ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO
FUNDAÇÃO GETULIO VARGAS

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REINSURANCE IN BRAZIL:
What happened to prices?

São Paulo
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Dissertação apresentada à Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, como requisito para obtenção do título de Mestre em Administração de Empresas.

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RESUMO

Neste estudo investigamos a mudança no Brasil de um mercado fechado monopolista de resseguros para um mercado aberto. O foco tem sido sobre os prêmios, como a queda nos preços foi um dos benefícios mais antecipados da nova estrutura do mercado. Para comparar os preços de resseguro entre mercados o Índice Combinado foi usado. Ao comparar o Brasil ao Resto do Mundo, Índices Combinados significativamente menores foram observados para 2001 – 2007. No período 2008 – 2010, após a abertura, parece ter sido uma convergência dos Índices Combinados com os níveis no mundo. Confirma que os preços de resseguro eram altos no passado, e que ocorreu uma queda nos preços desde a abertura. No entanto estas conclusões devem ser tratados com alguma precaução uma vez que apenas 2,5 anos de experiência está disponível desde a abertura do mercado e outros fatores podem ter influenciado a evolução dos preços observados.

Palavras-chave: Resseguros, Brasil, abertura do mercado, preço

ABSTRACT

This study investigates the change-over from a closed monopolistic market to an open market for reinsurance in Brazil. The focus has been on premiums, as a price decrease was one of the most anticipated benefits of the new market structure. To compare the price of reinsurance across markets the Combined ratio has been used. When comparing Brazil to the Rest of the World, significantly lower Combined ratios have been observed for 2001 – 2007. In the period 2008 – 2010, after the opening, there seems to have been a convergence of the Combined ratios to world levels. This confirms that reinsurance prices were high in the past, and that a decrease in prices took place since the opening. However these conclusions should be treated with some caution as only 2,5 years of experience is available since the market opening and other factors could have been influencing the observed price development.

Keywords: Reinsurance, Brazil, market opening, price

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1 INTRODUCTION

The aim of this research is to discover to what extent Brazil's insurance market has been affected by the opening of the reinsurance market, which ended the monopoly of the *Instituto de Resseguros do Brasil* (IRB) in 2008. One of the expectations of the ending of the monopoly was an increase in competition resulting in a decrease in price for reinsurance; Vieira (2007), Da Silva et al. (2008), Vairo (2008). With more than 80 reinsurers operating in Brazil by the end of 2010 and various others still contemplating to enter, competition has indeed taken off. But two years since the opening, insurers argue that a decrease in reinsurance prices seems not to materialise; Salum (2010). Other expectations of increased competition included a more sophisticated product offering, because of the expertise that would be brought in by international reinsurance groups, and more demand for reinsurance, because of the lower prices. The latter, lower prices, have been mentioned by many but have so far not been investigated in detail. Therefore to examine what really happened and is happening, the (price) situation before and after the market liberalisation will be compared by using publicly available information inside and outside Brazil.

Before expanding on the aforementioned research topic, a general overview, the (global) reinsurance market and the specific changes in Brazil will be presented.

1.1 What is reinsurance?

Reinsurance is a form of insurance. A reinsurance contract is legally an insurance contract. Reinsurers are the insurance providers to insurance companies. It is a means by which an insurance company can protect itself against the risk of losses. The reinsurer agrees to indemnify the cedant insurer for a specified share of specified types of insurance claims paid by the cedant for a single insurance policy or for a specified set of policies; McIsaac Babbel (1995), Patrik (2001), SwissRE (2002), Gastel (2004).

1.2 Why reinsurance?

The main reason for an insurer to acquire reinsurance is to allow the company to assume greater individual risks than its size would otherwise allow for, and to protect a company against unbearable losses. Other reasons to engage in reinsurance contracts are for example income smoothing (to get less volatile cash flows), surplus relief (to free-up capital in order to continue writing new insurance contracts in case the insurer runs out of capital), arbitrage

("buy cheap, sell high") or expertise, as part of the reinsurance service package includes training and risk assessment assistance for primary insurers.

For many types of insurance, the gap between the time of the accident and the time of the settlement could reach several years. If an insurer is defaulting during that period, policyholders could lose part of their claims. Therefore, the ultimate interest of any policyholder is the continued financial viability of the insurance company. Policyholders usually cannot diversify their risk by using many insurers and they do not perfectly monitor the managers of the insurance companies because it is costly and requires specialized expertise. Furthermore, the potential of large catastrophic losses and the cyclical nature of the insurance business exacerbate the incentives conflict between the different stakeholders; Harrington Niehaus (2000), Weiss (2007). Managing the underwriting (U/W) residual risks through reinsurance purchase could limit large losses and reduce agency costs. Hence, reinsurance reduces insolvency risk by stabilizing loss experience and strengthens the financial viability of insurance firms; Froot (2001), Cummins et al. (2008).

