NAIC
National Association of Insurance Commissioners

JOURNAL OF INSURANCE REGULATION

Cassandra Cole and Kathleen McCullough
Co-Editors

Vol. 34, No. 7

How to Set Rates if You Must: An Efficiency-Based Methodology for Setting Promulgated Insurance Rates with an Application to Title Insurance

Jing Ai
Patrick L. Brockett
Linda L. Golden
Utai Pitaktong

JIR-ZA-34-07

NAIC
National Association *of* Insurance Commissioners

The NAIC is the authoritative source for insurance industry information. Our expert solutions support the efforts of regulators, insurers and researchers by providing detailed and comprehensive insurance information. The NAIC offers a wide range of publications in the following categories:

Accounting & Reporting
Information about statutory accounting principles and the procedures necessary for filing financial annual statements and conducting risk-based capital calculations.

Consumer Information
Important answers to common questions about auto, home, health and life insurance — as well as buyer's guides on annuities, long-term care insurance and Medicare supplement plans.

Financial Regulation
Useful handbooks, compliance guides and reports on financial analysis, company licensing, state audit requirements and receiverships.

Legal
Comprehensive collection of NAIC model laws, regulations and guidelines; state laws on insurance topics; and other regulatory guidance on antifraud and consumer privacy.

Market Regulation
Regulatory and industry guidance on market-related issues, including antifraud, product filing requirements, producer licensing and market analysis.

NAIC Activities
NAIC member directories, in-depth reporting of state regulatory activities and official historical records of NAIC national meetings and other activities.

Special Studies
Studies, reports, handbooks and regulatory research conducted by NAIC members on a variety of insurance-related topics.

Statistical Reports
Valuable and in-demand insurance industry-wide statistical data for various lines of business, including auto, home, health and life insurance.

Supplementary Products
Guidance manuals, handbooks, surveys and research on a wide variety of issues.

Capital Markets & Investment Analysis
Information regarding portfolio values and procedures for complying with NAIC reporting requirements.

White Papers
Relevant studies, guidance and NAIC policy positions on a variety of insurance topics.

For more information about NAIC publications, view our online catalog at:

http://store.naic.org

Printed in the United States of America

NAIC Executive Office
444 North Capitol Street, NW
Suite 700
Washington, DC 20001
202.471.3990

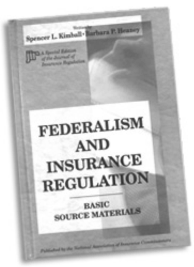
NAIC Central Office
1100 Walnut Street
Suite 1500
Kansas City, MO 64106
816.842.3600

NAIC Capital Markets
& Investment Analysis Office
One New York Plaza, Suite 4210
New York, NY 10004
212.398.9000

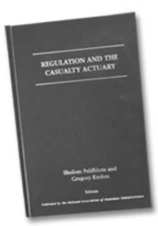
National Association of Insurance Commissioners

Companion Products

The following companion products provide additional information on the same or similar subject matter. Many customers who purchase the ***Journal of Insurance Regulation*** also purchase one or more of the following products:



Federalism and Insurance Regulation
This publication presents a factual historical account of the development of the framework for insurance regulation in the United States. It does so in part by using illustrative early statutes, presenting them chronologically, and in part by using cases that illustrate the interpretation of the crucial later statutes. Copyright 1995.



Regulation and the Casualty Actuary
This anthology reprints 20 important papers from past issues of the Journal of Insurance Regulation that are most relevant for practicing actuaries and state insurance regulators. It covers a wide range of issues, such as ratemaking, auto insurance pricing, residual markets, reserving and solvency monitoring. This invaluable reference explains these complex topics in straightforward, non-technical language. Copyright 1996.

How to Order

816.783.8300 | prodserv@naic.org | http://store.naic.org

International orders must be prepaid, including shipping charges. Please contact an NAIC Customer Service Representative, Monday - Friday, 8:30 am - 5 pm CT.

Purpose

The *Journal of Insurance Regulation* is sponsored by the National Association of Insurance Commissioners. The objectives of the NAIC in sponsoring the *Journal of Insurance Regulation* are:

1. To provide a forum for opinion and discussion on major insurance regulatory issues;

2. To provide wide distribution of rigorous, high-quality research regarding insurance regulatory issues;

3. To make state insurance departments more aware of insurance regulatory research efforts;

4. To increase the rigor, quality and quantity of the research efforts on insurance regulatory issues; and

5. To be an important force for the overall improvement of insurance regulation.

To meet these objectives, the NAIC will provide an open forum for the discussion of a broad spectrum of ideas. However, the ideas expressed in the *Journal* are not endorsed by the NAIC, the *Journal's* editorial staff, or the *Journal's* board.

How to Set Rates if You Must: An Efficiency-Based Methodology for Setting Promulgated Insurance Rates with an Application to Title Insurance

Jing Ai*
Patrick L. Brockett**
Linda L. Golden***
Utai Pitaktong****

Abstract

In a competitive insurance market, competition enforces cost and pricing efficiency. In some markets, however, either competitive economic environments do not exist or considerations exist such that the regulators set rates. This can occur with the introduction of new types of insurance (e.g., agricultural insurance

* Associate Professor in Risk Management and Finance, Department of Financial Economics and Institutions, Shidler College of Business, The University of Hawaii at Manoa, Honolulu, HI 96822; *jing.ai@hawaii.edu*.

** Gus S. Wortham Chaired Professor in Risk Management and Insurance, Department of Information, Risk, and Operations Management, Red McCombs School of Business, The University of Texas at Austin, Austin, TX 78712; *utpatrickbrockett@gmail.com*.

*** Patricia and Shelby Carter, Jr. Regents' Professor in Global Business, Department of Marketing, Red McCombs School of Business, The University of Texas at Austin, Austin, TX 78712; *linda.golden@mccombs.utexas.edu*.

**** Senior Modeling Analyst, USAA Insurance, San Antonio, TX 78288.

in emerging markets) or in markets with insufficient information for consumers to make informed choices. Regardless of the desirability of rate regulation, it does happen. The objective of this paper is to explore how to develop better methods for setting regulated rates. This paper presents a data envelopment analysis (DEA) approach to determine efficient levels of expenses to use as an input into rate making by regulators when market competition determined levels of expenses are unavailable. Thus, we develop an efficiency-based rate promulgation methodology and use title insurance in Texas to illustrate this process. Using data from the Texas Department of Insurance (TDI), we show how our methodology, in conjunction with current TDI procedures, can improve the rate promulgation process for title insurance. The insights from our empirical analysis are generally applicable to other cost plus pricing models.

Introduction

A primary directive of insurance regulation as it relates to rate setting is that rates not be inadequate, excessive or unfairly discriminatory. The "not excessive" standard occurs to protect the consumer from companies overcharging for services and making "excessive" profits. In theory, forces of market competition under complete information should provide a form of self-policing since an insurer who is "overpricing" a product will lose its customers (and profit) to the competition that does not overcharge, thus bringing rates down.[1]

However, regardless of one's view on market set rates versus the desirability of regulator set insurance rates, promulgated rates do exist. This might occur, for example, when it is perceived that competition alone fails to provide economic discipline on prices, or because of other economic externalities motivating regulators to step forward and promulgate the insurance rate to protect the consumer and/or the insurer.

This promulgation of rates occurs most frequently in new insurance markets, markets having little competition and in lines of business associated with individual consumers (as opposed to commercial insurance). Additionally, when the government is the insurer (e.g., in noncommercial national flood insurance), rates are promulgated without the benefit of market competition enforced discipline. The objective of this paper is to answer the following question: Given that rate regulation happens, is there a way to set promulgated rates better than we do currently? This paper presents a methodology for setting rates efficiently, if regulators' must promulgate, and applies it to pricing title insurance.

The most important components of rate setting are the determination of the expected losses and expenses (and profit). There are sophisticated statistical models available in the actuarial literature to estimate expected losses, such as those presented in Klugman, Panjer and Willmot (2008). Competition motivates insurers to adopt increasingly better methods for estimating losses, and regulators who set rates also have access to the actuarial data and actuarial techniques useful for determining loss estimation as well.

In a competitive economic environment with knowledgeable participants, market efficiency will force the insurers to control expenses to achieve profitability. In a promulgated rate environment, however, the regulator must set rates so as to reward efficiency in expense handling and discourage inefficiency, all the while setting a single overall rate for the marketplace and allowing for a reasonable profit for insurance firms.

This paper provides a data envelopment analysis (DEA)-based method to assist the regulator in determining an efficient level of expense allocation. We

1. However, when the insurance itself is peripheral to the purchase of another product, such as title insurance associated with home purchase or credit insurance associated with automobile purchase, consumers may not focus on this cost and may not exert significant pricing pressure on the market to bring prices to economically efficient levels.

develop a rate promulgation methodology that can be used in the absence of market competition forcing pricing efficiency. This is illustrated using regulator promulgation of title insurance rates in Texas. Title insurance is a common line of business associated with virtually every mortgaged home purchase. Thus, it has a widespread impact on the population. For this reason, title insurance pricing and related consumer-centered issues have drawn a lot of attention from regulators and legislatures (e.g., GAO, 2007; Crocker and Kleit, 2009). However, except for a few interesting overview studies (e.g., Sirmans and Dumm, 2006; and Dumm, Macpherson and Sirmans, 2007), there is little discussion of this important line of business in the recent literature, especially with regard to the rate-setting role that regulators often play in title insurance.

In the process of empirically illustrating our proposed method, this paper gives an overview of the title insurance market focusing on an explicit discussion of how the rates are currently set in Texas. The illustration then provides an efficiency analysis of the title insurance market using Texas data, including efficiency comparisons within and across various organizational forms and sizes of title insurance agents. We address issues posed in title insurance rate hearings and faced by the industry and regulators.

Overview of the Manual Rate Promulgation Methodology

The "manual rate" process is the most appropriate for promulgated rates for a homogeneous group of exposures. In "manual rate" promulgation, different classes of risks are priced from a set of basic rating tables. The price for an insurance policy is obtained by determining the class into which the hazard falls and then reading the factor (say dollars to charge per $1000 of coverage) from a table for this class. Then, that factor is multiplied by the number of exposure units encompassed by the policy.

The pure premium method is a basic method that can be used for developing the factors that contribute to the creation of the manual rate table. The pure premium method determines factors based on exposure and expected loss. Specifically, the rate R is given by:

$$R = \frac{E[L] + F}{1 - V - Q}, \tag{1}$$

where R is the indicated rate per unit of exposure, E[L] is expected discounted present value of losses per unit of exposure, F is fixed expense per exposure unit, V is a variable expense factor, and Q is a profit and risk contingency factor.

Once this value is calculated for each class, a manual rate table is created with the factor (per exposure unit) for each class. In a competitive market setting, each company uses its firm's proprietary data and other information to determine the three main components in (1) (i.e., expected loss payment [loss ratio], expense reimbursement [expense ratio] and allowable business profits [target profit rate]). See Ai and Brockett (2008) and Casualty Actuarial Society (1990) for more details.

To promulgate insurance rates, regulators assume the task of determining each of the rate components based on aggregate industry level data. Thus, the promulgated insurance rates should still satisfy the general ratemaking objectives to be adequate, not excessive, and not unfairly discriminatory. As detailed in the numerous title insurance rate setting hearing documents (e.g., State Office of Administrative Hearings, 2009; Texas Department of Insurance, 2010), insurance regulators face the challenge of incentivizing efficient operations in a marketplace lacking competition while also setting a uniform rate.

