reserve Ratio</th>
<th>Net Interest Margin</th>
<th>Return on Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.41 0.39 0.35 0.30</td>
<td>0.70 0.65 0.71 1.41</td>
<td>3.25 3.04 2.86 2.77</td>
<td>0.49 0.52 0.36 0.58</td>
</tr>
<tr>
<td>Median</td>
<td>0.45 0.41 0.32 0.30</td>
<td>0.55 0.63 0.54 1.00</td>
<td>3.40 3.45 2.96 2.78</td>
<td>0.82 0.73 0.44 0.64</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.64 0.72 0.63 0.54</td>
<td>2.00 1.88 2.21 5.67</td>
<td>4.10 3.71 3.56 3.62</td>
<td>1.17 1.30 1.07 0.99</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.15 0.10 0.09 0.07</td>
<td>0.26 0.26 0.21 0.21</td>
<td>1.90 1.47 2.09 1.91</td>
<td>-1.87 -2.38 -1.82 -0.14</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.14 0.15 0.15 0.13</td>
<td>0.49 0.42 0.60 1.45</td>
<td>0.62 0.71 0.47 0.54</td>
<td>0.97 0.91 0.71 0.30</td>
</tr>
</tbody>
</table>

Table 2. A summary of the relative efficiencies of thirteen mortgage and thrift companies for the period 2008 to 2011.

<table>
<thead>
<tr>
<th>Company</th>
<th>2008.00</th>
<th>2009.00</th>
<th>2010.00</th>
<th>2011.00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>efficiency</td>
<td>Percentage Efficiency</td>
<td>efficiency</td>
<td>Percentage Efficiency</td>
</tr>
<tr>
<td>ASTORIA FINANCIAL CORP</td>
<td>1.57</td>
<td>0.64</td>
<td>0.69</td>
<td>1.30</td>
</tr>
<tr>
<td>BANK MUTUAL CORP</td>
<td>1.44</td>
<td>0.69</td>
<td>0.77</td>
<td>2.52</td>
</tr>
<tr>
<td>BROOKLINE BANCORP INC</td>
<td>1.06</td>
<td>0.94</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>DIME COMMUNITY BANCSHARES</td>
<td>1.08</td>
<td>0.92</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>HUDSON CITY BANCORP INC</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>NEW YORK CITY BANCORP INC</td>
<td>1.24</td>
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<td>NORTHWEST BANCSHARES INC</td>
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<td>PROVIDENT FINANCIAL SVCS INC</td>
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<td>0.80</td>
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</tr>
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<td>WASHINGTON FEDERAL INC</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.10</td>
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</table>
Table 3 illustrates the peer group for the inefficient companies for the year 2011.

<table>
<thead>
<tr>
<th>Company</th>
<th>Efficiency</th>
<th>Loan Loss</th>
<th>Int Rate</th>
<th>Return on Asset</th>
</tr>
</thead>
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<td>ASTORIA FINANCIAL CORP</td>
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<td>0.1099</td>
<td>0.4924</td>
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<td>BANK MUTUAL CORP</td>
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<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>DIME COMMUNITY BANCSHARES</td>
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<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>HUDSON CITY BANCORP INC</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
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</tr>
<tr>
<td>NEW YORK CMNTY BANCORP INC</td>
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## Appendix A: List of Thrifts and Mortgage Companies in this Study

**THrifts & MORTGAGE Finance‡**

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