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# Agribusiness Reinsurance in Argentina— Actuarial Models for Decision-Making

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## Introduction

**A**gribusiness insurance shows very promising growth potential in Argentina. Reinsurance plays a key role in the development of this type of insurance, being a source of capital for the industry. The ceding companies use reinsurance to finance their activities because of different reasons. These include having a capitalization level below their objective; not wanting to assume a specific type of risk; or the use of their own capital for the activity is not optimal.

Reinsurance will continue to play a very important role in the development of agribusiness insurance. However, retention levels will go on rising, with the increasing experience of ceding companies in this line of business.

In this context, it will be very important for insurance companies to perform technical actuarial analysis to determine optimal retention levels. This analysis should also be useful in negotiations with reinsurers on the terms and conditions applicable to the new reinsurance schemes.

## Reinsurance Strategies

It is necessary that the ceding companies have a clear reinsurance strategy and see reinsurers who participate in their contracts as strategic partners.

Münchener Rück leads most reinsurance contracts in the agribusiness field. This reinsurer normally defines the minimum rates to be charged by the ceding companies. Among the other participating reinsurers one can mention the following: Hannover Rück, Swiss Re, Mapfre Re, Transatlantic Re, Scor, QBE and XL Re.

The insurance companies have both proportional contracts (Quota-Share), which provide a higher underwriting capacity, and non-proportional contracts (Stop Loss), used for protection from deviation in claims experience. A combination of both types is common.

Insurance companies often commence their business operations with Quota-Share contracts with high cession levels (usually combined with Stop Loss contracts). When the Companies' experience increases, retention levels tend to decrease. For example, a company could initially have a 50 percent Quota-Share contract, combined with a Stop Loss contract (protecting its retention) with an 80 percent priority and a 100 percent limit (on the retained premium).



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After a couple of years, the ceding company could decide to increase its retention in the Quota-Share to 75 percent (maintaining the Stop Loss contract), considering it has acquired greater experience in this line of business.

Following that, some years later, the company may consider that it only needs the Stop Loss contract as it already has enough experience and technical capabilities for its development. In addition, at this time, its claims experience may be very predictable.

When a ceding company makes a change in its reinsurance structure, it is advisable to perform technical actuarial analysis of the claims experience, as well as to model all those endogenous and exogenous factors that are relevant to decision making.

### Claims Modeling

In order to make reinsurance-related decisions, the ceding company should determine the aggregate loss distribution through the building of a mathematical model. This model is built by actuaries interacting with agronomists, meteorologists and other professionals in the insurance industry. They take into account both the empirical experience and all those variables that may have a significant impact in claims experience.

The suggested technique for obtaining results is simulation, which allows for solving a complex model with many correlated random variables.

The modeling process requires choosing a statistical distribution (such as Log-Normal; Transformed Gamma; or Burr) fitting the phenomenon under analysis, which should be assessed using a goodness-of-fit test. The parameters of the distribution also need to be properly chosen and tested.

It is important to consider that modeling must be performed for each relevant area and crop. For example, an insurance company could divide its portfolio into five different geographic areas (depending on the associated risk levels) and ten types of insured crops. In said case, there will be 50 probability distribu-

tions that can be combined, in order to have a sole aggregated loss distribution or aggregated distributions for a specific zone or crop.

Both the chosen distributions and the parameters must be tested frequently. For example, considering the “Law of Large Numbers,” the standard deviation of the distribution is expected to decrease as the portfolio size increases.

Another important factor to consider is the existing correlation in claims experience for different areas. This leads to the need for defining different correlation indexes between zones. These influence the aggregate claims experience ‘capturing’ the benefit of diversification for claims experience stabilization. The lower the correlation is, the higher the benefit of portfolio diversification between zones.

### Direct Premiums and their Exogenous Components

As in other lines of business, direct premiums in agribusiness insurance are calculated by multiplying the insured amounts by the premium rates. Premium rates are defined taking into account different variables, such as: the coverage (hail insurance with or without additional; multi-risk insurance); the area in which the insured farm is located; the crops insured and the deductible percentage, among others.

On the other hand, the face amount could be modified by variables not controlled by the ceding company. For example, said amount could be obtained by multiplying the number of sown hectares by the yield (in acres per hectare) and by crop prices (in dollars per acre). Both, the yield and the crop prices, are exogenous variables that the insurance company cannot control.

Those prices will depend on different variables, such as: the existing world stock for each crop relative to its consumption, whether they can be used or not as bio-fuels, the agricultural policies adopted by central countries and the increasing participation of China and India as main actors in the world economy.

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Crop price rises would lead to a proportional increment in the face amount (*ceteris paribus*), which would imply an increase in insurance and reinsurance premiums.

This in turn could result in decreased capitalization levels, which arises from comparing own capital and direct premiums. Consequently there would be an increase in the demand for reinsurance as a source of capital.

### Capitalization Level

The capitalization level is a key variable in making reinsurance-related decisions. For those companies operating in business lines with a very predictable and limited claims experience, the required capital (expressed as a multiple of the insurance premium) could be less than for those which operate in business lines with a more volatile claims experience.

An insurance company will have to define a target capital, depending on its risk aversion. For example, it could decide that its goal is to have a capital level that, with a 99 percent probability, will be sufficient to cover unfavorable claim experiences.

Once the aggregate claims distribution is determined, the need for its own capital to meet said goal could be higher or lower, depending on the structure of the reinsurance contract and the retention levels.

Therefore, a ceding company's decisions in reference to reinsurance will depend on the capital level that the company has to support its growth process. For example, the company's capital could total 150 percent of its premiums. However, considering its risk aversion grade and the aggregated claims distribution, its goal could be to have a capital equaling 200 percent of its premiums.

In this situation, reinsurance presents itself as a solution, being a capital source for financing the activities of the ceding company. Through a convenient reinsurance scheme, the need for own capital could be reduced to the level that the company effectively has available.

### Conclusions

Agribusiness insurance shows very promising growth potential in Argentina. In this context, it is particularly important that insurance companies make wise decisions in reference to such critical aspects of their business as optimal capitalization levels and reinsurance strategies.

We, consultants who specialize in reinsurance, have the responsibility to continue collaborating with our clients in modeling their insurance activity, providing technical actuarial tools. It is vital that these tools be effective for decision-making and for negotiating reinsurance terms and conditions. □