In (1), the expected loss component is amenable to standard loss modeling and estimation using well-studied actuarial techniques, and the allowable profit rate can be determined based on the general economic and financial market conditions.[2] Inefficiency in promulgated rate setting lies most plausibly in the expense component of the insurance rate. When promulgating rates, expenses have to be predicted at the aggregate level using historical data reported by different companies (e.g., by a standard regression model for title insurance in Texas), so in most of the current regulatory rate setting methodology, higher expenses (as reported companies) lead to higher allowable expenses for promulgated rates.

Because of the importance of expense determination in rate promulgation, title insurance in the U.S. is a natural context to develop and illustrate our efficiency-based rate promulgation methodology. Unlike most other lines of insurance, title insurance losses account for only a small percentage of the premium,[3] thereby making it critical to appropriately estimate expenses. This market serves as a clean environment to study rate promulgation, focusing on the expense component of the rate.

A DEA-Based Methodology for Improved Rate Promulgation Based on Efficiency

We design a rate promulgation methodology to address inefficiencies arising from the lack of market competition and distorted agent incentives. Since we cannot rely on market competition to arrive at an efficient equilibrium price, the

---

2. This is not to imply that the expected loss determination is non-controversial in rate setting hearings, only that the discussion there involves standard actuarial considerations that are routinely examined and decided by regulators. Moreover, the loss ratio in title insurance is very low compared to the expense ratio, so expected loss determination is less contentious (cf., Nyce and Boyer, 1998).

3. In 2008, title insurers paid 5% of their premiums back to customers on claims as compared to 70% for other types of insurance (insure.com 2009).

central question is how to establish a benchmark reference that promotes efficiency in rate setting. The current rate setting process in title insurance in Texas uses the entire set of companies in the marketplace as the reference set for determining expenses. Thus, there is no distinction between efficient and inefficient companies. It is desirable to input efficient companies for marketplace rate setting, and DEA provides a methodology for measuring firm efficiency as a starting point for more informed rate setting.

DEA benchmarking emulates the competitive market by identifying a reference set of market participants that are operating more efficiently in providing products or services in comparison with their peers. We derive our efficiency measure using the widely accepted frontier efficiency analysis model, DEA.

The DEA efficiency analysis is of the “win at your own game” type, allowing market participants to compete along identified dimensions of “inputs” (costs and expenses) and “outputs” (products and services), thus assessing the efficiency with the ratio of outputs to inputs. The market participants that can beat others in the “competition” are deemed efficient in converting the inputs into outputs. Efficient firms, those on the efficiency frontier, produce more output for their given level of input than do others in the marketplace. Once the operationally efficient market participants are identified, we set the insurance rate considering only their data for rate promulgation.

In the next section, we present a brief overview of the DEA method for efficiency determination and discuss the specific DEA model we selected for our analysis. An overview of title insurance and the Texas title insurance market, the context of our empirical analysis, is subsequently provided. We then discuss detailed model assumptions, input and output selections, and data descriptions for our DEA analysis. Lastly, we build on the DEA analysis results to develop an illustration of the proposed rate promulgation methodology.

Overview of the DEA Method and Choice of the DEA Model

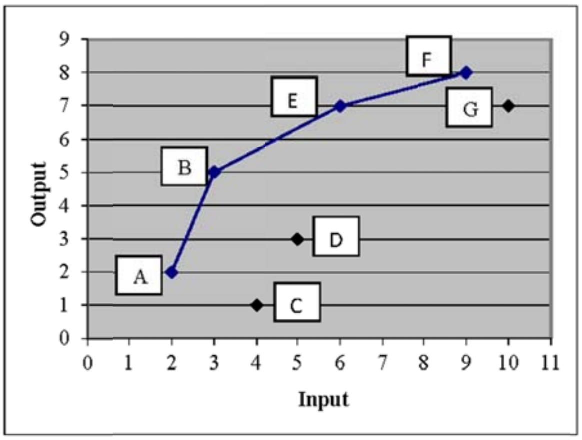
To find the set of efficient insurance providers for rate promulgation, we adopt the widely used frontier analysis approach, DEA (DEA, cf., Cooper, Seiford and Tone, 2007). DEA evaluates the efficiencies of entities, or the decision-making units (DMUs), relative to their competitive peers in the marketplace. By generalizing the simple ratio definition of efficiency (one output over one input) to multiple inputs and outputs, DEA produces a production frontier consisting only of relatively “efficient” entities.

In DEA, entities are allowed to “compete” in their own ways by varying their combinations of inputs and outputs in light of different strategies and, yet, they are still comparable with each other with respect to their efficiencies. Any entities off the efficiency frontier are deemed “inefficient” and are given guidelines on how to improve by the efficiency analysis. Via careful choice of inputs and outputs in

DEA, we can select the relatively more efficient insurance providers to determine the benchmark for the promulgated rate setting, rather than relying on the entire set of providers operating in the insurance market as is currently done.

Figure 1 illustrates this concept graphically. Consider a collection of seven DMUs with a single input production a single output.

Figure 1:
Illustration of the Efficiency Frontier



Example of seven DMUs with one input and one output: A = (2,2); B = (3,5); C = (4,1); D = (5,3); E= (6,7); F = (9,8); and G = (10,7). Those units on the efficiency frontier line are efficient.

DEA identifies the relatively efficient production units that yield the highest output relative to their input among a specified set of units. These efficient units (lying toward the top and to the left) are represented on the graph by A, B, E and F. The line connecting the efficient units is called the efficiency frontier or "envelopment surface" because it encapsulates or envelopes all the production units' performance. The DEA units strictly inside the envelope or frontier—namely DMUs C, D and G—are said to be inefficient in the DEA analysis.

Two ways to see the inferiority of these interior production unit points are to note that for an inefficient unit, another collection of DMUs could produce the same amount of output with less output, or it could produce more output while using the only same amount of input. For example, comparing the interior unit D horizontally with A and B, we see D could perhaps produce as much output as it does, but with less input (since a linear combination of A and B located on the line between A and B horizontal from D has the same output as D but uses less input than D). Alternatively, by comparing D vertically with B and E, we see we could use a linear combination of B and E to produce more output than D while using only the same input.

The DEA method has been used extensively by researchers to study insurance company efficiencies in various business functions. Cummins and Weiss (2013) provide a review of 74 papers that use the frontier efficiency methods to study insurers. A review provided by Eling and Luhnen (2010) contains 83 studies. In fact, many DEA models have been developed and applied to solve different practical problems in many fields (cf., Cooper, Seiford and Tone, 2007).

The classic BCC model (Banker, Charnes and Cooper 1984) is one of the most widely used DEA models allowing for variable returns to scale. We briefly summarize the BCC model in its original form below to highlight the intuitions of the DEA efficiency measure and analysis. A computer program to implement DEA in multiple dimensions is readily available in Cooper, Seiford and Tone, 2007.

Consider a collection of n DMUs that use multiple inputs to produce multiple outputs. We assume that DMU_r uses an amount x_{ri} of input i in production of outputs y_{rj}. Similar to other efficiency measures using the ratio of outputs to inputs, DEA provides a measure of efficiency with multiple inputs and outputs, but it uses a weighted sum of inputs in the denominator and a weighted sum of outputs in the numerator (because there are multiple inputs and outputs).

BCC Ratio Measure of Efficiency

The BCC model incorporates multiple inputs and outputs and evaluates the efficiency of any unit (called DMU_0) by solving the following mathematical programming problem for DMU_0 with inputs $\{x_{0i}\}$ and outputs $\{y_{0j}\}$:

$$\text{Max } \{u_j \text{ and } v_i\} \quad \frac{\sum_{j=1}^{s} u_j y_{0j} - u_0}{\sum_{i=1}^{m} v_i x_{0i}} ,$$

(2)
subject to

$$\frac{\sum_{j=1}^{s} u_j y_{rj} - u_0}{\sum_{i=1}^{m} v_i x_{ri}} \le 1, \qquad r = 1, 2, ..., n,$$

$$u_j \ge 0, j = 1, 2, ..., s, \quad v_i \ge 0, i = 1, 2, ..., m,$$

and u_0 is unconstrained in sign. Here the $\{u_j\}$ and $\{v_i\}$ are called virtual multipliers, and the ratio in (2) can be viewed as an indexed output over an indexed input, generalizing the usual ratio measure of efficiency with one output over one input. The computation in (2) is performed for all DMUs in turn by taking each sequentially as DMU_0 in (2) until an efficiency ratio is calculated for each[4].

The BCC model allows for variable returns to scale for the DMUs, and whether increasing, constant or decreasing returns to scale are present depends on whether the optimal value of u_0 is less than, equal to or greater than zero. The ratio measure (1) is always less than or equal to one (since DMU_0 is included in the constraint set). If the ratio is less than one, some other group of DMUs can use the same inputs and same weights to produce larger outputs than DMU_0. A wealth of other DEA models was developed over the years for various theoretical and practical considerations. (See Cooper, Seiford and Tone (2007) for details.)

To develop our proposed promulgated ratemaking approach, we specifically choose an alternative DEA model, the range adjusted model (RAM) (Cooper, Parker and Pastor, 1999). The RAM model has the same intuition of output to input as the BCC model and produces the exact same set of fully efficient entities as the classical models such as the BCC model (Banker, Charnes and Cooper, 1984) or the CCR model (Charnes, Cooper and Rhodes, 1978).

The RAM model also allows us to correctly rank order even the inefficient entities by their relative operational efficiencies, while some other models do not. In addition, the RAM measure of efficiency is dimensionless and is invariant to changes in location or scale of both inputs and outputs.[5] Using the RAM efficiency scores, we can obtain the desirable reference set of entities using pre-selected efficiency cutoff points to include both fully efficient and partially efficient ones. Therefore, it is appropriate for building our rate promulgation methodology in order to accommodate a regulatory perspective wherein enforcing full efficiency may not always be feasible or desirable.

The RAM model has been used in the insurance literature to evaluate efficiencies of different marketing systems and organization forms (cf., Brockett et al., 2005) and to compare different modeling approaches of insurer efficiency (Leverty and Grace 2010). See Cooper, Parker and Pastor (1999) for more details and the precise mathematical formulation.

Overview of Title Insurance and the Texas Rate Promulgation Process

Title insurance protects the property purchaser against defects in the ownership title of real property (such as previous owners or heirs having claim to the title, or workers or banks having listed liens against the property). It is an

4. By converting (2) to an equivalent linear program, this is computationally easy to perform, and there are many readily available programs to do this analysis.

5. This is an important property for a DEA model to have when examining financial intermediaries since one wants the results not to depend on whether one uses dollars or pennies (or thousands of dollars) to numerate the variables.

indemnity insurance against past events rather than future events, and it can be thought of as mainly an errors and omissions insurance policy.

Lenders on real property insist on such insurance as a prerequisite to funding on financed mortgages to protect themselves (and the purchasers). It is a sizable market in the U.S. For example, in Texas in 2008, title insurers wrote more than 2.5 million policies with premiums in excess of $1 billion. However, unlike other insurances, the loss ratio is a relatively small part of the total premium. Sirmans and Dumm (2006) provide a comprehensive overview of the history and current development of the title insurance industry.

Although title insurance has hardly been in the public limelight, its importance is far-reaching and has drawn a lot of attention from the regulatory bodies. A report (GAO, 2007) by the Government Accountability Office (GAO) to the U.S. House of Representatives Financial Services Committee highlighted the significance of title insurance to the large consumer base (i.e., home purchasers). The report identified issues including the low level of competitions and the resulting unduly high prices with an analysis of a representative sample of six states: California, Colorado, Illinois, Iowa, New York and Texas. It also has recommendations for regulatory changes centered on better supervision over market conduct, better availability of cost data and better analysis of cost efficiency for proper rate setting. In addition, regulator-driven studies have been completed at the individual state level to investigate the price related issues.

