Bank branch performance assessment: including customer satisfaction measures

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Including customer satisfaction measures in bank branch performance assessment

Abstract

This study reports a method for integrating customer satisfaction data into a DEA (Data Envelopment Analysis) model for exploring bank branch efficiency.

It is confirmed that inclusion of an unadjusted customer satisfaction score generates misleading results, but that use of an adjustment process can remedy this. In this particular case, bank branches are found to be subject to decreasing returns to scale.

Keywords:

Banks, branch networks, customer satisfaction, data envelopment analysis (DEA).
1 Introduction

Over the last few decades, the idea that a firm’s sole objective should be short-term profit maximization has become much less of a conviction. Business firms are now inclined to look at stakeholder and shareholder value, and to strive to link these with some sort of longer run perspective on profitability. To achieve this, particularly in a market which is not characterized by the model of perfect competition, firms need to look at a wider range of objectives, and recognise that there can be trade-offs between profitability this year and profitability in future years. Profitability in future years can be a reflection of more than just current expenditures and revenues, but can be impacted by issues such as customer and public perceptions of the level of service that is provided.

Banking is no exception to this challenge, while having the further complication that each organisation may have multiple points through which service is delivered, costs incurred, and revenues generated. Bank branches are often major service delivery points, and it is an ongoing challenge for management at bank headquarters to understand branches’ effectiveness in contributing to overall corporate objectives. Moreover, at the level of the individual branch, not all the factors which might be used to assess the performance of a bank at an overall level will be controllable, in that quantities of resources and outcomes may be specified elsewhere in the organisation.

For all this, getting a bank’s branch network to operate effectively should be an important corporate objective. Berger & Humphrey (1991) noted that the major source of efficiency differences between banks lay in X-efficiency rather than in scale effects, and if we are to address X-efficiency issues across a bank as a whole, addressing X-efficiency at branch level and making sure that branches operate at somewhere near an optimal scale can make a major contribution.
Moreover, as Berger et al (1997) note, this may also entail review of the number of branches as a whole.

This paper reports on a study of the efficiency of the branches of a New Zealand bank, with service quality included as an output. The key contribution is in finding a way in which service quality can be satisfactorily incorporated into an efficiency study, but in the process, we discover that, at least for the set of inputs and outputs used here, we can obtain an indication of optimal branch size.

The rest of the paper is structured as follows. In the next section we discuss the problems of using service quality measures in efficiency research, and look at some of the approaches that have been followed in previous research. Section 3 describes the data and method used in this study, while section 4 reports the results and discusses these. Section 5 concludes.

2 Service quality in bank efficiency studies

A number of previous studies have looked at customer satisfaction measures in studying bank branch performance, although obtaining suitable data has often been problematic. Thus Mukherjee et al (2002) used non-interest-income and interest spread as a proxy for customer service, although this was not a wholly satisfactory approach, as non-interest income and interest spread would also be expected to be affected by many more factors than customer satisfaction. Sales and service measures, as used by Cook & Hababou (2001), are not the same as customer satisfaction scores, although one would expect them to be related.

Key issues that need to be addressed are where customer satisfaction measures fit in the production process, and how they should be incorporated into efficiency studies. Thus Portela &
Thanassoulis (2007) note that service quality measures can either be included directly in the analysis, or compared to the results of efficiency studies that have been undertaken without their direct inclusion. We need to begin our analysis by formulating a clear vision of where service quality fits in the production process, mindful also that what applies for comparing banks may not apply exactly to assessing the performance of branches.

Avkiran (1999) used a service quality measure as an input, on the basis that satisfied customers were likely to make greater use of branch services, thus enhancing revenue performance. The potential negative to this (which the author did not discuss) is that branch managers might then prefer a lower customer satisfaction score as that would make their target output easier to achieve.

Athanassopoulos (2000) proposed treating service quality as part of a two-stage process. In the first stage, he suggests that branch level service quality should be an output from a model that has capabilities (of staff, etc) as an input. Actual performance was measured in a second stage, which had service quality as an input alongside costs and size, with outputs of deposits, commission income and workload (measured by queues). The service quality measure used as an input to the second stage was a maximum feasible service quality for each branch, rather than the level actually being achieved. This approach was also followed by Soteriou & Zenios (1999).

