Ratemaking for Captives and Alternative Market Vehicles

Ann M. Conway, FCAS, MAAA

Abstract:
Although captives represent a significant part of the insurance market, there is relatively little information on the subject in the actuarial literature. This paper describes ratemaking techniques and approaches that can be used for captives and other alternative market vehicles. To put the discussion in context, the paper begins with a description of various captive structures. It concludes with a discussion of the financial considerations associated with a captive program.

Keywords: Ratemaking, Expense Loads, Increased Limits, Trend and Loss Development, Solvency, Credibility, Simulation.

1. INTRODUCTION

Although captives have been in existence since the nineteenth century (the protection and indemnity clubs used for marine exposures essentially functioned like group captives (defined later)), the use of these vehicles has grown significantly in the last 40 years. This growth has been driven, in part, by the high cost or lack of availability of commercial insurance (i.e., in a hard market situation). Over time, captive owners often find reasons beyond the market cycle to use and/or expand their captives; in recent years, employee benefits have become an area of interest for U.S. concerns.

In spite of the prevalence of these alternative market vehicles, there is relatively little information on the subject in the CAS literature. For example, there is only one reference to captives in the CAS search database (Reinsuring the Captive/Specialty Company, Lee Steeneck, CAS 1982) and there are a limited number of references to self-insurance (e.g., Statistical and Financial Aspects of Self-Insurance Funding, Leigh Halliwell, CAS 1996; Hospital Self-Insurance Funding: A Monte Carlo Approach, David Bickerstaff, CAS 1989; Simulation Models for Self-Insurance, Trent Vaughn, CAS 1996). The self-insurance papers in the CAS literature focus mainly on simulation techniques.

This paper will describe ratemaking techniques and approaches that can be used for captives and other alternative market vehicles. Issues addressed include:

- Understanding the data submission – There is a wide range in the types of information that are compiled in the initial stages of evaluating the feasibility of a captive. This paper will discuss ways to evaluate the data provided and how to identify potential problems, omissions and inaccuracies.

- Evaluating the exposure – In the hard market captives are taking on new and different exposures than what they traditionally assumed. This paper will discuss potential exposures and how to evaluate them for ratemaking purposes. In some cases the exposures can be evaluated using more traditional techniques (e.g., increased limits factors) but in other cases no traditional methods exist (e.g., coverage for the workers compensation liabilities associated with smallpox vaccination).
- Making rates with limited or no data – The paper will discuss methodologies and approaches that can be used to address the limitations in the available data and describe how other data (e.g., insurance industry information or other types of data) can be incorporated into the pricing model. It will also discuss how the approach can evolve over time to incorporate more of the captive's data. The paper will also discuss how traditional ratemaking techniques (e.g., increased limits factors, credibility) can be applied in the context of ratemaking for captives and other alternative market entities.
- Reviewing allocation models – An end-product of many captive rate analyses is rates by entity or cost center. This paper will briefly describe some of the more commonly used allocation approaches and evaluate their strengths/weaknesses.
- Identifying some of the common pitfalls encountered in these types of pricing analyses.

The paper will begin with a description of the various alternative market structures to put the remaining points in context.

2. CAPTIVE BASICS

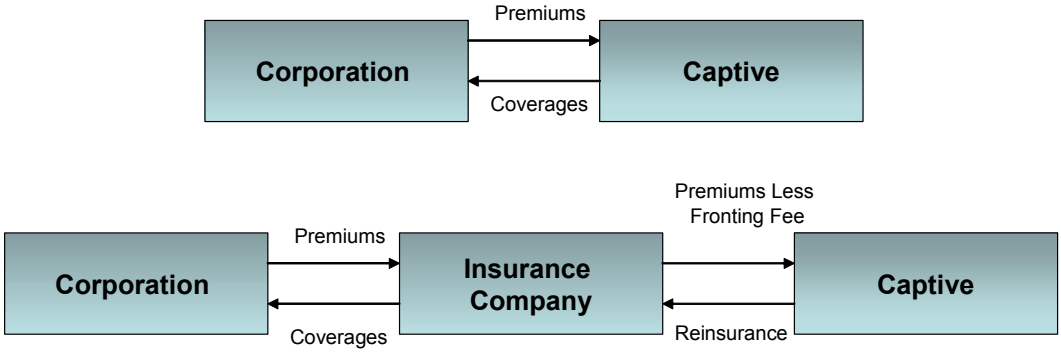
According to Best's Captive Directory, a captive can be defined as a closely held insurance company, where much or all of the captive's business is typically supplied by and controlled by its owners. Typically the owners (or shareholder/insureds) are actively involved in the underwriting, operations and investments of the captive. As of December 31, 2003 there are over 5,000 captives licensed, both in the U.S. and overseas, not including "cell" captives, according to the Best's Captive Directory. (Cell captives will be defined below.)

2.1 Types of Captives

There are a number of potential captive structures, including:

- Single parent – In this case, a single parent owns the captive (and a parent may own more than one captive) and the captive's financial results are "rolled up" to the parent. There are two types of single parent captives:
  - Direct writing – Under this structure, the captive issues the policy or policies directly to its insured (its parent). This type of captive is often used for coverages where the parent typically would not need to provide certificates of insurance or where there are fewer regulatory constraints (i.e., excess coverages, deductible reimbursement policies, or indemnification policies for liability).
  - Fronted or reinsurance captive – A fronting insurance company (a front) issues the policy to the parent and then the captive reinsures some or all of the front's exposure. A fronted program is often used for primary coverages where there is a need to issue insurance certificates regularly (i.e., for workers compensation). Fronting adds an additional level of expense to a captive operation because the front needs to be compensated for the use of its name, the administrative expenses of issuing the policy, and its creditworthiness or Best Rating. Currently fronting fees run between 10 and 12% of premium; in a softer market those fees could be lower. On a reinsurance basis, a captive can also participate in the excess layers provided by the captive's reinsurers or in the excess coverage purchased by the parent. In this scenario, there would not be a fronting fee.

    The following chart shows the relationships between a corporation and its captive under both a direct and fronted program.



Given the cost of establishing and maintaining a captive, the single parent option is not always viable for smaller entities. An often used "threshold" premium for a single parent captive is $750,000 to $1,000,000, given the level of ongoing captive expenses. Many organizations, however, establish single parent captives at significantly lower premium levels.