Since a wave of early studies (e.g., Johnson, 1966; Hofflander and Shulman, 1977; and Rosenberg, 1977), the relatively little academic literature on title insurance has focused on the price, competition (or lack thereof) and efficiency of the industry (cf., Todd and McEnally, 1974; and Koch, 1993). More recently, Dumm, Macpherson and Sirmans (2007) extend Nyce and Boyer's (1998) initial one-year analysis (with 1996 data) to an analysis on the financial performance of the title insurance companies for an extended period of time from 1995–2004. Based on their analysis, the authors say further studies are needed to examine competition and price level in the title insurance market. This article is in response to this call for further research via rate setting, an issue unaddressed in prior research.

In practice, title insurance rates are promulgated or heavily regulated in many states in the U.S.[6] In Texas, title insurance rates are discussed at biennial rate hearings, and allowable rates for the market are promulgated by the insurance commissioner in an official regulatory order. The parties that participate in the hearings present extensive evidence and usually include the TDI staff, Texas Land Title Association (TLTA), the Office of Public Insurance Counsel (a consumer advocate group), and various major title insurance companies (e.g., Fidelity National Title Insurance Company).

The discussions in the rate hearings focus primarily on the determination of the loss provision, the expense provision and the profit provision. Each party will

6. See, for example, the Title Insurance Regulatory Survey by American Land and Title Association, available at *www.alta.org/publications/tirs.cfm*, accessed July 31, 2012.

present its own rate change proposal and provide supporting documentation of their research methodology and findings. Administrative law judges then make recommendations on the rate change, which the commissioner considers before deciding on the promulgated rate.

In order to further characterize the current ratemaking process and provide a basis for our empirical analysis, we briefly summarize the findings (i.e., Finding of Facts (FOFs) in the Commissioner's Order) and decisions that appear in the latest Official Order of the Commissioner of Insurance of the State of Texas, "In the Matter of the 2008 Texas Title Insurance Biennial Rate Hearing," published Nov 4, 2010. For losses, the commissioner found that it is reasonable to have a 5% loss and loss adjustment expenses (LAE) provision in the rates, using the most recent five-year (2003–2007) average of policy year losses and LAE developed to ultimate. The commissioner also found a 6% profit provision to be reasonable, derived from an 11.25% after-tax cost of capital, a 4.06% after-tax investment income, a 1.75% premium leverage ratio and a 30%–31% tax rate.

The most critical issue in the rate setting process is the determination of reasonable expenses (since this constitutes such a sizable proportion of the rate). This was obtained by projections from a regression model of expenses on premium volume or policy counts. To estimate this regression model, the commissioner found it reasonable to use the most recent 10-year (1998–2007) industry-level aggregate data. A set of data adjustments for the expense items was also found to be necessary to arrive at a reliable estimation, which is detailed in a later section.

All title insurers were used in the regression regardless of their expense efficiency because there appeared to be no other reasonable methodology for determining how to cut firms for inclusion or exclusion in the promulgated rate setting process. This firm inclusion/exclusion decision is the issue we present criterion and a methodology to solve.

The impact of the organizational form and size of the title insurance agent was another issue brought to the attention of the hearing committee. Title insurance agents in Texas are classified into three types according to their organization forms: 1) independent; 2) affiliated; or 3) direct operations agents. Independent agents represent the largest number of producers.

In 2007 (the latest year for which we have data), there were 507 independent, 92 affiliated and 17 direct agents. Respectively, they wrote 40%, 46% and 15% of all agent-retained premiums.

Compared with independent agents, direct and affiliated agents may have better access to resources and expertise—such as the latest technology, market information and legal assistance—due to their close relationship with the underwriters. Perhaps due to this, although much smaller in number, direct and affiliated agents are much larger in volume than the independent agents. Based on 2007 data, the median retained premium for the group of affiliated agents is six times that of the independent agents, and the median for the direct agent group is 16 times larger.

Figure 2a:
Median On-Level Expense Ratio by Agent Type for 1998–2007[7]

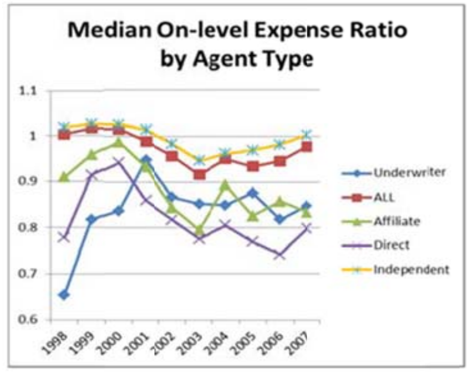
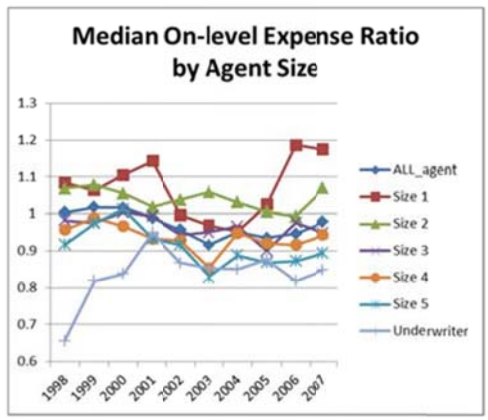


Figure 2b:
Median On-Level Expense Ratio by Agent Size Quintile for 1998–2007



Using the simple measure of on-level expense ratio,[8] and as shown in Figure 2a and Figure 2b, different agent types appear to differ in their expense levels over time and by size—an issue of concern in the rating hearings. Per Figure 2a, among the three types of agents, a pecking order is suspected to be in place with direct operations being the most efficient, followed by affiliated agents and lastly independent agents. Also, agents were divided into five size groups based on

7. In Figure 2a and Figure 2b, outliers with extremely large expense ratios (>5) are removed to smooth out the curves. The impact on the general trends of removing outliers is small, as shown in the figures.

8. An on-level expense ratio is the ratio of expenses over the on-level premium. The on-level premium is the adjusted historical premium amounts based on the current rate, to account for the rate difference between rates then and rates now.

retained premiums with an equal number of agents in each group (Figure 2b). The size 1 group contains the smallest agents, and the size 5 group contains the largest agents. Underwriters are also included in the graph for comparison purposes.

Although the issues with respect to the agent types and sizes were discussed at the hearing, no specific analysis was submitted to support the conjectured affects on rates. Therefore, the commissioner disregarded these in the rate promulgation. After we develop a direct measure of operational efficiency for our rate promulgation methodology, we address these issues and discuss them in the Appendix.

An Empirical Illustration of the Efficiency-Based Rate Promulgation Methodology with Application to Title Insurance

Financial statement data is obtained from the *Title Insurance Agents Statistical Report* and the *Title Insurance Underwriter's Statistical Report*. The reports are available on the TDI website at: (*www.tdi.texas.gov/reports/report8.html#title_rpts*). Because the underwriter data is only available at the industry aggregate level, in our DEA efficiency analysis we focus on title insurance agents, which happen to be the most important market participants in this market. We include underwriter data later in the regression analysis.

Using data from 2005–2007,[9] we first construct the input and output variables for the efficiency analysis of expenses. We use written testimonies by the presenting parties, the Administrative Law Judges' recommendation and the most recent Commissioner's Official Order for the 2008 Texas Title Insurance Rate Hearing to set up the rest of our analysis, ensuring that our results are verifiable and comparable to those presented in the hearing and applicable to future rate setting processes. This includes data adjustments of the expense items for the efficiency and regression analysis (data period 1998–2007), the regression model for expense ratio estimation, and the estimated loss ratio and target profit rate used in the rate promulgation.

9. More recent data is available, but this data is the most recent which was used in a TDI determination of rates and factors and processes. Accordingly, we used this data so as to be able to compare results with the actual TDI promulgated rates using detailed records of TDI processes in setting rates.

Data Adjustment of Expense Items and DEA Inputs and Outputs

When providing title insurance, agents consume resources to provide title search services and title defect protection in real estate transactions to fulfill the regulatory requirement and protect consumers/lenders. We model the title insurance agents' "production function" from the regulator's perspective (since the regulator sets rates). The outputs measure the amount of services provided, and the inputs measure the resources consumed in providing these services. As such, the two output variables selected are the agent's retained title premium and the number of title policies written.

We use two input variables to categorize total agent expenses: 1) capital and labor; and 2) operational expenses.[10] We combine capital (title plant lease) and labor (engaged in title search) because they are substitutes, and together they constitute the core expenses that support title agents' operations. Operational expenses include expenses incurred to support daily operational functions, such as rent, utilities, office expenses (e.g., fax, mail and office supplies), and ordinary business expenses (e.g., accounting fees, legal expenses and insurance), as well as advertising and promotion, employee travel, education, and unidentified "other expenses" items in the agent's financial report.

We also make three adjustments to the data following the hearing documents. First, we adjust the reported data to include expenses only for the rate-regulated title functions. Besides title insurance, title agents often are engaged in other related services such as escrow and non-policy services. These services are not rate-regulated and are not part of the hearing or the rate promulgation exercise. Therefore, we only include expense items identified to be related to the title insurance business in the agent-reported data.

Second, we exclude expense items that are inappropriate for the expense ratio calculations (e.g., bad faith claims, and fines and penalties). Certain pass-through items such as tax certificates and recording fees are excluded from both title revenues and expenses because the difference between revenues and expenses from these items has been considered insignificant.

Third, we adjust the historical data to arrive at on-level premiums. On-level premiums refer to premiums that would have been earned had the current rates been in effect for the entire data period. The on-level adjustment accounts for the

10. In general, in DEA, we want a collection of input variables such that all firms use the same inputs to produce the same outputs, and no firm has a zero amount for any input. This prevents too much disaggregation in the input variable set since if we disaggregate too much, we find that some firms will have a zero value for some input (e.g., in Appendix Table A1 some firms may have no "Equipment & Vehicle Lease" cost). Having a zero as an input would allow that firm to put a heavy virtual multiplier weight on the input for which it has a zero, and as a result look relatively efficient. Thus, we aggregate up to the level where all DMUs have non-zero values for the inputs used.

impact of rate differences making historical data compatible and is considered necessary by the commissioner. We use the present rate level factor calculated and presented in the direct testimony by the TDI staff (cf., Crawshaw, 2009). We exclude agents' data if they listed zero capital and labor expense or if they listed zero retained title insurance premiums.

A detailed documentation of the output and input variable definitions, including all the data adjustments, is given in Appendix A. A summary of such constructed input and output variables for the DEA efficiency analysis is presented in Table 1 for the sample period (years 2005–2007).