The majority of studies that have used customer satisfaction scores have used them as an output. This is consistent with Athanassopoulos’ (1998) specification for the objective of a bank branch as being “to penetrate its market by selling financial products to new customers while delivering services to existing customers” (p 174).

Another challenge with looking at customer satisfaction measures for branch efficiency studies is in measuring them, and then in applying them in models. We thus find that Oral & Yolalan
(1990) measured service efficiency as the time spent undertaking various activities, although a
more common approach to service quality measurement is through some sort of survey process.
Thus Soteriou & Stavrinides (1997) and Soteriou & Zenios (1999) used internal staff surveys,
which might be expected to be less than ideal, although Soteriou and Zenios (1999) found internal
survey results to be correlated with external survey results, and that there was no major impact on
the branch efficiencies estimated.

There is another important point highlighted in Dyson et al (2001) which needs to be considered.
This is their pitfall 4.3, highlighting the danger of mixing indices and volume measures, where
survey results on customer satisfaction are usually on some sort of index scale. Use of index
scales in this way will usually show small branches in a favourable light: this is because it is no
more difficult for a small branch rather than a large branch to achieve a satisfaction score of, say,
80%, although the large branch will have used significantly more resources to achieve this.

Treatment of this issue has not always been fully discussed in previous research, with the result
that we do not always know how it has been dealt with. This may, however, have been why
Soteriou & Stavrinides (1997) took care to use only a small group of branches, which they
regarded as being relatively homogeneous in terms of their size. It is an attempt to resolve this
problem that is the major focus of this paper.

3 Data and method

The research was undertaken on the branch network of a major bank that operates throughout
New Zealand. Although the New Zealand market is dominated by a small number of nationally
operating banks (the four largest had a combined market share of 89.7% of banking system assets
as at 31 December 2007), the market is perceived as highly competitive, with banks continually seeking to gain advantage over their rivals.

One of the areas in which they seek competitive advantage is in terms of customer satisfaction ratings, with these believed to generate advantage in terms of both customer acquisition and retention, and in sales of increased volumes of banking products. The bank that is the focus of this study is no exception in this regard, and survey-based customer satisfaction scores have been an integral part of branch performance assessment for some time.

Because the author has been working with the bank, he has had access to a broad range of data, which has allowed a choice of what data ought to be used as inputs and outputs for the efficiency models used in the study. Previous studies, as far back as the first reported study of bank branch efficiency by Sherman & Gold (1985), have distinguished between the intermediation and production approaches to the modelling of the financial services firm. The production approach, which utilises physical mirrors of inputs and outputs, is most common for studies of bank branches, although data to allow its use are often difficult to obtain, unless, as in this case, the researcher is working with the bank that is providing the data.

The importance of the taxonomic distinctions between the two approaches may be overstated, however. A more important point is the one highlighted by Dyson et al (2001), which is that the input/output set should cover the full range of resources used and outputs created. With 127 branches in the full study, one also wants to be mindful of the need to limit total numbers of inputs and outputs, so as to maintain adequate discriminatory power. The inputs and outputs used in this study are broadly consistent with the production approach, although some variation on those used in previous research, to better reflect market conditions and management intentions.
This research uses Data Envelopment Analysis (DEA), for a number of reasons. In the first instance, DEA has been used for the majority of previous research on bank branches, and our approach is thus consistent with this. Secondly, because we are using some non-financial inputs and outputs, we would find use of the (alternative) parametric methods more challenging than otherwise. Moreover, we would find it difficult to establish appropriate separate measures of price and quantity for the inputs and outputs used. The third advantage of DEA is that it allows us to study the strengths and weaknesses of individual branch performance in greater depth.

The major weakness of DEA relative to the parametric approaches is its inability to deal with random error. This has been overcome to a significant extent by aggregating six sets of monthly data, which will mitigate the impact of any rogue numbers. Beyond that, we have checked our data with a super-efficiency model (Tone, 2002): no scores were generated which would indicate any concern with data integrity.