- Group captive - A group captive is owned by a group of companies; these may be industry specific (i.e., a group of nursing homes, a consortium of educational institutions) or may cross industry segments. Industry specific captives are often referred to as association captives, a name derived from the fact that many such captives are formed by members of a trade association. These captives can design their program around the particular exposures of their participants; the trade-off to the homogeneity of their exposure is that it may lack the risk spread that a more diversified captive would provide. Group captives can either write directly or on a reinsured basis (i.e., the captive reinsures the front). Results are shared among the captive owners in accordance with the participation agreement. Group captives often require members to contribute capital when they join the program; this contribution is often set as a percentage of direct written premiums. Note that some group captives write unrelated business in addition to the exposures of the group owners. While this may support the tax deductibility of premium (discussed later), it puts pressure on the captive to properly price the unrelated business.

  A group captive allows smaller and/or less well capitalized entities to participate in a captive arrangement; it also provides for risk sharing, which may be a consideration for low frequency/high severity exposures. It does, however, require a sharing of information among the members, as well as a sharing of adverse experience. A group captive will often have a higher expense ratio than a single parent captive, as there can be more administration costs to run this type of program. It may, however, provide a better opportunity for acceleration of premium deductions than a single parent captive.

- Sponsored cell (or rent a captive) – In this arrangement, the sponsor, which may be a traditional insurer, establishes a captive and the participants use (or "rent") a cell in the captive (i.e., the sponsor's capital provides the financial backing for the business

the cell owner wishes to place in the captive). Note that the sponsor is not an insured of the captive and the participants (or insureds) do not own or control the captive. These programs can be written on either a direct or reinsured basis. There are two general ways for participants to share in the captive results:

- Percentage participation – Each participant's share of captive overall profits/losses would be determined as a percentage of its premiums, its losses or some other pre-determined value. All participants' assets would be available for any losses that occur during the insured period.
- Protected (or segregated) cell captive – In a protected cell arrangement, the assets of a cell are protected from the liabilities of all other cells within the company; thus the participant's profit or loss is based on its own experience, subject to the level of "protection" provided by the reinsurance in place. Note that these "protected" vehicles are relatively new, so there is no real track record on how the protection would actually work or how it would hold up outside of the domicile.

A sponsored cell arrangement allows an entity to participate in a captive without any capital contribution. However, the expenses associated with this type of arrangement are typically higher, perhaps significantly, than for a single parent or group captive. The expense differential is driven by three factors:

1. The sponsor needs to be compensated for the use of its capital.
2. In the case of a protected cell captive, the cost of the "protection" would be passed on to the program participants.
3. Under some programs, the cell participants do not have the flexibility to select their own vendors (e.g., an investment manager) and may thus pay higher fees to the vendors selected by and/or owned by the sponsor.

- Risk retention group – A risk retention group (RRG) is a variant of a captive with a few key differences. RRGs were authorized under the Liability Risk Retention Act of 1986 to provide liability insurance (including products and medical malpractice, but specifically excluding workers compensation). All owners/insureds of an RRG must be engaged in businesses that have similar or related liability exposures. Both vertical and horizontal RRGs are permitted (vertical and horizontal are defined

below). The RRG is an on-shore entity (and can not be domiciled off-shore). After being chartered in one state, an RRG can write insurance on-shore without having to become an admitted insurer in every state in which it does business. The RRG does have to register with any state other than the domiciliary state in which it plans to write insurance. This type of structure is useful for entities that cross state lines (e.g., for a healthcare system, which is providing insurance to physicians in a number of states). An RRG may cost more to operate than a captive, because it is often regulated more like a traditional insurance company than a captive insurance company and the capital requirements can be more significant. Unlike a captive, however, it does not require a front to write business domestically.

RRGs can either be owned directly by the entities insured by the RRG (horizontal RRG) or by a single entity that owns the RRG, which then has its members and owners as the insureds of the group (indirect or vertical ownership). RRGs must have at least two policy holders (unlike a single parent captive). The RRG can be organized in any form permitted by its domiciliary state, i.e., a stock company, a mutual company, or a reciprocal. A reciprocal RRG is an incorporated association, managed by an attorney-in-fact, which allows its members (or subscribers) to exchange contracts of "insurance". Depending on the reciprocal's structure (as determined by its bylaws), profits and losses can be allocated back to the subscribers' accounts.

The following table compares some key criteria with respect to the various types of captives.

Captive Type	Who Supplies Capital	Use of Front?	Off Shore?	Typical Users
Single Parent	Owners	Maybe	Maybe	Larger corporations, health care systems
Group Captive	Owners	Maybe	Maybe	Smaller corporations, universities
Sponsored Cell	Sponsor	Maybe	Maybe	Small corporations
Risk Retention Group	Owners	No	No	Health care systems, Affinity groups

There are two other vehicles, which are often referred to as captives, but which are not captives in the strict sense (i.e., the owners are not necessarily the insureds).

- Agency captive (or producer – owned reinsurance companies (PORCs)) – Insurers often offer captive participation to groups of agents to allow them to share in the underwriting profits produced by their accounts (in some cases the PORC is formed by agents and industry associations). In this scenario, the captive owners are not its insureds.
- Special purpose vehicles (SPVs) – These offshore vehicles can be used to securitize insurance exposures (e.g., cat bonds).

2.2 Domiciles

Captives are domiciled in venues that have passed legislation that allows captive formation, either on-shore (e.g., Vermont, South Carolina, Hawaii), or offshore (e.g., Cayman Islands (Cayman), Bermuda, Guernsey). Currently the most popular domiciles are Bermuda, Cayman, and Vermont; the 2002 Best's Captive Directory indicates that about two-thirds of the licensed captives are in five domiciles.

Domicile	Number of Captives	Net Written Premiums ($ in Billions)
Bermuda	1,625*	$28.8
Cayman Islands	665*	5.3
Vermont	674*	3.5
Guernsey	408	3.6
Luxemburg	280	2.7

Based on the 2002 Best's Captive Directory, updated with information from the domicile websites as available.
* Denotes updated data.

Domiciles vary with respect to their capital requirements, the level of regulatory oversight, and their accounting rules, among other items. These factors, as well as the captive owners' perception of the regulatory environment and the underlying captive

infrastructure (e.g., the availability of captive managers, auditors, etc.) will influence the domicile choice. Other criteria considered in the decision on domicile include:

- The level of premium taxes
- The ability to discount liabilities
- Coverage lines permitted

In some instances, the choice of domicile is limited by the type of coverage the captive owner is considering; for example, writing employee benefits coverage under the United States Department of Labor Expedited Process Rules requires the use of a U.S. licensed captive.