Table 1:
Summary Statistics for DEA Inputs and Outputs

Panel A Year 2005

	Output: Premium ($)		On-Level-Premium ($)		Output: # of Policies		Input: Capital and Labor ($)		Input: Operational Expenses ($)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Affiliated	6,111,645	1,648,480	5,915,072	1,595,728	6,430	2,158	3,682,717	902,085	1,528,462	392,334
Direct Op	11,334,537	7,904,609	10,971,832	7,651,661	11,572	6,692	6,250,927	4,231,294	2,120,672	1,639,115
Independent	821,469	327,202	795,182	316,732	1,196	516	537,983	198,360	226,620	89,258
Overall	1,854,494	406,320	1,795,150	393,318	2,217	623	1,137,586	254,788	462,133	108,508
	Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation	
Affiliated	9,838,941		9,524,095		9,220		6,545,855		2,302,195	
Direct Op	10,263,705		9,935,266		12,647		6,468,264		1,830,868	
Independent	1,569,467		1,519,244		2,550		1,071,173		445,774	
Overall	4,917,092		4,759,745		5,208		3,153,778		1,129,179	

Panel B Year 2006

	Output: Premium ($)		On-Level-Premium ($)		Output: # of Policies		Input: Capital and Labor ($)		Input: Operational Expenses ($)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Affiliated	6,408,274	1,920,397	6,203,209	1,858,944	6,732	2,262	3,903,619	1,008,090	1,400,035	393,408
Direct Op	12,854,457	8,182,033	12,443,114	7,920,208	12,749	8,750	7,141,046	5,240,087	2,203,128	1,776,886
Independent	856,248	343,073	867,568	332,095	1,217	517	604,145	223,848	264,674	99,423
Overall	1,987,268	461,190	1,923,676	446,432	2,298	630	1,241,924	297,928	476,478	128,237
	Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation	
Affiliated	10,631,966		10,291,743		10,065		7,471,797		2,150,710	
Direct Op	11,310,474		10,948,539		11,497		7,165,581		1,826,659	
Independent	1,769,762		1,713,129		2,088		1,310,600		655,744	
Overall	5,334,341		5,163,642		5,261		3,580,498		1,153,347	

Panel C Year 2007

	Output: Premium ($)		On-Level-Premium ($)		Output: # of Policies		Input: Capital and Labor ($)		Input: Operational Expenses ($)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Affiliated	5,595,114	1,913,086	5,573,329	1,907,347	5,521	1,818	3,559,764	859,100	1,311,079	439,519
Direct Op	9,697,953	5,380,408	9,663,859	5,364,267	9,773	6,585	5,535,606	3,361,788	2,235,190	1,747,296
Independent	872,041	320,214	869,425	319,253	1,121	480	607,577	224,329	273,092	100,362
Overall	1,816,180	404,087	1,810,732	402,875	2,010	579	1,182,278	282,384	480,825	116,591
	Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation		Standard Deviation	
Affiliated	9,463,538		9,435,148		8,098		6,978,826		2,095,485	
Direct Op	9,940,836		9,911,013		9,381		6,227,676		2,093,734	
Independent	2,027,136		2,021,055		2,182		1,496,434		789,365	
Overall	4,873,407		4,858,787		4,477		3,417,007		1,223,330	

Using the properly constructed inputs and outputs data, we run two sets of DEA analyses using the RAM model for the years 2005–2007 to make our results comparable to those in the most recently completed 2008 rate hearing. The first set of analyses obtains DEA evaluations among all title agents. The second analysis contains a separate DEA evaluation for each group of title agents within the three organizational forms: 1) affiliated; 2) direct operations; and 3) independent agents. This is to allow each group to have a representation of a reasonable size in the selected benchmark set for rate promulgation in the event that a particular group should dominate the efficiency frontier. In the DEA analyses, each title insurance agent is viewed as a DEA "production unit" searching and examining titles to minimize losses and maintaining profits. A separate set of DEA analyses are run for each of the years in the three-year period 2005–2007.

While the housing market crash and the financial crisis starting in 2006 had non-negligible impact on the title insurance market, the most significant impact was on the incurred loss component due to increased title searches (including fraudulent behavior)—not on the expense ratio component upon which our analysis focuses. In addition, data from the Real Estate Center at Texas A&M University (*http://recenter.tamu.edu/*) shows the housing market has seen both rise and fall in our sample period. By covering both trends in the selected sample period, we capture a relatively complete cycle in our analyses. In the subsequent regression analysis, we also follow the commissioner's order to adjust the projected premium for the adverse impact of the housing market crash.

The DEA efficiency analysis results are presented in Table 2 and Table 3, including the number of efficient agents and the percentage of efficient agents. Because the DEA efficiency analysis is run each time using a single year's data, we have identified and counted the number of agents that are efficient in all three years ("all years") and those that are efficient in at least one of the three years ("any year"). The "any year" definition is used to identify the efficiency-based reference sets for further analysis in order to accommodate possible fluctuations in efficiency over time.

Table 2 presents DEA efficiencies when all agents are evaluated together. It also presents the number of agents that are included in what we call a supra median efficiency set to accommodate a regulatory perspective for a more complete market coverage in ratemaking. The RAM model is used to run DEA analysis with all agents for each of the years in the data period 2005–2007. The efficiency evaluation for "all years" identifies agents that are efficient in all three years. The efficiency evaluation for "any year" identifies agents that are efficient in any of the three years. The supra median efficiency set consists of the top 50% of agents ranked by efficiency, and it is subsequently included in the regression models for expense projection.[11] As can be seen in Table 2, about 2% to 3% of the agents are fully efficient.

11. We also performed DEA analysis with an alternative cutoff point of top 80% in efficiency; i.e., agents that rank within the top 80% are all included in the supra median efficient set. With this almost full market coverage, this top 80% efficient set of agents behaves only slightly better than the set of all agents, and sometimes similar to the set of all agents. Therefore, we do not present results for this set of agents in DEA result Table 2 and Table 4, regression results Table 7 and Table 8, and figures in the Appendix B.

Table 2:
DEA Efficiency Results (All Agents Together)

	# of Agents	# of Efficient Agents	% of Efficient Agents
2005	593	16	2.70
2006	609	14	2.30
2007	617	14	2.27
All Years		7	
Any Year		24	

Table 3 on the next page presents the efficiency analysis results when each group of agents is evaluated separately. The RAM model is used to run a separate DEA analysis within each group of agents for each of the years in the data period 2005–2007. The efficiency evaluation for “all years” identifies agents that are efficient in all three years. The efficiency evaluation for “any year” identifies agents that are efficient in any of the three years. The “union” set of efficient agents in Panel D encompasses all efficient agents from the DEA evaluations for each of the three groups.

In particular, as shown in Table 3, almost 50% of the direct operations agents are efficient in the small group of 15–17 direct agents. About 15% of affiliated agents are efficient within their own group. In stark contrast, only 2% of the independent agents are operating efficiently, out of the large group of 500 independent agents. This might be due to the fact that independent agents in Texas are very diverse, can be much smaller in size, may not specialize in the title insurance business alone, and do not usually have access to the expertise and support of title underwriters. Panel D of Table 3 presents a reference set that encompasses all efficient agents from the DEA evaluations for each of the three groups.

Further, we calculate expense ratios for the efficient agents to verify if they incur lower expenses on average. We carry out the calculations based on both the efficiency evaluation pooling all types of agents together and the other evaluation where each type of agents is evaluated separately. Since there are a few agents with extremely large expense ratios, possibly due to data reporting problems that we are not able to identify, we present the median on-level expense ratios by efficiencies in Table 4. The on-level expense ratio is the expense over the on-level premium. Consistent with our hypothesis, while the median on-level expense ratio for all agents is above 0.95, efficient agents typically have much lower expense ratios of 0.6–0.7. This significant reduction suggests that averaging expenses incurred by *all* agents without discriminating on the basis of production efficiency will increase promulgated rates.

Table 3:
DEA Efficiency Results (Each Group of Agents Run Separately)

Panel A Affiliated Agents			
	# of Agents	# and % of Efficient Agents	
2005	84	14	16.67
2006	88	13	14.77
2007	92	14	15.22
All years		6	
Any year		24	
Panel B Direct Operations Agents			
	# of Agents	# and % of Efficient Agents	
2005	16	8	50
2006	15	7	46.67
2007	17	8	47.06
All Years		4	
Any Year		10	
Panel C Independent Agents			
	# of Agents	# and % of Efficient Agents	
2005	493	7	1.42
2006	506	10	1.98
2007	508	11	2.17
All Years		2	
Any Year		15	
Panel D The Union Set of Efficient Agents from Each Organizational Form			
	# of Agents	# and % of Efficient Agents	
2005	593	29	4.89
2006	609	30	4.93
2007	617	33	5.35
All years		12	
Any year		49	

Table 4:
Median On-level Expense Ratios by Agent Efficiencies
(All Agents Together)

Year	2005	2006	2007
All Agents	0.9504	0.9616	0.9912
Efficient Agents Only	0.6369	0.5950	0.7253
Supra Median Efficient Agents (Top 50%)	0.9194	0.9438	0.9849

In Table 5, agent efficiencies are evaluated by the RAM model of DEA analysis with all agents for each of the years in the data period 2005-–2007. The set of "supra median efficient" agents consists of agents that are ranked among the top 50% in efficiency. Median on-level expense ratios are calculated for each set of agents for each year.

Figure 3 clearly illustrates the relationship between agent efficiencies and expense ratios. For each year in the period 2005–2007, agents are first ranked by their efficiency scores (on the horizontal axis), and the median on-level expense ratio is calculated cumulatively for each efficiency score percentile (on the vertical axis). Figure 3 shows that median expense ratio increases almost monotonically as less efficient agents are successively included, with the most significant jumps occurring approximately before 50% of the agents are included.

For each year in 2005–2007, agents are ranked by their efficiency scores obtained by the RAM DEA analysis of all agents. Median on-level expense ratios are calculated cumulatively for each percentile on the Y-axis and plotted against the corresponding efficiency percentiles on the X-axis.

Table 5 illustrates the median expense ratio vs. agent efficiency when an agent's efficiency is evaluated only within its own organizational form. Consistent with Figure 2a, affiliated and direct operations agents generally have lower expense ratios than independent agents. However, all efficient agents across the groups have significantly lower expense ratios than other agents in their group. Interestingly, although independent agents tend to incur much higher expenses in general, expense ratios for the most efficient ones are comparable with, and sometimes even lower than, those of the efficient direct operations agents and affiliated agents.

This finding has important implications for ratemaking. One of the major debates in the rate hearings is regarding whether a separate expense ratio (and insurance rate) should be promulgated for each group of agents. Our findings suggest if we use the improved ratemaking methodology and thus focus on (more) efficient agents only, between-group differences in expense efficiencies are much mitigated. Therefore, our findings support the commissioner's view that separate rate promulgation should not be warranted.