The DEA models used are not the traditional (constant returns to scale) CCR and (variable returns to scale) BCC models, but the non-oriented slacks based model available as part of the DEA-Solver software, associated with Cooper et al (2000). These traditional models have their deficiencies, in that they propose that DMUs should be either minimising inputs (the input-oriented model) or maximising outputs (the output oriented model). Bank branches should be doing both of these, and in doing so they are not constrained by the aggregate size of the market, which is a common reason for the use of an input-oriented model for the study of banks as a whole. This provides justification for use of a non-oriented model, rather than the output-oriented models more commonly used in prior studies of bank-branch efficiency (Athanassopoulos et al, 2000; Paradi & Schaffnit, 2004).

\footnote{For a discussion of the strengths and weaknesses of different approaches to modeling an efficient frontier, see Berger et al (1993) or Berger & Humphrey (1997). Golany & Storbeck (1999) summarise the advantages of using DEA for analysis of bank branches.}
A further consideration is that the CCR and BCC models discussed above focus only on radial slacks and do not deal satisfactorily with non-radial slacks. This provides a basis for use of a slacks-based model, as described by Tone (2001). This provides a measure of what is termed mix-inefficiency, which is a product of input and output inefficiencies. Efficiency scores generated must thus be less than or equal to those generated under CCR or BCC models, with these lower efficiency scores providing greater discriminatory power. Tone further notes that the dual of the slacks based model is profit-maximisation, as opposed to either input (cost) minimisation or output (revenue) maximisation.

The range of potential inputs and outputs for which data were available for this study are recorded in Table 1. In some cases data elements could be seen as alternatives to each other (e.g. staff numbers relative to staff expense), while in other cases data appeared to be unreliable (as with floor area, which sometimes included space used by non-branch staff), or incomplete (some quality survey categories). This quickly allowed us to reduce the potential 13 inputs and outputs to 10, with a choice between staff numbers or staff expense as the input. The correlation coefficients between these two alternative input variables and the outputs were very similar, and we therefore heeded management guidance and used staff numbers in the analysis.

[Insert Table 1 about here].

We were also faced with the issue of how to deal with the survey results, which were reported on a 1 to 5 rating scale (although with relatively few scores below 4), and thus lacked and

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2 This is particularly applicable where the input and output variables do not have the same dimensions. See the discussion in Avkiran (2006). Use of a slacks-based model is also justified by Avkiran & Rowlands (2008).
proportionate relationship to the resources actually utilised in branches. Their potential unsuitability was further highlighted by their not being correlated with the input variables.

Our proposed solution to this conundrum is to multiply the relevant output for which we have customer satisfaction scores by the quantity of that output, generating a composite output variable. We thus multiplied the number of new accounts opened and the number of transactions processed by the relevant survey score.\(^3\) The logic underpinning these composite output variables is that there should be a trade-off between the numbers of accounts opened (transactions processed) and customer perceptions of the quality of the service received. The values of the composite output variables can reasonably be expected to increase with the applications of more staff resource.

4 Results

We began by running models with 1 input and 8 outputs, which included the number of accounts opened and transaction numbers unadjusted, alongside the unadjusted customer satisfaction scores. Models were run with both constant and variable returns to scale, to allow us to obtain estimates of scale efficiency.

The differences between the constant and variable returns to scale results were found, using a Mann-Whitney test, to be significant at less that 1%, supporting the existence of scale inefficiency.\(^4\) Figure 1, which plots estimated scale efficiency against full-time equivalent staff numbers, suggests decreasing returns to scale.

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\(^3\) The other two sets of survey results were incomplete, as insufficient responses were received in respect of some branches.

\(^4\) Detailed results from this and other models are omitted for reasons of space, but are available from the author on request.
Decreasing returns are what one would expect from this analysis, because the satisfaction scores are not proportional to the inputs. As further confirmation of the weaknesses of this approach, we find that in the constant returns to scale model, projected customer satisfaction scores often exceed the maximum value of 5. This means that the variable returns to scale model is the only one whose results could be taken seriously, if we were not aware of the problems arising from use of index variables.