It is important to note that a captive is considered an insurance company in its domicile; it is generally not considered an insurance company in the state (or states) where its parent/owner is located. Thus, in general, a captive can not perform any of the functions associated with the providing of insurance outside of its domicile (this limitation does not typically apply to an RRG). Depending on the structure of the insurance arrangement, however, some insurance company functions (such as claims) could be handled outside of the domicile (i.e., in the case of an indemnity policy whereby the captive agrees to indemnify the parent).

2.3 Reasons to Form a Captive

There are a number of reasons why organizations consider forming captives, including:

- Cost reduction - A key driver in captive formation is the potential to reduce insurance costs. Factors contributing to this include:
  - Better than average loss experience – An entity with good loss experience could have lower insurance costs using a captive because insurer pricing tools such as experience rating do not fully capture differentials in loss levels.
  - Lower expenses – A captive owner could negotiate more attractive terms than the expense level that is reflected in an insurance company's expense ratio as it may be able to purchase "unbundled" services from its vendors.
  - Retention of investment income – Investment income generated on unearned premiums and loss reserves is retained by the holder of these liabilities, which

would typically be the insurer under a traditional insurance program. A captive can retain the investment income on its unearned premium and reserves, potentially decreasing its parent's insurance costs.

- Improved cash flow – In addition to the retained investment income, a captive can provide its parent with improved cash flow through a more flexible premium payment plan or a more rapid payment of claims.

In spite of these potential advantages, a captive may not necessarily provide its parent with lower insurance costs, particularly if:

- Loss experience is worse than average
- Expenses are higher than an insurer's expense ratio
- Investment results are poor
- Premium is higher than competitive market pressures would indicate
- The capital invested in the captive could be better deployed within the corporation.

- Accelerate tax deductions – An insurance company is allowed to deduct both paid losses and reserves (case plus IBNR), while a self-insurer is only allowed to deduct losses as they are paid. An organization may be able to use the insurance accounting treatment by establishing a captive (again this depends on the organizational structure) or participating in some form of a group captive. The determination of premium deductibility is complex, in part because insurance is not explicitly defined within the tax code. Factors considered in the evaluation of deductibility include:
  - Risk assumption – Does the captive assume some risk, as supported by its business plan, or is the program a financing mechanism?
  - Corporate structure – Are premiums paid to the captive by subsidiaries (e.g., a brother sister relationship), or the parent?
  - Who owns the captive? Are the insureds different from the captive's owners?

- Increase capacity for its parent – A captive can provide coverage that may not be readily available from the commercial market (i.e., in that it is unique or in that it is not affordable). It can also provide coverage for gaps in the parent's program (i.e., a quota share percentage of an excess liability layer).
- Manage corporate retentions – Many entities use their captive for programs such as deductible buy downs; in these types of programs the parent may take on a fairly high deductible level (e.g., $250,000 or $500,000 per occurrence) but each division may be responsible for the first $25,000 or $50,000 per occurrence. The gap between the parental deductible and the division deductible can be funded in the captive, through either a pure risk sharing among divisions or based on some form of experience rating. The existence of the captive would allow the parent to have greater flexibility in its risk financing while dampening the impact of large claims on a single division's results.
- Centralize risk financing – A key benefit many organizations derive from a captive is that it provides a tool for the coordination of various risk financing arrangements and raises the profile of the risk management function to a higher level in the organization. A centralized focus can be a key element in controlling organizational risk financing.
- Direct access to reinsurance – A captive allows a company to access reinsurers directly, rather than relying solely on the brokered market. This has become a less compelling advantage since a number of reinsurers/excess insurers can be accessed directly and/or through the brokered market without the need for a captive. However, reinsurance is a critical component of a well-managed captive; in addition to per occurrence coverage, captives, particularly newly formed captives, will tend to purchase quota share and/or aggregate stop loss coverage, if available at an acceptable cost. These covers are helpful to newer captives to allow them to manage their exposure and build surplus.
- Support business partners or customers – Some organizations use their captives to provide "insurance" to their partners (e.g., vendors) or customers (e.g., warranty coverage). This can provide the owners with potential tax advantages (to the extent it is "third-party" business as defined by the Internal Revenue Service), risk diversification and underwriting profits, if the business is properly

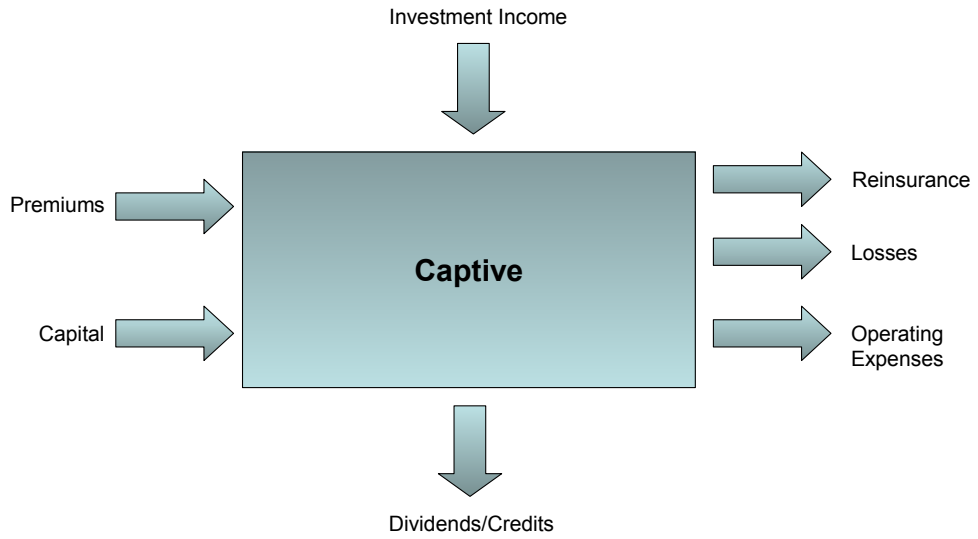
priced. It can also increase "loyalty" to the extent that the coverage offered is difficult or expensive to purchase in the commercial market.

3. RATEMAING ISSUES

An entity considering establishing a captive will typically evaluate the feasibility of this risk-financing vehicle. While a feasibility study considers a number of strategic issues in addition to losses and expenses (e.g., the impact of Federal income taxes, the viability of the business plan), this paper will focus on the loss and expense components of the analysis.

In its simplest terms, the premium charged by a captive should be sufficient to cover the expected losses and expenses associated with the coverage provided; appropriate pricing should consider the impact of expected investment income and a provision for adverse deviation, as discussed below.