Figure 3:
Efficiency Score Cumulative Percentile (Most Efficient to Least Efficient) Versus Cumulative Median On-level Expense Ratio (All Agents Together)

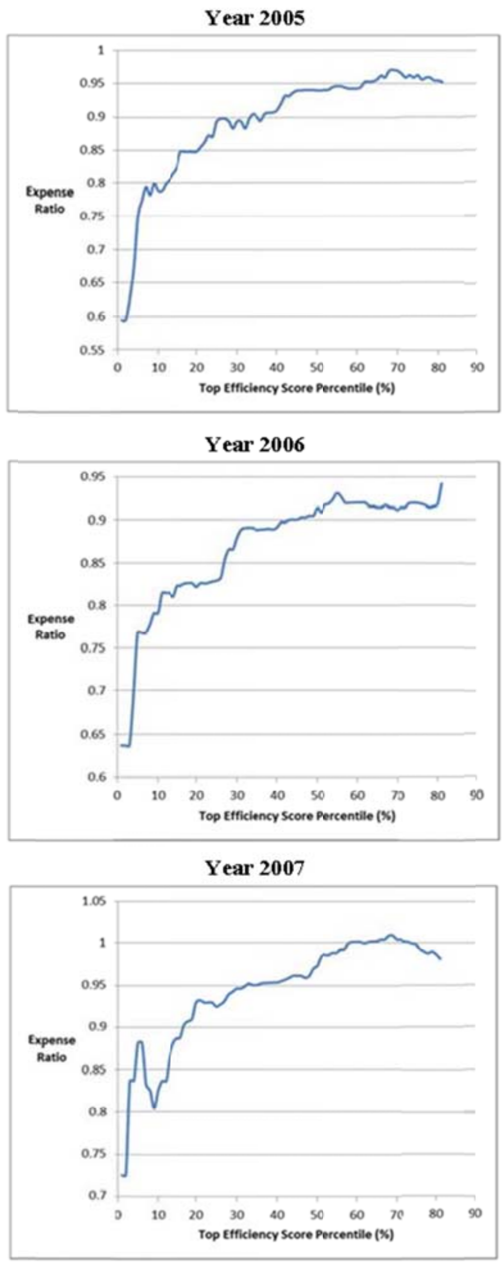


Table 5:
Median On-Level Expense Ratios by Agent Efficiencies
(Each Group Separately)

Panel A Affiliated Agents			
	2005	2006	2007
All	0.8272	0.8636	0.8343
Efficient Only	0.5743	0.6563	0.6675
Panel B Direct Operations Agents			
	2005	2006	2007
All	0.7694	0.7426	0.7991
Efficient Only	0.7396	0.6326	0.8426
Panel C Independent Agents			
	2005	2006	2007
All	0.9825	0.9949	1.0182
Efficient Only	0.3607	0.7796	0.8372
Panel D The Union Set of Agents			
	2005	2006	2007
All	0.9548	0.9695	0.9862
Efficient Only	0.4012	0.7582	0.81337

Note that in Table 5, agent efficiencies are evaluated when a RAM DEA analysis is run for each agent organization form for each year in the data period 2005–2007. In Panel D, “efficient only” “union set of agents” include efficient agents from any of the three DEA analysis for the three different agent organization forms. Median on-level expense ratios are calculated for each set of agents for each year.

Regression Analysis for Expense Ratio Estimation in Rate Setting

Following conventional industry methodology and the Texas insurance commissioner’s order, we run regression analysis to obtain the projected expenses and calculate the projected expense ratio for use in the title insurance ratemaking formula. Unlike the current rate promulgation process by the TDI that uses the expenses of all title agents, we define three smaller efficiency-based sub-sample sets to use in the regression: 1) the set of fully efficient agents wherein agent efficiency is evaluated among all types; 2) the set of fully efficient agents wherein agent efficiency is evaluated within their own agent type; and 3) the set of agents ranked among the top 50% in efficiency when evaluated among all agent types, i.e., the supra median efficient agents.[12]

Across the above three sets, we define the reference set of efficient (or supra median efficient) agents as the set of agents that are efficient (or supra median efficient) in at least one of the three years—i.e., the "any year" definition as previously described. This is to compensate for the possible fluctuation in efficiencies found in a single year. As a baseline case, a set of regressions are also run with all agents included, as was done when the insurance rates were promulgated by the commissioner's order.

In addition to agents' expenses, title underwriters' expenses should also be included in the regression for the expense ratio estimation. We obtain underwriter's financial data from the "Underwriters Experience Report" to the TDI (*www.tdi.texas.gov/reports/report8.html#title_rpts*).

Similar to data adjustments for the agent data, we make two adjustments to the underwriter data. First, we exclude certain expense items not appropriate for ratemaking purposes, including damages paid for bad faith suits, fines or penalties for violation of law, donations/lobbying, and trade association dues. Losses and loss adjustment expenses incurred also are excluded because they are already accounted for in the loss provision. Second, only the part of expenses associated with the rate-regulated title function are included in the expense projection for rate promulgation. Unlike the agent data, underwriters' reported expenses are not broken into different components showing whether they are related to the title function or the other functions (such as escrow service). As a result, we perform a reallocation at the aggregate level by allocating to the title insurance function a proportion of the expenses according to the ratio of underwriters' retained premium to their total title income. The expense item "net addition to unearned premium reserve" is not subject to this adjustment.[13]

Because underwriter data is available only at the industry aggregate level, we are not able to run a similar set of efficiency analyses for the underwriters (so as to exclude from aggregate expense consideration the expenses from those inefficient underwriters), and we are forced to include all underwriters in the sample set for the regression analysis. Note that in title insurance, underwriters' financial obligations lie primarily in the title losses and loss adjustment expenses, which constitute only a small proportion of the insurance rate. In addition, underwriters' expense is much less than the agents' expense and thus only accounts for a small portion of the total expense ultimately included in the promulgated rate. Therefore,

---

12. We also ran the regression analysis using an additional sub-sample of supra median efficient agents with an 80% cutoff point to obtain an almost full market coverage by excluding only the agents that were in the bottom 20% in efficiency. The results are much closer to those using all agents, although we can still find that the projected expense ratio (as in Table 8) using regression results from this alternative reference set is slightly lower than using all agents. We only discuss the 50% supra median efficient set of agents in the paper to conserve space.

13. This data adjustment is consistent with what is done by the TDI in its direct testimony for the rate hearing.

this simplification should have relatively minor impact on the expense ratio estimates and the promulgated rate.

Table 6 gives a description of the underwriter data relative to agent data at the aggregate level for the 10-year period 1998–2007, our regression analysis sample period following the commissioner's order. We can see that agents retain around 85% of the premium collected and incur much higher expenses. Agents' expense ratios are in most cases higher than underwriters' expense ratios.

Table 6:
Description of Underwriter Data

Year	UW Premium/ Agent Premium	UW Expense/ Agent Expense	Agent ER	Underwriter ER
1998	0.2066	0.1559	0.8676	0.6545
1999	0.2397	0.2129	0.9207	0.8180
2000	0.2182	0.1993	0.9169	0.8373
2001	0.1840	0.1956	0.8928	0.9492
2002	0.1748	0.1720	0.8815	0.8676
2003	0.1879	0.1962	0.8164	0.8526
2004	0.2406	0.2277	0.8986	0.8503
2005	0.2045	0.2009	0.8924	0.8767
2006	0.2068	0.1888	0.8960	0.8182
2007	0.2205	0.2028	0.9221	0.8482

Note that in Table 6, the retained premiums and the expense ratios (ER) are all adjusted to be on-level. In column 2 (3), the ratios of underwriters' retained premium (expenses) to agents' retained premium (expenses) are calculated. Column 4 and Column 5 present the expense ratios for agents and underwriters, respectively.

We use a time series regression model (4) to estimate the combined expenses of title agents and underwriters, using four samples of data. These are: (a) underwriters and all agents; (b) underwriters and efficient agents evaluated among all types; (c) underwriters and efficient agents evaluated within each type; and (d) underwriters and top 50% supra median efficient agents.[14]

---

14. We also performed another set of regression analysis using a number of policies written as the predictor variable for expenses: $\text{Expense}_t = a' + b'*(\text{Number of Policies})_t$. However, there are some discrepancies in the number of policies written in the agent and underwriters' reported data entailing a necessary adjustment of the observed number of policies for the regressions. Due to data limitations, this adjustment can be rather ad hoc. For example, in the direct testimony by the TDI staff (Crawshaw, 2009), a "judgment" factor of 0.45 is applied to calculate the total number of policies from the agent reported number of owner policies and agent reported number of total policies. We have run our analysis using only the number of owner policies and the adjusted total number of policies by the TDI method, and find the model significance (adjusted R^2 and F-value) is significantly lower across the samples than the presented model (4). Nonetheless, using parameter estimates from this alternative regression model, we can still find that the projected expense ratio using all agents as the reference set is about 9% higher than that using only the efficient agents. The insights from this alternative regression model are largely consistent with those presented in the paper. Therefore, we did not present these additional results in the paper.

$$\text{Expense}_t = a + b^{*}\text{Premium Volume}_t \qquad (4)$$

In the various testimonies in the 2008 Texas Title Insurance Rate Hearing, several interested parties presented regression models similar to (4).[15] Following the commissioner's order, we take historical data from year 1998 to year 2007—i.e., 10 years total—to find the predicted expense ratio for the year 2011, the beginning year for the promulgated rate change to take effect. We have adjusted all expenses and premium volumes to 2005 cost levels by using the gross domestic product (GDP) deflator obtained from the Bureau of Economic Analysis (*www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=2006&LastYear=2008*, last updated Feb. 29, 2012).

The regression analysis results are presented in Table 7. The results show that on-level premium is a strong predictor for expenses, as indicated by the high adjusted R^2 and the small p-values.[16]

Four samples are used: 1) underwriters and all agents; 2) underwriters and efficient agents where efficiency is evaluated among all agents; 3) underwriters and efficient agents when efficiency is evaluated within each agent's own organization form; and 4) underwriters and the supra median efficient agents whose efficiency ranked among the top 50% as evaluated among all agents. An agent's efficiency is calculated by the RAM model of DEA analysis for each of the years 2005–2007. An agent is determined to be efficient if it is efficient in at least one of the three years. Adjusted R^2 and F statistic value are also presented for each model. P-values of the F statistics are presented in the parentheses. *** indicates statistical significance at the 1% level.

Based on the regression results in Table 7, we next calculate the projected expenses for year 2011. We derive the projected expense ratio by scaling the projected expenses by the projected premium volume. Following the commissioner's order, because of the economic downturn, the projected premium volume in 2011 is assumed to be 15% lower than the average of 2006 and 2007.

[15] Ultimately, neither the commissioner's order nor the administrative judges' recommendation to the commissioner formally gave a definitive specific regression model to use. We used (4) in a manner consistent with testimony.

[16] Across the samples, the intercept has an extremely large p-value, suggesting that it is statistically indistinguishable from zero. As the intercept represents fixed expenses in this regression model, a plausible explanation is that it can be hard to separate out fixed expenses from variables expenses (varying with premium written) when the agents record their data items or report to the TDI. Due to the data limitations and the scope of our paper, we are not able to further investigate this issue. However, note that our predictor variable and the model itself are highly statistically (and economically) significant.

Table 7:
Regression Analysis Results[17]

	Intercept	Premium
	Panel A: All Agents	
Parameter Estimate	537657	0.8332***
p-Value	0.4519	0.0000
	Adjusted R^2: 0.9581	F: 206.95(0.0000)
	Panel B: Efficient Agents Evaluated Among All Agent Types	
Parameter Estimate	-28567	0.8059***
p-Value	0.9375	0.0000
	Adjusted R^2: 0.9401	F: 142.15 (0.0000)
	Panel C: Efficient Agents Evaluated Within Each Agent Type	
Parameter Estimate	-250730	0.8605***
p-Value	0.4945	0.0000
	Adjusted R^2: 0.9599	F: 216.20 (0.0000)
	Panel D: Supra Median Efficient Agents (Top 50%)	
Parameter Estimate	-262211	0.8726***
p-Value	0.5445	0.0000
	Adjusted R^2: 0.9727	F: 321.67 (0.0000)

The projections are executed for the four samples of data culled for efficiencies and are presented in Table 8. As was done for expenses, for the efficiency-based samples, premium is included only from agents that are deemed efficient (or supra median efficient) by the appropriate definition.