We next ran the same models with a reduced set of outputs, with the new account and transaction numbers multiplied by the relevant customer satisfaction scores. This reduced the number of outputs from 8 to 6.

Although there is a difference between the medians of the two sets of efficiency scores, this is no longer significant, even at the 10% level. Mean estimated scale efficiency is now 93.8%, as opposed to 80.4% under the previous (invalid) approach. A scatter-plot showing scale efficiency from these models against full time equivalent staff numbers is shown in Figure 2: the trend suggests decreasing returns to scale, but the slope of the line is less steep, consistent with the scale efficiency not being statistically significant.

As a check on the consistency of results, we undertook a Spearman’s rank order correlation between the results from the two variable returns to scale models, and obtained a correlation
coefficient of 0.755. The results from the models with differing treatments of customer satisfaction scores can be presumed to be broadly consistent with each other.

The final set of models run had full-time equivalent staff as an input, with two outputs only, the customer satisfaction adjusted numbers of new accounts opened and of transactions. In this case, despite the relatively high mean value for scale efficiency, 94.8%, scale efficiency was significant, but only at the 5% level. The relevant scatter plot of scale efficiency relative to full-time equivalent staff numbers is shown as Figure 3, with evidence of decreasing returns to scale.

[Insert Figure 3 about here].

The rank-order correlations relative to the previous models were no longer as strong, although they remained firmly positive. Both this set of models and the previous one generated results broadly consistent with management views of the efficiency of branches in the network.

5 Discussion and conclusion

Previous research on the efficiency of bank branches has found challenges in dealing with customer satisfaction. Athanassopoulos (2000) has proposed a solution to this by using a two-stage analysis, but the approach followed here is a single-stage approach, with the customer satisfaction measure adjusted by a measure of the volume of activities in respect of which the satisfaction score is being generated. The results we have obtained are broadly consistent with management perceptions of the performance of the branches, and will thus provide a foundation for the bank to use DEA to explore and promote the efficiency of its network.
There is an extensive range of data available to support this process, however, and there is still considerable scope to explore combinations of inputs and outputs, and to review the results obtained. Some differences between the different sets of result can be expected, as differing input/output sets will highlight different aspects of branch activities. Because of the emphasis on customer satisfaction in the New Zealand banking market, and this bank being no exception in emphasizing this, customer satisfaction measures will continue to be an important part of such modeling.

Both Golany & Storbeck (1999) and Athanassopoulos & Giokas (2000) have previously discussed the process of implementing and integrating efficiency analyses into a bank, and we should not expect that such an integration process in this case will occur quickly. As the author continues to work with the bank, more lessons may be able to be learned, and more opportunities created to understand issues around bank branch efficiency. This includes looking at sub-sets of branches, based on their size, as was reported by Hartman et al (2001). Beyond that, the process may be complicated by changes occurring within the bank through time, as management explores new options for delivering service to current and prospective customers. We have opportunities to look forward to!
References:


Table 1: Available input and output data

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
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<tbody>
<tr>
<td>Branch floor area</td>
<td>Number of new accounts opened</td>
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<tr>
<td>Staff (full-time equivalent)</td>
<td>Customers served (per month)</td>
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<tr>
<td>Total branch staff expense</td>
<td>Number of transactions</td>
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<tr>
<td></td>
<td>New credit card accounts</td>
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<td></td>
<td>New housing loans</td>
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<td></td>
<td>New term investments (number, not $)</td>
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<td>Quality of lending service</td>
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<td></td>
<td>Quality of new accounts service</td>
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<td>Quality of service – other product sales</td>
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<td>Quality of service – counter transactions</td>
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Figure 1: Plot showing scale effects (relative to full-time equivalent staff as an input) from models with unadjusted satisfactions scores as outputs.
Figure 2: Plot showing scale effects (relative to full-time equivalent staff as an input) from models with adjusted satisfaction scores included in outputs.
Figure 3: Plot showing scale effects (relative to full-time equivalent staff as an input) from models with adjusted satisfaction scores as only outputs.