The following chart shows simplified cash flows associated with a captive.



Pricing for a single parent captive tends to be based on a break-even profit assumption, whereas pricing for a group captive may have an assumed profit provision, which will be returned in policyholder dividends or premium credits should the experience be favorable.

Generally, more difficulties arise in developing captive premiums at the inception of the captive or when a new coverage is offered.

While the following analysis focuses on captive premiums, the approaches described can be used in the analysis of self-insured programs. The most significant differences between a funding analysis for an individual self-insured and a captive are:

- Loss focus – Typically the funding analysis for an individual self-insured will focus on the loss component, rather than the combination of losses and operating expenses. This is because the associated program expenses are often developed within the context of the risk manager's budgeting process and the amounts held as liabilities or in a trust (which could be used as a funding vehicle for a self-insured program) generally consider only losses and allocated loss adjustment expense (ALAE).
- Discounting – Many individual self-insureds do not consider discounting in the development of their self-insured accruals because it can be difficult, within a corporate structure, to develop a mechanism to credit back investment income. A risk manager

booking discounted liabilities increases the likelihood that future upward liability adjustments will be needed.

- Risk Margins – Often individual self-insureds establish liabilities at an expected level; i.e., they do not include a provision for adverse deviation. In some cases this approach is driven by auditor considerations (e.g., the FAS 5 criteria, related to accruing loss contingencies, of probable and estimable). In other cases, the decision to book at an expected level is cost driven.

For a workers compensation self-insured group (SIG) the ratemaking analysis will typically involve establishing a deviation (from published premiums or loss costs) for the SIG; this can involve a consideration of both the loss and operating expense components.

3.1 Data Issues

There is a wide variety in the quality of the loss and exposure data available for captive pricing analyses. Some entities will have complete historical loss data spanning a number of years; in other cases the data will consist of loss runs by participant (e.g., as can be the case when evaluating the experience for a group of potential captive owners who previously had individual insured programs). Some common problems with an initial data submission include:

- Exposures without losses – The loss information provided may not include historical information for all exposures (e.g., for a group with 30 potential members, loss runs may be provided for only 20 of the members). There are two ways to address this issue; obtain the missing data or develop the analysis using only the exposures that provided loss data. While the latter approach may reduce the credibility of the results, the assumption that the missing data reflects no losses is likely optimistic. Note, also, that this approach assumes that the loss experience for potential members with no loss data is similar to that of potential members with loss data. In some situations, there may be additional data that could be used to check the validity of this assumption (e.g., workers compensation experience modification factors).
- No closed claim data - Another source of incompleteness relates to data that only includes open claims; often loss runs, particularly from expired programs, will show activity on pending claims and/or claims closed within the evaluation period. Open

claim data can be used to project ultimate losses; however it will typically produce a more volatile result than more standard development methods.

- Combined coverage data – Entities that have coverage on a combined lines basis will often submit loss information that does not separate the claims by coverage. In order to develop useable loss projections the loss and exposure data needs to be split by coverage. To the extent the data cannot be split out, the actuary can use industry statistics to split the data into its component pieces (e.g., a common assumption is that general liability would represent between 5 to 10% of a combined medical/general liability program). This approach may not accurately measure the exposure of a specific entity.

- Incomplete exposure data – Often exposure data is provided for the latest year or two, while the loss data may cover a longer period. Typically, the captive organizer may be able to provide growth assumptions that can be used to develop estimates of historical exposures. For certain companies, this approach will produce a reasonable estimate of historical exposures. In cases where there have been significant changes (for example, through an acquisition or divestiture), this approach may create a mis-match between exposures and losses. Depending on the volume of losses, the limitations in the exposure data can have a significant impact on the credibility of the analysis. A typical experience period is five to seven years; for a larger volume of losses in a short tail line, three complete years of data could be sufficient. Conversely, for a high severity low frequency exposure, a ten year experience period may not be fully credible.

- Inconsistent exposure data – Inconsistency in exposure data is often found when a group program is being analyzed (i.e., a group of nursing homes considering captive formation), though it can also be found in a single parent situation. The differences may be relatively simple, such as what is being counted (e.g., what is a "bed") and is the term defined in the same manner across the group (e.g., skilled care, assisted living and independent living beds may all be considered to be long term care beds, but they represent significantly different exposures. In other cases, the differences may involve more complex issues, such as what is included in the data (for example, payroll can be straight payroll, payroll including overtime, payroll with benefits, etc.). Sometimes the exposure data provided is not internally consistent (e.g., consistently increasing premiums with decreasing payroll). While there are some scenarios where this may be a

plausible relationship (e.g., where payroll reductions result in deteriorating loss experience, with a parallel increase in workers compensation experience mods), often this reflects incompleteness or inconsistency in the exposure data.

- Claim count data – Claim count data is often not provided or is not available at a useful level, which limits the types of analysis that can be performed. Also, if claim count data is provided from a number of claims handlers, the compiled claim count data may have limited use because different insurance companies and different third party administrators (TPAs) often have different criteria for the establishment of claim files. This data issue becomes more problematic when there are multiple insurance companies and TPAs and/or changes in claims handling practices.
- Partial loss data – Occasionally an entity will provide loss data that may not consistently include ALAE. This is often true for coverages such as employment practices, where the ALAE may be tracked outside of the risk management function (i.e., in legal). To provide a valid comparison to an insurance product, it is necessary to reflect the ALAE data in the analysis since it is generally a significant portion of ultimate costs for this type of exposure.

3.2 Industry Statistics

Some of the issues described above can be resolved through the back and forth dialog of the data collection process; other issues may prove more difficult. For this reason, many captive pricing analyses typically rely more on industry statistics than would the pricing for an insurer's products.

The more commonly used industry statistics include:

- Benchmark loss development patterns – Many entities do not retain the historical data necessary to construct development patterns and/or they are not able to obtain this information from carriers with expired programs. In other cases, the data triangulation may lack credibility (e.g., for a low frequency/high severity exposure or where there have been multiple carriers insuring the risk). Typical sources for benchmark patterns include compiled industry data (e.g., Best's Aggregates & Averages) or publicly available rate filings. As with any benchmark, it is important to consider how the entity's data fits the benchmark statistics used. For some

coverages, publicly available data is limited and/or non-existent (e.g., umbrella liability) so the benchmark pattern may be highly judgmental.