Table 8:
Expense Ratio Projections

	Projected Premium ($)	Projected Expenses ($)	Projected Expense Ratio
All Agents	11,279,195	9,935,413	0.8809
Efficient Among All	5,018,869	4,016,326	0.8002
Efficient Within Each Type	6,082,603	4,983,341	0.8193
Supra Median Efficient Agents	8,595,202	7,237,959	0.8421

For Table 8, the projected premium for each sample for 2011 was calculated as 15% less than the average premium of that same sub-sample for the years 2006 and 2007. Projected expenses were calculated by substituting the projected premium into the regression model (3) using the parameter estimates in Table 7. The projected expense ratio is the projected expense over the projected premium volume. Four different samples are used for the projections: 1) underwriters and all agents; 2) underwriters and efficient agents when efficiency is evaluated among all agents; 3) underwriters and efficient agents when efficiency is evaluated within

17. Durbin-Watson test statistics are obtained to examine autocorrelations in the time series regressions, and they support the validity of the regression model.

each agent type/organization form; and 4) underwriters and the supra median efficient agents (top 50% as of efficiency when evaluated among all agents). An agent is determined to be efficient if it is efficient in at least one of the three years.

Table 8 shows that the projected expense ratio with all agents' data is significantly higher than that with just the efficient subsets of agents. In fact, the subset of fully efficient agents evaluated among all agent types projects an expense ratio more than 9% lower than that produced with all agents' data. Even when we use the supra median efficient agents (top 50% ranked by efficiency scores) to include much more of the market, the expense ratio projected is still significantly lower than using all agents' data as is currently done. The findings illustrate that it is important to evaluate the operational efficiencies of title insurance agents in setting rates. Excluding data produced by the least efficient agents will lead to a significantly lower expense ratio provision, and that should be considered in the ratemaking process.

Thus, this DEA efficiency analysis has substituted economic efficiency notions from efficient frontier production behavior for competitive market enforced efficiency. Using the DEA efficiency-based rate promulgation methodology not only discourages inefficient expenses by excluding these extra expenses of highly inefficient producer in the estimated expense ratio or the promulgated title insurance rate, it also actively rewards efficiency. This is because the more efficient agents can still have a lower expense ratio than that implied by the promulgated rate if the reference set of firms includes all supra median efficient agents.

The efficiency-based methodology also produces a useful by-product giving guidance to the inefficient agents as to how to improve (cf., Brockett et al. 2008, Brockett et al. 2001). For each individual agent, the efficiency analysis will show exactly which inputs are being overused. Once the sources and relative magnitudes of the inefficiency are pointed out, the efficiency analysis also produces a benchmark set of agents who can utilize less expense to produce the same amount of products/services. (See Brockett et al. (2001) for details.)

Premium Calibration for a Prototype Title Policy

Based on the projected expense ratios, we can calculate the indicated rate change for rate promulgation using the ratemaking formula (1). According to the commissioner's order, the proposed promulgate expected loss ratio is 5%, and allowable profit rate is 6%. Therefore, the difference in indicated rate change that occurs by taking expense efficiency into account (as opposed to setting rates using all efficient and inefficient agents) is obtained as the difference between applying formula (1) with the expense ratio projection based on all agents and applying formula (1) with the expense ratio projection based only on the more efficient agents.

Because expected losses and profit rate are the same in the two cases (and variable costs are incorporated into the fixed costs), after computation this reduces to the difference in projected expense ratio (determined by the regression) divided by (1-profit rate) = (0.8809–0.8002)/(1-0.06) = 8.59% difference in indicated rate change. The difference in indicated rate change between using all agents' data and the supra median efficient agents' data is (0.8809–0.8421)/94%=4.13%.

The economic implication of this promulgated rate differential can be significant. For example, for a house worth $100,000, the current promulgated premium (from the 2006 Rate Hearing) is $843.[18] Consequently, the proposed efficiency-based methodology leads to a reduction in promulgated insurance rate change ranging between $35 (based on supra efficient agents) and $72 (based on fully efficient agents) from the current rate promulgation methodology. If the property prices are much higher, which would occur in most other cases, the economic impact will be much more significant.

The efficiency-based promulgated rate rewards "best practice" performance, while the originally promulgated rate rewards average expense performance. By using the new DEA based rate promulgation method, the regulator will be able to potentially increases social welfare and motivate the insurers' quest for expense efficiency; a quest self-motivated by market competition in market-set rate environments.

In Appendix B, we further explore our efficiency analysis results and discuss a few related key controversies in the Title Insurance Rate Hearing, including: 1) if independent agents are "handicapped" and are consistently less efficient in expenses than affiliated and direct operations agents; and 2) if smaller agents are consistently less efficient in expenses than larger agents. We find strong evidences that larger agents are indeed more expense-efficient and some support for the relative inefficiency of independent agents. These findings likely also have policy implications for future rate setting practices.

Conclusions and Implications

This paper proposes an efficiency-based methodology for insurance rate promulgation, DEA. In order to provide a rate that is "not excessive" to the consumers, the rate promulgation methodology developed herein can substitute economic efficiency via DEA frontier analysis in lieu of market competition-based efficiency. The DEA method helps regulators determine what companies to use in the determination of allowable expenses, including expense-efficient companies and excluding expense-inefficient ones. This provides a more rigorous method for

18. $100,000 is the largest reference house value for the title insurance rate setting in Texas. Title insurance rates for all house values greater than $100,000 are obtained based on the rate for a house worth $100,000. Therefore, we select this value in our illustrative premium calibration. The corresponding title insurance rate of $843 is obtained from the TDI's website at *www.tdi.texas.gov/orders/titlerates2004.html*.

determining companies to include in ratemaking than currently exists. Some states, such as Texas, include all firms due to the lack of a justifiable methodology for determining an appropriate cut off for firm inclusion. We develop an empirical example showing the savings that can be obtained using the DEA efficiency-based method.

Using an efficiency measure developed from the widely accepted frontier analysis model DEA, we identify (relatively) more efficient insurance agents and base the rate promulgation only on their experience, rather than all agents' experience as is done in most current rate promulgation practices. We illustrate our methodology in the context of the Texas title insurance market for three reasons. First, title insurance provides an appropriate environment to study efficient rate promulgation. Second, title insurance is actually promulgated or heavily regulated in most of the states in the U.S. In particular, title insurance is promulgated by the insurance commissioner through a biennial rate hearing in the Texas market. This allows us to improve upon and make a comparison with the actual ratemaking methodology used in practice. Third, because of the rate hearings, Texas title insurance data is publicly available for empirical illustrations of the methodology.

In an efficiency analysis of the Texas title insurance market during 2005–2007, we find that there is significant heterogeneity in efficiency across the insurance agents. On average, the efficient agents have an expense ratio 30% lower than the aggregate of all agents. Even the supra median efficient agents have significantly lower expense ratios. We also find that larger agents tend to operate more efficiently than smaller agents, and some evidence suggests that direct operations agents and affiliated agents are more efficient than independent agents.

Based on the efficiency analysis results and the most recent commissioner's order for the Texas title insurance rates, we find that the proposed efficiency-based rate promulgation methodology has an economically significant impact on the promulgated rate change using data from 1998–2007. By substituting the efficiency-based reference sets for the aggregate market reference sets in the regression model for ratemaking, the resulted percentage rate change is 4% to 9% lower.

Future research can look into improving the estimation of the loss and profit components in the insurance rates. Further work is also needed to look into the driving forces of heterogeneity in efficiency across agent types and sizes, as well as explore applications to other promulgated rate environments such as credit insurance.

Appendix A

Variable Descriptions and Data Adjustments for DEA Efficiency Analysis

We selected two output variables and two input variables to assess title insurance agent efficiencies using the DEA analysis. Table A1 includes a list of the output and input variables (bolded) along with the corresponding data items (not bolded) from the Title Insurance Agent Statistics Reports submitted by the title insurance agents to the TDI (available at *www.tdi.texas.gov/reports/report8.html#title_rpts*). The two output variables— namely, total premium written and the number of policies written— measure the services that the title insurance agents have provided, and the two input variables include the core expense "Capital and Labor" to perform the title search services and the "Operational Expenses" incorporating all normal operating expenses they incur in doing business. For each title insurance agent and each of the three years in the data period for the DEA analysis (2005–2007), we obtain from the raw data reports the specific data items shown beneath the corresponding output and input variables in Table A1 and add them up to obtain the desired output and input variable values.

Table A1:
Description of Input and Output Variables for DEA Efficiency Analysis

OUTPUT VARIABLES			
Premium Written		**Number of Policies Written**	
Total Retained Premium		Policies Issued	
INPUT VARIABLES			
Capital and Labor	**Operational Expenses**		**(Excluded Expenses)**
Salary	Rent	Printing & Photocopy	Tax Certificates Fee
Benefits	Utilities	Office Supplies	Recording Fee
Title Plant Lease	Accounting & Auditing	Equipment & Vehicle Lease	Courier & Overnight Delivery Fee
	Insurance	Depreciation	Fee for Title Exam & Evidence Furnishing
	Interest Expense	Directors Fee	Fee for Exam to Attorney/Other
	Legal Expense	Dues, Boards & Associations	Closing Fee to Other Agent/Underwriter
	Licenses, Taxes & Fee	Bad Debts	Closing Fee to Attorney/Other
	Postage & Freight	Advertising & Promotion	Loss & Loss Adjustment Expense
	Telephone & Facsimile	Employee Travel, Lodging & Education	Damages for Bad Faith Suit
		Other Expense	Fines or Penalties
			Donations/Lobbying
			Trade Association Fees

Following the commissioner's order and other hearing documents, three data adjustments are performed. First, in the raw data reports, all the expense data items are broken into title insurance-related and non-title insurance-related. We selected and included data items that are supposedly related to title insurance identified with "_TITLE" in the raw data files.

Second, a list of expense items are excluded from the "Operational Expense" input since they are deemed to be inappropriate for the promulgated rate. The list of excluded expenses is specified in Table A1.

Third, an on-level adjustment is made to historical premium amounts based on the current rate in order to account for any rate differences that have occurred in the data periods for the DEA efficiency analysis and the subsequent rate-setting regression model. All historical rate changes in the Texas title insurance market were promulgated by the rate hearings. We take the present level rate factors calculated and presented in the direct testimony of the TDI staff (Crawshaw, 2009), and we calculate the on-level premiums by multiplying the original premiums by the factors. The factors calculated for our data period (1998–2007) are presented in Table A2.

Table A2:
Present Rate Level Factors for On-Level Premium Calculation

Year	Present Rate Level Factor
1998	0.835
1999	0.850
2000	0.850
2001	0.850
2002	0.859
2003	0.905
2004	0.935
2005	0.968
2006	0.968
2007	0.997

Please note that in Table A1, the output variables' names (premium written and number of policies written) and the two input variables (capital and labor and operational expenses) are in bold, and the corresponding data items from the original agent reported data are listed beneath each output or input variable. The rightmost column contains the list of expense data items excluded from the calculation of the input variable "Operational Expenses" per the Texas insurance commissioner's order and other rate hearing documents. All expense data items from the original agent reported data are the ones allocated (by the agents) to the title insurance business, identified with "TITLE" in the names of the data items.

