# THE MISSING LINK: IS BOOK VALUE EFFICIENCY RECOGNIZED BY THE MARKET?

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### The Missing Link: Is Book Value Efficiency Valued by the Market?

#### ABSTRACT

Modern frontier efficiency analysis has been widely utilized in bench marking banks, insurers, and other financial services firms. Cost, revenue, and profit efficiencies are estimated by measuring the performance of firms relative to efficient frontiers consisting of the "best practice" firms in an industry. Despite widespread interest in this type of research, nearly all extant efficiency studies of the financial services industry are based on accounting data, and there have been few attempts to measure the linkage between book value efficiency and market value performance. The objective of this paper is to determine whether book value efficiency translates into superior market-value performance for publicly traded insurance companies. The topic is important because book value efficiency analysis is often the best way to trace the sources of inefficiency at a detailed level within the firm.

Keywords: Insurance, productive efficiency, market value

## 1. Introduction

Since the introduction of econometric and mathematical programming approaches to measuring firm efficiency in the late 1970s (Aigner, Lovell, and Schmidt 1977, Chames, Cooper, and Rhodes, 1978), modern frontier efficiency analysis has become the state-of-the-art in measuring the performance of business firms and other types of decision making units. The field has expanded dramatically during the past two decades, leading to the publication of numerous articles, books and monographs, analyzing efficiency in many different industries and nations worldwide. A survey by Berger and Humphrey (1997) identified more than 130 articles on the banking and insurance industries alone, and the field has continued to expand rapidly since that article was published.<sup>1</sup>

In spite of the widespread interest in efficiency research, nearly all efficiency studies of the financial services industry conducted to date are based on accounting data, and there have been few attempts to measure the linkage between book value efficiency and market value performance. The lack of literature investigating this relationship is somewhat striking as it is well accepted in the

<sup>&</sup>lt;sup>1</sup>Also see Berger, Demsetz, and Strahan (1999) for a more recent literature review. A review of insurance efficiency research is presented in Cummins and Weiss (2001).

corporate finance literature that, absent agency costs, the objective for publicly traded companies should be to maximize the market value of the firm's equity. The objective of the present paper is to remedy this deficiency in the existing literature by analyzing the relationship between book value efficiency and market value performance. We analyze a sample of insurance firms and seek to determine whether book value efficiency translates into superior market performance for publicly traded insurance companies. By focusing on a single industry, we avoid comparability problems that may arise due to accounting differences across industries as well as the difficulty in comparing firms operating with respect to different cost, revenue, or profit frontiers.

The importance of the question we seek to address is two-fold. First, as discussed above, there currently exists no paper in the extant literature which investigates the relationship between book value efficiency and market value performance. This is surprising since theory so clearly predicts a linkage between efficiency and firm value. We seek to establish that linkage.

Second, and perhaps more importantly, performance measures such as the ones we produce have theoretical advantages relative to more traditional measures currently employed to judge the performance of a firm's management relative to a set of peer companies. The efficiency measures of firm performance produced by modern frontier efficiency methodologies have two primary advantages over traditional performance measures such as return on equity and return on assets: (1) Frontier efficiency measures control for differences in input usage and ou tput production in multiinput, multi-output firms using a rigorous approach derived from micro-economic theory. This produces a single measure of firm performance (along a given performance dimension) that automatically controls for differences among firms in input and output mix. And (2) the methodology provides a natural approach to decomposing the firm's overall efficiency score into its scale, technical, and allocative efficiency components.

Having separate estimates of the sources of inefficiency is particularly important in directing resources to operational areas where improvements are most needed. Decomposing efficiency is also

useful in analyzing the effects of changes in organizational form and industrial market structure. For example, most of the largest life-insurers in the U.S. have recently demutualized, adopting the stock organizational form after being organized as mutual insurers for many decades. The industry is also engaged in a wave of consolidation not only between domestic firms operating in the same sector of the industry but also between institutions operating in different sectors (e.g., life insurance and banking) and between institutions domiciled in different countries around the world. Transactions of this type change not only the scale of the organization, but also change the allocative mixes of inputs and outputs for the consolidating firm. Performance measures that separate these various effects will enable us to better guide market participants and policymakers as to the fundamental sources of value being generated through transactions of this type.

# 2. Methodology

Our analysis will be based on the U.S. life and property-liability insurance industries over the period 1993 to 2000. Because traded stock prices reflect the overall performance of insurance groups rather than that of individual companies, the efficiency analysis is conducted at the group level. However, because it is the universe of firms in an industry that determines the cost, revenue, and profit frontiers, the efficiency analysis is conducted over the entire industry rather than just for traded firms. The sample consists of the maximum number of groups and unaffiliated single insurers in each year of the sample period for which meaningful data are available. The source of the data used to analyze efficiency are the regulatory annual statements filed by insurers with the National Association of Insurance Commissioners. Data on market returns and market capitalizations for the publicly traded insurers will be taken from the CRSP tapes. All data sources are available at GSU.

We will analyze both cost and revenue efficiency, and decompose efficiency into its technical, allocative, and scale components. Technical efficiency measures the proportion by which input usage (output produced) could be reduced (increased) if the firm were to adopt the most efficient technology. Allocative efficiency measures the extent by which costs could be reduced

(revenues could be increased) if the firm were to choose inputs (outputs) in the production process in the correct proportions. Finally scale efficiency provides a measure of the additional costs the firm is bearing because it is either too small (large), and thus operating with increasing (decreasing) returns to scale.

We measure efficiency using the two most widely accepted frontier efficiency methodologies – (1) Data envelopment analysis (DEA), and (2) econometric estimation of frontiers using a maximum likelihood approach (MLE). DEA is a non-parametric method that utilizes linear programming to estimate efficient frontiers (Charnes, et al. 1994), whereas the econometric approach is parametric and allows for the separation of inefficiency from purely random shocks that move firms away from the frontier (Lovell 1993). Both have been shown to provide useful measures of firm performance in a book value context.

The next step in the study will be to use the efficiency scores of the traded firms to analyze the connection between efficiency and market value performance. We plan to utilize three primary measures of market value performance: (1) The firm's stock price performance, measured as the total returns on the firm's stock; (2) total returns in terms of Sharpe ratios, to control for intra-firm differences in risk; and (3) Tobin's Q ratio, a standard measure of performance in this type of research (e.g., Konar and Cohen 2001). These measures are used as dependent variables in regressions where the independent variables will include our various frontier efficiency measures and a set of control variables hypothesized to be related to firm value. For example, the finance literature emphasizes the relationship between firm value and firm growth opportunities, ownership structure, board composition, and differences in access to external capital markets. We will also draw from the insurance literature which suggests firm value is related to other important firm characteristics such as size, business mix (i.e., focus vs. diversified strategies), organizational form, proper alignment of product distribution system type with line of business mix, and overall firm leverage. Accordingly, our primary measure of whether accounting-based efficiency affects performance will be the statistical significance of the regression coefficients on the efficiency scores in the market performance regressions.

### 3. Project Status

The status of this project as of the end of May 2002 is as follows. First, the literature review and development of the testable hypotheses is complete. The construction of the panel data necessary to estimate the firm-level efficiency measures is also complete and we are now calculating the various measures of cost and revenue efficiency. The market-value data set that will be used to construct the dependent variable, as well as many of the various control variables, has been secured and we are currently extracting the necessary information to conduct the empirical tests. The write-up of the empirical test and the results will commence thereafter and we anticipate having a completed paper by no later than August 1.

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