- Industry size of loss curves – A larger entity may not have fully credible data beyond a certain limit (e.g., $500,000 per occurrence) while a smaller entity's data may not be credible beyond significantly lower limits (e.g., $50,000 per occurrence). While this issue is more critical in low frequency/high severity lines (such as professional liability), it often is a factor in pricing captive exposures in more typical lines (e.g., auto liability). In many captive pricing analyses, losses are limited (for example, to $100,000 per occurrence) and the exposure above this limit is estimated using industry increased limits factors that can be obtained from rate filings.
- Trend Factors – Most entities do not have sufficient data that would allow for the determination of credible trend factors. Again, this is more of an issue for low frequency/high severity lines. For entities with a reasonable volume of stable data, their own trend information can supplement industry data; for other entities, industry trend data would be used directly. Again, the typical source of trend data is industry rate filings. These can be supplemented with Consumer Price Index (CPI) data, the Masterson Index (as published by A.M. Best), and other economic trend data.
- Industry loss costs – An entity's historical loss experience may be too sparse or volatile to provide a reliable indication of the potential exposure to loss. Industry loss costs can be used as a supplement to entity data; these industry loss costs are often developed from rate filings. Note that considerable judgment can be necessary when using industry loss costs particularly in lines where there has been a significant change in the market.
- Statutory changes – For certain coverages (e.g., workers compensation or professional liability) statutory changes can significantly impact future costs. For workers compensation, in the absence of a law reform, these annual changes tend to be 1% or less, driven by medical and/or wage inflation. For professional liability, these can be significant, depending on the type of tort reforms enacted. For captive analyses, the actuary will typically need to rely on published evaluations of law changes, with judgmental adjustments to reflect differences in an employer's workers compensation program (e.g., a different level of use of utilization review) or to adjust

for known limitations in the data used to price a tort reform package (e.g., the applicability of the state data used in the analysis to the state in question, given the wide variation in the tort environment by state).

4. RATEMAKING EXAMPLES

The following section includes three examples of potential ratemaking approaches that could be used in a captive scenario. Note that in each of the examples (Exhibits 1 through 3), the analysis is developed from the last sheet forward to Sheet 1, which summarizes the results.

4.1 Example One

A single parent captive is considering writing an indemnification policy for its self-insured workers compensation program where the self-insurer retains the first $500,000 of any occurrence. The company has an existing captive and adding this coverage would allow more diversification in the captive. The company has a relatively high volume of claims, and the largest claim reported to date is valued at $600,000. Five years of loss and exposure information was available (See Sheet 7 of Exhibit 1, which summarizes the data).

The actual analysis is relatively straightforward. First ultimate losses limited to $100,000 per occurrence are developed using the company's data and industry loss development patterns. Two projection methods are used (incurred and paid loss development) and ultimate losses limited to $100,000 per occurrence are selected for each year (see Sheet 3 of Exhibit 1). The estimated ultimate losses are trended and adjusted for benefit level changes and compared to payroll to calculate a limited pure premium for each year (see Sheet 2 of Exhibit 1). A limited pure premium is selected based on the historical results. In this exhibit, frequencies and severities are also calculated to check the reasonability of the projections. Expected losses limited to $100,000 per occurrence for the upcoming year are calculated in Exhibit 1, Sheet 1 by multiplying the selected limited pure premium by the projected exposures (payroll).

The indication is then adjusted to reflect the program retention ($500,000 per occurrence) using an increased limits factor (ILF). Given the limitations in the data (e.g., complete individual claim detail was not available since the large loss summary only captured information on claims valued at $100,000 or more), the company's experience cannot be

used directly to develop ILFs. In Sheet 6 of Exhibit 1, we compare the company's implied ILF to industry data. The calculations shown in Exhibit 1, Sheet 6 provide only general guidance as to the entity's large loss experience (in this case suggesting that the company's large loss experience is somewhat more favorable than is implied by industry data). Note that this approach gives a very "macro" sense of how the company's large loss experience compares to industry large loss experience. A more traditional approach involves developing and trending individual claim data to calculate ILFs; this methodology requires a large volume of claims, preferably including all claims rather than just those over a certain dollar limit. Given this data constraint, captive analyses tend to rely more on published ILFs. The selected ILF used in the projection on Exhibit 1, Sheet 1 relies mainly on industry data, given the limited credibility of the company's historical large loss experience.

We then calculate a risk margin and adjust the indication to reflect discounting and operating expenses in Exhibit 1, Sheet 1. The parent has determined that it will use a 75% confidence level factor in its captive pricing, as this is acceptable to the domicile's regulators.

The company and industry data are used to develop the frequency and severity parameters for a loss simulation in Exhibit 1, Sheet 2. To develop the frequency estimates, reported and closed claim counts are projected to an ultimate basis using benchmark patterns (see Exhibit 1, Sheet 4). Given the differences in company and TPA approaches to opening claim files, there is little industry data to use to develop claim count patterns, which means that the actuary may need to develop patterns from the experience of similar entities. In deriving the simulation parameters, medical only claims are excluded given their low average severity (less than $500 per claim typically). This provides a "truer" picture of potential variation, since the inclusion of a large number of low severity claims would dampen the results (i.e., produce a narrower risk margin). For liability lines, excluding closed no payment claims would have a similar impact. Exhibit 1, Sheet 2 shows the details of the adjustment.

For modeling purposes, a Poisson distribution was assumed for frequency and a lognormal distribution was assumed for severity; the coefficient of variation (one of the inputs for the lognormal distribution) was estimated based on industry size of loss distributions. Note also that the severity derived in this calculation is limited to $100,000; for simulation purposes, this often needs to be adjusted to an unlimited basis. A common problem in deriving simulation parameters for feasibility studies relates to calculating an

unlimited severity. Even if the data is provided on an "unlimited" basis, there is generally not a sufficient volume of large claims for the data to be actually unlimited. It is important to determine the "implied" limit in the data and then adjust the calculated severity to an unlimited basis (i.e., through the application of ILFs); otherwise the calculated risk margins may be understated.

Present value is reflected using an industry loss payment pattern and an assumed investment yield (see Exhibit 1, Sheet 5). Captive pricing often considers the time value of money, in part because many of the major captive domiciles allow discounting of reserves and/or prospective funding. In determining an appropriate discount rate, the actuary typically relies on input from the parent, and/or the captive's investment advisor. In some domiciles (e.g., Caymans) captives are allowed to have a greater percentage of equity investments than U.S. statutory rules would allow, which could have a favorable impact on the assumed investment yield.