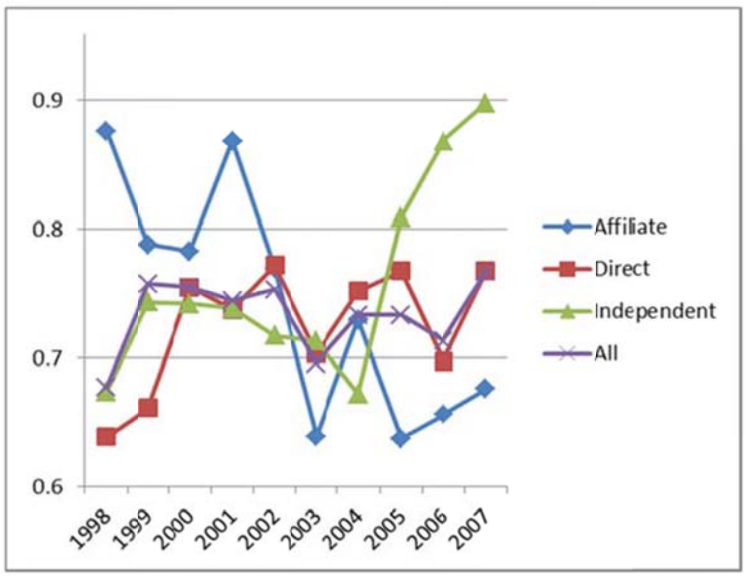
For Table A2, the present rate level factors are used to make "on-level" adjustments to historical premium volume, in order to account for rate changes that have occurred during the historic data period. The factors in this table are taken from the direct testimony of the TDI staff (Crawshaw, 2009), where the factors were calculated based on historical rate changes promulgated by previous rate hearings. The on-level premiums are then calculated by multiplying the original premiums by these factors.

Appendix B

Discussions of Other Key Controversies in the 2008 Rate Hearing

In this section, we discuss a few other key controversies in the Title Insurance Rate Hearing that our methodology can address. These include: 1) whether independent agents are "handicapped" and are less efficient in expenses than affiliated and direct operations agents; and 2) whether smaller agents are less efficient in expenses than larger agents. These issues were discussed in the direct testimonies and other hearing documents. However, little evidence was provided to support a conclusive recommendation and as a result, no specific resolutions were given in the commissioner's order. DEA can shed light on these issues.

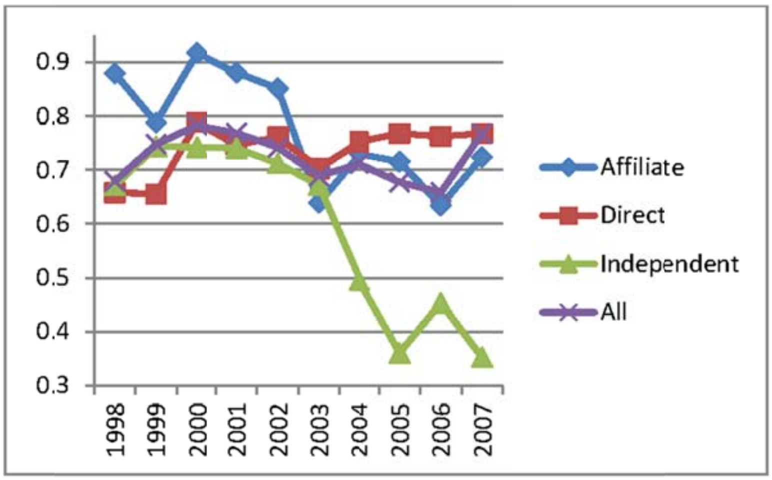
Figure A1:
Median On-Level Expense Ratio for Efficient Agents by Agent Type in 1998–2007 (Efficient in Any Year as Evaluated Within Its Own Agent Type)[19]



19. Median on-level expense ratios are calculated for these sets of efficient agents during the ten-year period 1998-2007. Outliers (agents with on-level expense ratios greater than 5) are removed to smooth out the curves although the insights are largely the same if these outliers were included.

First, we test the suspected pecking order hypothesis for different agent organization forms with respect to their operating efficiencies. Figure A1 and Figure A2 plot the median on-level expense ratios from 1998–2007 (our sample period for the rate-setting regression analysis) for the efficient agents who were evaluated within their own groups and among all agents, respectively. Based on the two efficiency evaluations, we select the agents that are efficient in at least one of the three years (2005–2007) for which DEA analysis was conducted (i.e., the "any year" definition),[20] and we calculate their on-level expense ratios for the years 1998–2007.

Figure A2:
Median On-Level Expense Ratio for Efficient Agents by Agent Type in 1998–2007 (Efficient in Any Year Evaluated Among All Agents Together)



Although the percentages of efficient affiliated and direct operations agents are much higher than that of independent agents, the median on-level expense ratios for the <u>efficient</u> independent agents are not necessarily larger than those of efficient affiliated and direct operations agents. These seemingly conflicting results suggest that the independent agents in general are less efficient, but the top performers can be very competitive against other types of agents.[21] Our findings are consistent with the commissioner's order in that the pecking order of agent

20. We select agents that are efficient in at least one of the three years rather than in all three years in order to obtain a reasonable size of efficient agents to plot the figures.

21. The issue of whether the efficient performers in one group differ statistically from the efficient performers in another group can be statistically investigated using the Mann-Whitney type of rank statistics as presented in Brockett et al. (2005). See Brockett and Golany (1996) for a detailed description of an analytical approach to use rank statistics for efficiency comparisons between different programs (i.e., groups of DMUs).

organization forms cannot be conclusively supported and does not warrant a rate differential between independent agents and other agent types.

Figure A3 and Figure A4 contain similar sets of graphs of expense ratios by agent types for the supra median efficient agent sets (i.e., top 50% in efficiency). To identify the supra median efficiency sets, agent efficiency is evaluated among all agents for each of the years in 2005–2007. A set of agents that is supra median efficient in any of the three years (i.e., the "any year" definition) and a set that is supra median efficient in all three years (i.e., the "all years" definition) are used to calculate median on-level expense ratios for the period 1998–2007.

The comparisons across different agent types using only the supra median efficient agents are similar to those with all agents, where direct operations agents have the lowest expense ratios, and independent agents have the highest expense ratios. The insights here are more consistent with the suspected theory that independent agents tend to be less efficient than direct operations and affiliated agents.

Figure A3:
Median On-Level Expense Ratio for Supra Median Efficient (Top 50%) Agents by Agent Type in 1998–2007 (Efficient in All Years, Evaluated Among All Agents)

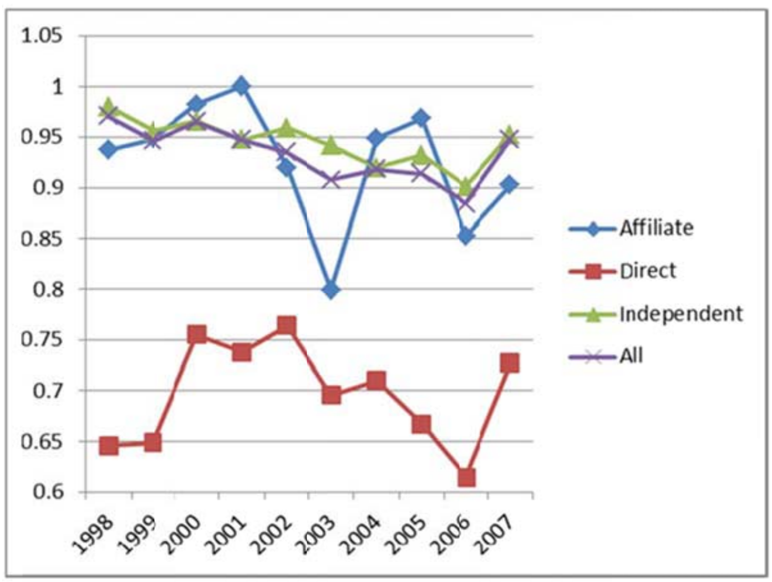
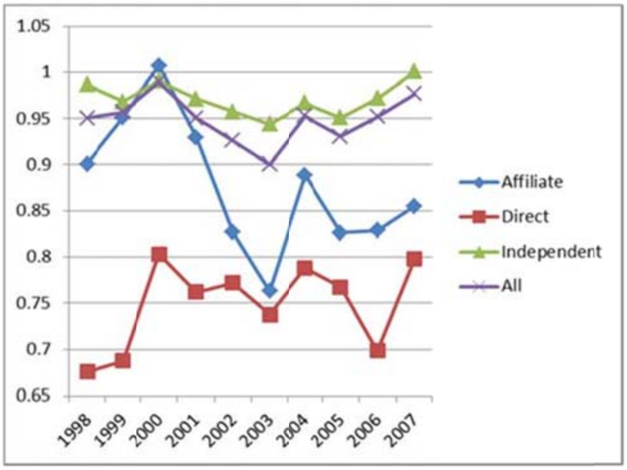


Figure A4:
Median On-Level Expense Ratio for Supra Median Efficient Agents (Top 50% Efficiency) by Agent Type in 1998–2007 (Any Year, Evaluated Among All Agents)



Additionally, we examine the impact of agent size on expense efficiency. Figure A5 and Figure A6 on the next page present median on-level expense ratio comparisons among efficient agents who belong to the large size group or the small size group. Because there are only a small number of efficient agents, we identify efficient agents in any of the three years (2005–2007) (i.e., the "any year" definition) and use only two size groups in these graphs to ensure a minimum number of agents in each group.[22] We can see that smaller agents, even when they stand out as fully efficient in using the expenses to provide core title services in competitions with agents of all sizes, still have higher expense ratios than those efficient agents of larger sizes.

Figure A7 and Figure A8 on the next page present similar results for the two sets of supra median efficient agents (i.e., top 50% in efficiency) using "any year" and "all years" definitions. The plots for the set of supra median efficient agents confirm strongly that larger efficient agents have consistently lower expense ratios across the years. These findings provide evidence that smaller agents seem to be less efficient than larger agents, and the projected expense ratio may be inflated when smaller agents are included in the rate promulgation.

22. The curves are still quite volatile because of the small number of data points for each curve.

Figure A5:
Median On-Level Expense Ratio for Efficient Agents by Agent Size Halves in 1998–2007 (Efficient in Any Year, Evaluated Within Each Agent Type)

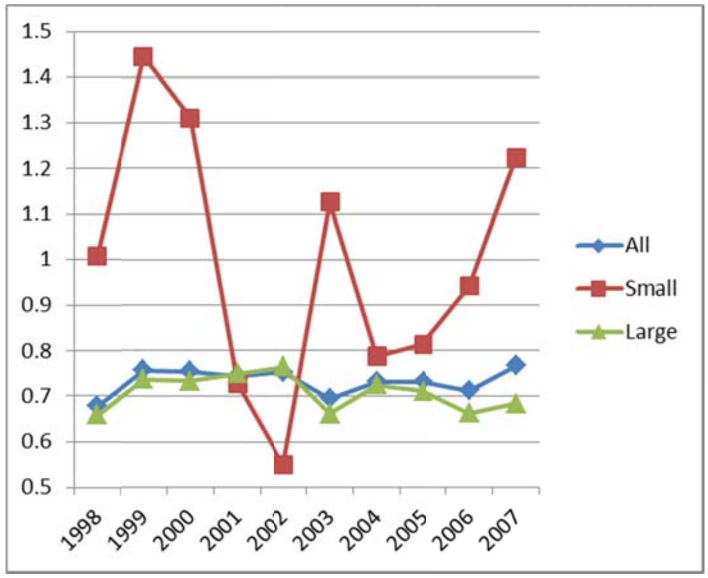


Figure A6:
Median On-Level Expense Ratio for Efficient Agents by Agent Size Halves in 1998–2007 (Any Year, Evaluated Among All Agents)

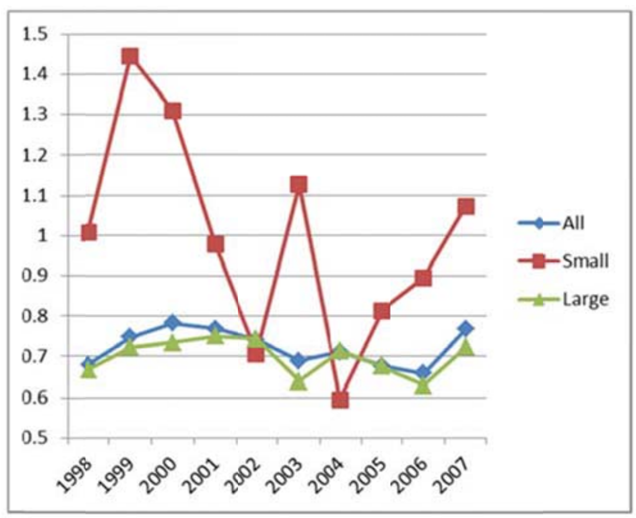


Figure A7:
Median On-Level Expense Ratio for Supra Median Efficient Agents (Top 50%) by Agent Size Halves in 1998–2007 (All Years, Evaluated Among All Agents)

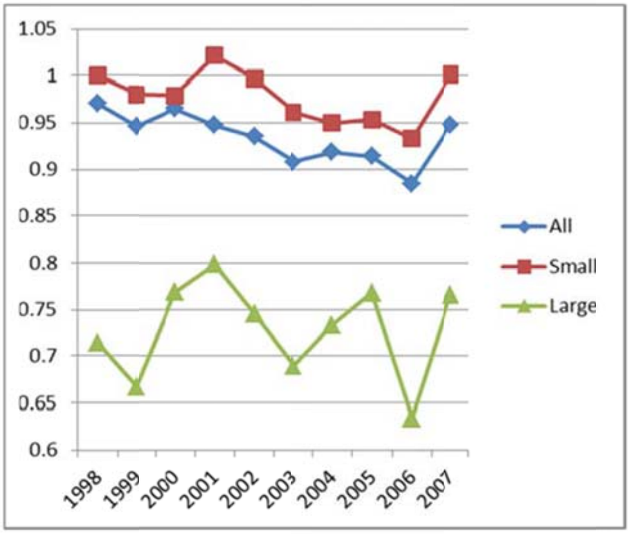
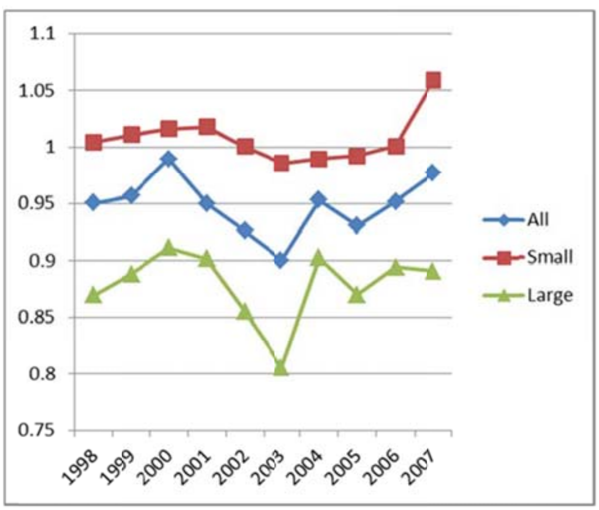


Figure A8:
Median On-Level Expense Ratio for Supra Median Efficient Agents (Top 50%) by Agent Size Halves in 1998-2007 (Any Year, Evaluated among All Agents)



References

Ai, J., and P.L. Brockett, 2008. "Insurance Pricing/Nonlife," *Encyclopedia of Quantitative Risk Assessment and Analysis*, 922–933, Melnick, E. and B. Everitt (eds.), Chichester, UK: John Wiley and Sons, Ltd.

Banker, R.D., A. Charnes, and W.W. Cooper, 1984. "Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis," *Management Science*, 30:1078–1092.

Brockett, P.L., L.L. Golden, S. Sarin, and J. Gerberman, 2001. "Identification of Target Firms and Functional Areas For Strategic Benchmarking," *The Engineering Economist* , 46: 274–299.

Brockett, P.L., W.W. Cooper, L.L. Golden, J.J. Rousseau, and Y. Wang, 2005. "Financial Intermediary Versus Production Approach to Efficiency of Marketing Distribution Systems and Organizational Structure of Insurance Companies," *Journal of Risk and Insurance*, 72: 393–412.

Brockett, P.L., and B. Golany, 1996. "Using Rank Statistics for Determining Programmatic Efficiency Differences in Data Envelopment Analysis," *Management Science*, 42: 466–472.

Brockett, P. L., W.W. Cooper, L.L. Golden, S.C. Kumbhakar, M.J. Kwinn, Jr., B. Layton, and B.R. Parker, 2008. "Estimating Elasticities with Frontier and Other Regressions in Evaluating Two Advertising Strategies for U.S. Army Recruiting," *Socio-Economic Planning Sciences*, 42: 1–17.

Casualty Actuarial Society, 1990. *Foundations of Casualty Actuarial Science*. New York, NY: Casualty Actuarial Society.

Charnes, A., W.W. Cooper, and E. Rhodes, 1978. "Measuring the Efficiency of Decision Making Units," *European Journal of Operational Research*, 2: 429–444.

Cooper, W.W., K.S. Park, and J.T. Pastor, 1999. "RAM: A Range Adjusted Measure of Inefficiency for Use with Additive Models, and Relations to Other Models and Measures," *Journal of Productivity Analysis*, 11: 5–42.

Cooper, W.W., L.M. Seiford, and K. Tone, 2007. *Data Envelopment Analysis: A Comprehensive Text with Models, Applications, and References and DEA Solver Software, 2nd Ed.*, Norwell, MA: Kluwer Academic Publishers.

Crawshaw, M, 2009. Direct Testimony of Dr. Mark Crawshaw in the matter of 2008 Texas Title Insurance Biennial Rate Hearing, SOAH Docket No: 454-09-0129.G.

Crocker, K.J., and A.N. Kleit, 2009. Presentation: "Title Insurance in the Runaway of Reverse Competition" on Behalf of the Office of the Attorney General of the Commonwealth of Pennsylvania Before the Commissioner of Insurance of the Commonwealth of Pennsylvania, July 2, 2009, and Additional Statement for the Public Hearing on Title Insurance Rates and Practices.

Cummins, J.D., and M. Weiss, 2013. "Analyzing Firm Performance in the Insurance Industry Using Frontier Efficiency and Productivity Methods," 28: 795–861, In: Dionne, G. (Ed.), *Handbook of Insurance, 2nd Edition*, Springer, New York.

Dumm, R.E., D.A. Macpherson, and G.S. Sirmans, 2007. "The Title Insurance Industry: Examining a Decade of Growth," *Journal of Insurance Regulation,* 25: 23–51.

Eling, M. and M. Luhnen, 2010. "Efficiency in the International Insurance Industry: A Cross Country Comparison," *Journal of Banking and Finance,* 34: 1497–1509.

Government Accountability Office (GAO), 2007. Report to the Ranking Member, Committee on Financial Services, House of Representatives, "Title Insurance Actions Needed to Improve Oversight of the Title Industry and Better Protect Consumers," April 2007, GAO-07-401.

Hofflander, A.E. and D. Shulman, 1977. "The Distribution of Title Insurance: The Unregulated Intermediary," *Journal of Risk and Insurance,* 44: 435–446.

Insure.com, 2009. "The Basics of Title Insurance," accessed December 2014 at *www.insure.com/home-insurance/title.html*.

Johnson, H.M., 1966. "The Nature of Title Insurance," *Journal of Risk and Insurance,* 33: 393–410.

Klugman S. A., H.H. Panjer, and G.E. Willmot, 2008. *Loss Models: From Data to Decisions, 3rd Ed*. New York, NY: Wiley.

Koch, D., 1993. "Title Insurance: A Regulatory Perspective," *Journal of Insurance Regulation,* 12: 3–13.

Leverty, J.T., and F.M. Grace, 2010. "The Robustness of Output Measures in Property Liability Insurance Efficiency Studies," *Journal of Banking and Finance*, 34: 1510–1524.

Nyce, C. and M.M. Boyer, 1998. "An Analysis of the Title Insurance Industry," *Journal of Insurance Regulation*, 17: 213–55.

Rosenberg, M.K., 1977. "Historical Perspective of the Development of Rate Regulation of Title Insurance," *Journal of Risk and Insurance,* 44: 193–209.

State Office of Administrative Hearings, 2009. Proposal for Decision: In the Matter of Texas Title Insurance Biennial Rate Hearing, SOAH Docket No: 454-09-0129.G.

Sirmans, G.S. and R.E. Dumm, 2006. "Title Insurance: An Historical Perspective," *Journal of Real Estate Literature,* 14: 291–320.

Texas Department of Insurance, 2010. Official Order of the Commissioner of Insurance of the State of Texas, Austin, Texas. Date: Nov, 4, 2010, Subject Considered: In the Matter of the 2008 Texas Insurance Biennial Rate Hearing. Docket No. 2691 Order Correcting Commissioner's Order No. 10-0959 NUNC PRO TUNC.

Todd, J.D. and R.W. McEnally, 1974. "Profitability and Risk in the Title Insurance Industry—The Texas Experience," *Journal of Risk and Insurance,* 61: 415–34.

Guidelines for Authors

Submissions should relate to the regulation of insurance. They may include empirical work, theory, and institutional or policy analysis. We seek papers that advance research or analytical techniques, particularly papers that make new research more understandable to regulators.

Submissions must be original work and not being considered for publication elsewhere; papers from presentations should note the meeting. Discussion, opinions, and controversial matters are welcome, provided the paper clearly documents the sources of information and distinguishes opinions or judgment from empirical or factual information. The paper should recognize contrary views, rebuttals, and opposing positions.

References to published literature should be inserted into the text using the "author, date" format. Examples are: (1) "Manders et al. (1994) have shown. . ." and (2) "Interstate compacts have been researched extensively (Manders et al., 1994)." Cited literature should be shown in a "References" section, containing an alphabetical list of authors as shown below.

Cummins, J. David and Richard A. Derrig, eds., 1989. *Financial Models of Insurance Solvency*, Norwell, Mass.: Kluwer Academic Publishers.

Manders, John M., Therese M. Vaughan and Robert H. Myers, Jr., 1994. "Insurance Regulation in the Public Interest: Where Do We Go from Here?" *Journal of Insurance Regulation*, 12: 285.

National Association of Insurance Commissioners, 1992. *An Update of the NAIC Solvency Agenda*, Jan. 7, Kansas City, Mo.: NAIC.

"Spreading Disaster Risk," 1994. *Business Insurance,* Feb. 28, p. 1.

Footnotes should be used to supply useful background or technical information that might distract or disinterest the general readership of insurance professionals. Footnotes should not simply cite published literature — use instead the "author, date" format above.

Tables and charts should be used only if needed to *directly support* the thesis of the paper. They should have descriptive titles and helpful explanatory notes included at the foot of the exhibit.

Papers, including exhibits and appendices, should be limited to 45 double-spaced pages. Manuscripts are sent to reviewers anonymously; author(s) and affiliation(s) should appear only on a separate title page. The first page should include an abstract of no more than 200 words. Manuscripts should be sent by email in a Microsoft Word file to:

Cassandra Cole and Kathleen McCullough
jireditor@gmail.com

The first named author will receive acknowledgement of receipt and the editor's decision on whether the document will be accepted for further review. If declined for review, the manuscript will be destroyed. For reviewed manuscripts, the process will generally be completed and the first named author notified in eight to 10 weeks of receipt.

Published papers will become the copyrighted property of the *Journal of Insurance Regulation*. It is the author's responsibility to secure permission to reprint copyrighted material contained in the manuscript and make the proper acknowledgement.