Operating expenses are then added to the discounted 75% confidence level losses to determine the captive premium shown on Exhibit 1, Sheet 1. Typical expenses could include:

- Captive management (producing the captive financials, dealing with regulators, financial reporting/MIS
- Excess insurance or reinsurance, potentially including some form of aggregate coverage.
- Claims handling, if not included in management
- Fronting fees
- Audit
- Actuarial
- Legal
- Taxes – These include state premium taxes or possibly direct placement/self-procurement taxes, federal excise tax (if "insurance premiums" are paid to an offshore domicile), federal income taxes.
- Investment expenses (if not netted out of investment income)
- Travel costs (for Board of Directors meetings)

- Letter of credit (LOC) costs if needed; generally a front will require collateral and LOCs are often used to meet the collateral requirements. LOCs are often used as part of a captive's capitalization.
- Risk management/loss control services (if any)
- Other expenses: brokerage commissions/fees, any sponsorship/endorsement fee (probably not for single parent), domicile charges (amount and basis varies by domicile), bond fees, D&O insurance (for the Board of Directors), etc.

Annual expenses for a single parent captive typically range from $50,000 to $150,000 (excluding excess insurance or reinsurance). Note that this range contemplates a fairly generic program; complex multi-line captives will likely have higher operating expenses.

The expenses included in Exhibit 1, Sheet 1 are:

- Excess insurance; and
- A pro-rata amount of total program expenses (e.g., captive management, audit). In this example the policy is assigned a 10% pro-rata share of expenses; the remainder of the total program expenses is allocated to the other coverages written in the captive. The 10% allocation was determined by comparing this coverage's expected losses to the total captive expected losses. A more refined allocation procedure could be used (i.e., to reflect differences in the various expense components by coverage). Exhibit 1, Sheet 8 shows the details of the expense calculation.

Many captive programs incorporate a retrospectively rated premium (retro-rated) feature, where the premium reflects the insureds' loss experience subject to minimums and maximums. This approach provides an advantage to the captive in the event that loss experience is adverse; however, it may have a negative impact on the acceleration of tax deductibility.

At future evaluation dates, the above analysis could be modified in a number of ways to better reflect the entity's loss experience, including:

- Company specific loss development triangles could be created. Note that this would be a longer term initiative (unless historical loss valuations were available). It may also be difficult to capture future valuations of run-off programs (in this case, pre-captive

experience) unless there is a mechanism for the company to obtain this data from its prior carriers.

Developing a company specific loss payment pattern would also effect the discounting calculation and would potentially imply a lower discount amount (i.e., if captive losses are paid more quickly than implied by industry benchmarks)).

- A more robust adjustment to industry size of loss curves could be developed, which would affect both the increased limits adjustment and the calculation of risk margins. It could also impact the captive's retention level for this coverage, as it would allow a better comparison of the cost of retaining the exposure relative to reinsuring it.
- The lost time/medical only split could be modified to reflect emerging experience.

4.2 Example Two

The next scenario involves a group of four physician practices seeking to form a captive to cover their professional liability exposures. There are two factors driving their interest in a captive – their loss experience has been extremely favorable and their premium expenses have increased significantly. Market conditions would suggest that the lowest attachment for excess insurance/reinsurance for the proposed captive is likely to be between $1 million and $2 million per occurrence. The physicians are presently in a first dollar program written on an occurrence form.

Given the level of exposure (i.e., the retention level of at least $1 million per occurrence) under consideration, a key question to consider is the credibility of the data; is it reasonable to assume that the loss experience is fully credible or should it be supplemented with other sources of data? The volume of large claims in the data shown in Exhibit 2, Sheet 4 (a large loss listing) does not provide a true picture of ultimate losses at the levels of coverage being considered for the captive, given the volume and level of large claim activity (for example, there are only two claims in excess of $500,000). There are also some limitations in the overall data provided, which are summarized by accident year on Exhibit 2, Sheet 5 (this exhibit also includes diagnostic statistics calculated to provide insight on data "reasonability"). Some observations include the following:

- Exposure information is not provided for all policy years

- The trends in loss information are not necessarily consistent with the trends in exposure data. (Note the loss level in the 2000 year relative to the prior and subsequent years; it is over 25% greater, while the exposure level is relatively consistent). Given the nature of the exposure (professional liability) this fact on its own may not be indicative of significant data issues.
- Average values of open claims do not track average paids, nor does frequency track loss volume
- The data quality appears to vary by entity.

In reviewing this submission the actuary would need to try to resolve these questions and/or obtain additional data. To the extent these issues cannot be resolved, an approach would be to exclude questionable data and develop the analysis based on a smaller volume of apparently more reliable data. However, the corresponding reduction in data credibility may limit the appeal of this approach.

Exhibit 2, Sheet 3 details the pricing approach used, which is based on an "experience rating" model. The first step is to evaluate the data to determine at what loss limit it is credible (in the example, we have assumed losses limited to $100,000 per occurrence are fully credible). Then estimated ultimate losses for each accident year are calculated by multiplying the basic limit incurred losses by loss development factors. These ultimate losses are divided by exposures on a base class basis; in the example, we have assumed that all of the physicians practice in the same specialty. Often, it would be necessary to adjust the exposures to a common (or base class) basis by multiplying the number of physicians for each specialty by classification factors, which reflect the relative "riskiness" of each specialty. These class factors can be obtained from rating manuals; note that there is significant variation in the class rating schemes using by different carriers. This calculation produces a developed loss cost per base class physician, which is then compared to an industry expected loss cost. The industry expected loss cost could be derived from rate filings, or the experience of similar exposures. The loss development factors used in this Exhibit are also based on industry experience.

The actual loss costs are compared with the expected loss costs to determine an experience modification factor (experience mod) for each accident year. This calculation could also be done on a paid basis, but given the length of the expected payment pattern for

professional liability, the paid comparison may be less meaningful than the reported loss comparison presented herein. The individual accident year results are then weighted (using exposures and reporting patterns as a proxy for the implied credibility of each year) to calculate an overall weighted average experience mod factor.

The credibility of the loss experience is determined by calculating a credibility factor; in this case, it is based on the number of insured physicians, on a base class basis. A full credibility standard of 40,000 is used in the example. A credibility weighted experience mod is calculated (reflecting a unity factor for the balance of credibility), and based on this calculation, an experience mod is selected. The selected experience mod is applied to the industry expected loss cost to calculate an experience-modified loss cost. The product of the experience-modified loss cost (from Exhibit 2, Sheet 3) and projected exposures (on a base class basis) is estimated losses for the forecast period (see Exhibit 2, Sheet 2).

To this point, the analysis has been performed on an accident year (or occurrence) basis. Given that reinsurance for this coverage is generally written on a claims-made basis, the coverage through the captive will be provided on a claims-made basis (using the same coverage form reduces coverage gaps that can arise when there are changes in retention prospectively). Since the physicians have historically been insured on an occurrence basis, they do not need to purchase coverage for prior exposures (e.g., tail coverage from their current insurer or nose coverage from the captive). As such, the initial captive premium would reflect first year claims-made coverage (that is, the captive would cover all claims reported in the first policy period occurring on or after the retro date (in this case, it would be the effective date of the policy)). Accounting guidelines may also suggest that a tail premium be included to cover claims reported subsequent to the expiration of the policy period. The accident year losses are converted to a claims-made basis on Exhibit 2, Sheet 2 through the application of a claims-made factor (again, based on industry data).

An increased limits factor is then used to adjust the losses to the appropriate retention level. In this example, where three retentions are evaluated, the ILFs are based solely on industry data due to the credibility (or lack thereof) of the physician groups' large loss volume. Similarly to Example One, risk margins and discounting are incorporated and expenses are added to the loss projection to estimate premiums (see Exhibit 2, Sheet 2). However, there are three important differences from Example One:

- The risk margin parameters are developed entirely from industry data, given the volume of the historic data.
- The entire program expenses are reflected in the premium, since the proposed captive contemplates a single coverage (Exhibit 2, Sheet 7 details the expense components, excluding profit).
- The expenses include a profit loading, which could be returned to the members in the form of a dividend, should the experience be favorable.

Exhibit 2, Sheet 1 shows the allocation of premium by physician group. Column (4) of this exhibit shows an allocation based on exposures, while Columns (6) and (8) show allocations based on counts and incurred losses, respectively. The final allocation is based on equal weightings of the three percentages. Note that this weighting is judgmental; other weights could be used. In developing the allocation methodology, factors to consider include:

- The level of risk sharing among group members; a loss-sensitive allocation system generally implies less risk sharing among the members.
- The impact of loss control and risk management – to the extent that these two factors can influence experience, a loss-sensitive allocation can have a long-term favorable impact. If losses are more fortuitous, a loss-sensitive allocation may be considered punitive.
- The variation in member size – if a group is comprised of large and small members, an exposure-based allocation may not reflect economies of scale that could be attributed to a larger member. In practice, groups where members vary significantly in size (particularly where there is one large member and a number of small members) may find it difficult to develop a "fair" allocation.

After the premium allocations are developed, the individual premium is increased by a factor of 50% to incorporate an initial capital contribution. The combination of the risk margin and the initial capital contribution are estimated to reflect a 90% confidence level. Given the level of retention under consideration and the line of coverage (professional liability), a start-up captive would typically fund at this confidence level.

Over time, captive experience could be incorporated into the analysis, but at a much slower rate than in Example One. This difference arises due to the nature of the coverages considered in the examples (workers compensation in Example One at $500,000 per occurrence limits vs. professional liability in Example Two at $1,000,000 per occurrence limits). For a number of years, it would be necessary to rely heavily on industry development statistics and size of loss curves, as well as industry loss costs.

4.3 Example Three

In this situation a company is considering writing coverage in its captive for a new exposure that is not underwritten and/or reasonably priced in the insurance market. Because of the novelty of the exposure there is little or no industry loss data available, which means that pricing would need to rely on non-insurance data.

The first step in evaluating this type of exposure is understanding the process by which an insured event would generate a claim and then modeling the process. This could involve interviewing the potential insured and obtaining external data. An example of this situation would be a healthcare entity that is considering offering coverage through its captive for workers compensation claims that could arise from immunizing healthcare workers for smallpox.

For purposes of this example we look at frequency and severity separately; in some types of these analyses it would be necessary to develop projections on a combined basis, due to limitations in available data. To simplify the modeling process, we also assume that there would only be two ways in which a claim could arise:

- A vaccinated worker contracted smallpox; or
- A vaccinated worker infected a co-worker.

To develop a claim frequency projection, it would be necessary to compile exposure data for the potential insured. This would be combined with industry frequency data (in this example, the Center for Disease Control (CDC) website could provide a range of useful input) to estimate a claim projection for the insured's program. We estimate two claim frequencies on Exhibit 3, Sheet 3 (the claim frequency for a direct exposure (a worker contracting smallpox directly from the vaccination) and the claim frequency for an indirect exposure (a worker contracting smallpox from a fellow worker having been vaccinated)) and combine the implied ultimate claims from the two potential exposure sources (i.e., we are

assuming the severity of a claim will not vary regardless of how the claimant was exposed). The key variables underlying the claim frequency projection are:

- Projected exposure. In this example payroll was converted to number of employees, since the publicly available data related frequency to an employee headcount. The conversion assumed an average salary per employee. Note that this simplified example does not consider exposure differences among categories of employees (i.e., physicians vs. administrative staff); to incorporate such a differential, it would also be necessary to consider salary differentials among the employee groups when converting payroll to headcount.
- The percentage of workers vaccinated and the estimated percentage of non-vaccinated workers exposed to vaccinated workers; this information was provided by the healthcare system.
- The estimated percentage of vaccinated workers contracting smallpox and the estimated percentage of non-vaccinated workers contracting smallpox; this was based both on industry information and input from the healthcare system.
- An "interaction effect". This factor is essentially a modifier which is used to adjust the projection to reflect an actual or perceived difference in the potential insured's exposure relative to that implied from the publicly available data (i.e., if it was believed that the level of interaction among employees could result in higher or lower infection rates than external data would suggest). In Exhibit 3, Sheet 3 it was assumed that the interaction effect would increase the number of claims by 20%.

The estimated claim counts for the direct exposure are calculated on Exhibit 3, Sheet 3 as the product of the estimated headcount, the percentage of workers vaccinated, and the percentage of vaccinated workers contracting smallpox. Similarly, the estimated claim counts for the indirect exposure is calculated as the product of the estimated headcount, the complement of the percentage of workers vaccinated (to determine non-vaccinated workers), the estimated percentage of non-vaccinated workers exposed to vaccinated workers, the estimated percentage of non-vaccinated workers contracting smallpox and the interaction effect. The total projected claims on Exhibit 3, Sheet 3 are the sum of the projected claims for the two exposures.

Each worker infected with smallpox will experience varying levels of disease and associated costs. To simplify the example, we assume one of three outcomes (using a workers compensation industry claim categorization).

- Outcome A - A fatal claim (the claimant dies within two weeks of exposure);
- Outcome B - A permanent total claim (the claimant is permanently unable to work); and
- Outcome C - A temporary total claim (the claimant is out of work for eight weeks). Given the nature of the disease, we assume that there will be no minor claims (e.g., medical only claims).

Percentage probabilities are assigned to each outcome based on external data and input from the healthcare system and estimated severities are developed for each of the scenarios. A claim severity for each outcome is shown in Exhibit 3, Sheet 2; this severity reflects the estimated indemnity and medical (both current and future) costs of each outcome. Key inputs include the assumed wage level, associated medical costs, future wage and medical trends, and the potential for benefits for dependents. The analysis of severity could be further refined to reflect a wider range of potential outcomes.

An overall estimated severity is determined by calculating the weighted average of the estimated cost of the three outcomes. The frequency and severity assumptions are then combined to calculate expected losses in Exhibit 3, Sheet 1. As in the prior examples, the expected losses are adjusted to reflect discounting, risk margins and operating expenses. Given the nature of the coverage, the fact that it is an additional coverage for the captive (so that the additional expenses are more of a frictional cost) and that no excess insurance or reinsurance will be purchased, the associated expense level is relatively minimal as compared to Example One or Two. Note that the payment pattern used in the discount calculation (Exhibit 3, Sheet 4) reflects the projected cash flows associated with each outcome, rather than an aggregate industry payment pattern.

In the absence of an actual incident, it may not be possible to further refine this analysis in subsequent years; thus, the potential captive premiums are primarily a function of the underlying assumptions and external data.

5. FINANCIAL CONSIDERATIONS OF A CAPTIVE

Developing captive premiums that reflect potential profit provisions and/or incorporate risk margins or capital contributions increase the financial strength of the captive and offer a number of advantages over a long-term horizon. These include:

- Enhancing the flexibility to change the program retention in response to market conditions
- Increasing the ability to raise premiums (i.e., by adding new members to a group captive or adding additional coverage to a single parent captive)
- Providing the flexibility to support a higher than average level of claim payments in a single year without liquidating assets
- Positioning the captive to meet solvency requirements of the domicile or a rating agency (as needed).

For a captive, the premium analysis needs to be considered in the context of the captive's financial position. Some of the key financial ratios to consider in evaluating the financial strength of a captive include:

- The premium to surplus ratio – This leverage ratio reflects a company's exposure to pricing errors; for example, if a company's premium to surplus ratio were 2:1, a 10% underestimate on premiums would have a 20% effect on surplus. This is probably the most commonly used leverage ratio, though there is not necessarily one "right" ratio. Factors to consider in evaluating a captive's premium leverage ratio include the type of business (exposure, policy form and limits offered), the relative adequacy of its pricing, and its approach to loss reserving. According to Tillinghast's Recognized and Accepted Captive Standards (TRACS), captives in general tend to have lower premium to surplus ratios than commercial insurers, because they often have higher risk retention to surplus ratios. A range of "normal" leverage ratios for captives is from 1:1 to 5:1, although it can be greater in some offshore domiciles.
- The reserves to surplus ratio – The reserve leverage ratio measures a company's exposure to reserving errors and again there is not necessarily a "right" ratio for a captive. In evaluating this ratio, it is important to consider the level of reinsurance used

by the captive and its approach to establishing reserves. Similar considerations apply to this ratio as to the premium to surplus ratio. A range of reserve to surplus ratios for captives is 3:1 to 5:1. At higher leverage ratios, a relatively small increase in reserve levels would have a significant impact on surplus.

Although large premium and reserve leverage ratios can be negative from the financial perspective of captive, it does not necessarily follow that low leverage ratios are positive. A low leverage ratio could imply that the captive is adequately priced or reserved; it could also imply that the captive is overcapitalized and that the "excess" capital could be put to better use within the organization. Conversely high leverage ratios could indicate that the captive's pricing and/or reserving is stronger (more conservative) than average.

- Risk retention to surplus ratio – A number of domiciles use the "10% rule" (i.e., a company may not expose more than 10% of its surplus to any single risk or loss). This ratio is considerably higher than the risk retention level of a large insurer. Many captive owners believe that captives should be risk takers, with the understanding that they may need to contribute additional premium or surplus if experience is adverse. Risk retention ratios of captives can range from 10% to over 200%, depending on the coverage, membership structure (i.e., single versus group) and domicile.

Any analysis of a captive's financial position also needs to consider its use of reinsurance. Typical ways reinsurance is used in a captive program include:

- Protection from catastrophe losses (either per occurrence or in aggregate) – purchasing reinsurance gives the captive more stability with respect to income fluctuations and/or solvency.
- Providing capacity – Captives often provide high limits of coverage (relative to the captive's surplus), particularly in low frequency/high severity lines. Purchasing reinsurance allows a captive to provide these limits while protecting the captive's surplus position.
- Supporting growth – A group captive or RRG may purchase reinsurance to facilitate growth because in the short run growth will have a negative impact on the captive's leverage ratios. The impact is assumed to be short run because it is assumed that the "business growth" is adequately priced. If this assumption does not hold, the purchase

of reinsurance is more critical (assuming the reinsurer does not question this use of its surplus), or more importantly, the growth strategy should be re-evaluated.

- Providing an exit strategy – A captive withdrawing from some or all of the coverages offered will often transfer the remaining liabilities to a reinsurer through a LPT.

There are a number of other factors to consider in evaluating a captive's financial position, such as its investment portfolio, but they are beyond the scope of this paper.

6. CONCLUSION

Captives and alternative vehicles will likely continue to represent a large component of the risk financing market. It is likely that captive owners will continue to use these vehicles to finance new and different exposures, in addition to the more traditional coverage lines. This growth represents both a challenge and an opportunity to actuaries.

7. REFERENCES

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Biography of the Author

Ann M. Conway, FCAS, MAAA, is a Consulting Actuary with the Tillinghast business of Towers Perrin in the firm's Boston office. She is a principal of Towers Perrin. She is a graduate of the Massachusetts Institute of Technology. She is a Fellow of the Casualty Actuarial Society (CAS) and a member of the American Academy of Actuaries (AAA). Ms. Conway is a member of various CAS Committees, including the Nominating Committee, the Long Range Planning Committee and the Regional Affiliates Committee. She previously published a paper in the Ratemaking Call Paper Program: "An Approach to Ratemaking for Self-Insured Workers' Compensation for Both Individuals and Groups" (1994).