1.3   Global market

Given the benefit of risk diversification, the applicability of the law of large numbers and high values at stake, for example the billion dollar losses related to hurricanes or collapsing oil drilling platforms, the reinsurance industry is highly internationalised with a few big companies dominating the industry. In contrast the Brazilian reinsurance market, until recently, was closed and controlled by the state-owned monopolist IRB.

Consolidation in the 1990s has significantly increased the degree of globalization as well as the market share of the leading reinsurance firms; Cummins Weiss (2000). As can be seen in tables 1 to 6 below, the top 10 of reinsurers currently writes almost 75% of total premiums, the top 5 more than half and the top 2 alone, Munich Re and Swiss Re, represents one-third of the entire market.

Table 1. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2009	2008
1 Munich Re	33.705	29.077
2 Swiss Re	22.897	24.296
3 Hannover Re	13.639	10.196
4 Berkshire Hathaway	12.362	12.123
5 Lloyd's	9.734	6.702
6 SCOR	8.315	7.500
7 RGA	5.725	5.349
8 Transatlantic	3.986	4.108
9 PartnerRe	3.949	3.989
10 Everest Re	3.930	3.505
Total Market	159.729	146.742
Top 10 Market Share	74%	73%
Top 5 Market Share	58%	56%
Top 2 Market Share	35%	36%

Source: S&P Reinsurance Highlights 2010

Table 2. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2008	2007
1 Munich Re	29.077	30.284
2 Swiss Re	24.296	27.707
3 Berkshire Hathaway	12.123	17.398
4 Hannover Re	10.196	10.630
5 SCOR	7.500	7.872
6 Lloyd's	6.702	8.363
7 RGA	5.349	4.907
8 Transatlantic	4.108	3.953
9 PartnerRe	3.989	3.757
10 Everest Re	3.505	3.919
Total Market	147.707	162.067
Top 10 Market Share	72%	73%
Top 5 Market Share	56%	58%
Top 2 Market Share	36%	36%

Source: S&P Reinsurance Highlights 2009

Table 3. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2006	2005
1 Munich Re	25.433	22.603
2 Swiss Re	23.841	20.558
3 Berkshire Hathaway	11.576	10.041
4 Hannover Re	9.354	9.191
5 Lloyd's	8.445	6.567
6 SCOR	4.885	2.692
7 RGA	4.343	3.863
8 Everest Re	3.876	3.972
9 PartnerRe	3.690	3.616
10 Transatlantic	3.633	3.466
Total Market	141.912	130.678
Top 10 Market Share	70%	66%
Top 5 Market Share	55%	53%
Top 2 Market Share	35%	33%

Source: S&P Reinsurance Highlights 2007

Table 4. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2004	2003
1 Munich Re	28.889	29.198
2 Swiss Re	25.780	24.777
3 Berkshire Hathaway	10.580	11.946
4 Hannover Re	10.126	10.242
5 GE	8.173	9.729
6 Lloyd's	7.653	7.818
7 Allianz	5.586	5.226
8 Everest Re	4.532	4.315
9 XL	4.149	3.483
10 PartnerRe	3.853	3.590
Total Market	160.239	156.513
Top 10 Market Share	68%	70%
Top 5 Market Share	52%	55%
Top 2 Market Share	34%	34%

Source: S&P Reinsurance Highlights 2005

Table 5. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2002	2001
1 Munich Re	24.924	16.611
2 Swiss Re	21.600	15.429
3 Berkshire Hathaway	13.083	11.984
4 Hannover Re	8.526	6.287
5 Employers Re	7.892	7.392
6 Lloyd's	6.809	5.746
7 SCOR	4.693	3.651
8 Allianz	4.585	3.119
9 Gerling	4.463	4.408
10 XL	3.544	1.708
Total Market	138.601	103.430
Top 10 Market Share	72%	74%
Top 5 Market Share	55%	56%
Top 2 Market Share	34%	31%

Source: S&P Reinsurance Highlights 2003

Table 6. Reinsurance ranking based on Written Premiums

USD mln	Net Written Premiums	
Company	2001	2000
1 Munich	12.159	10.641
2 Swiss	6.823	5.290
3 Lloyd's	5.746	3.953
4 General	3.684	3.261
5 Allianz	3.119	3.727
6 American	2.762	3.166
7 Hannover	2.539	2.596
8 Gerling-Konzern	2.321	2.015
9 Kölnische	1.980	2.075
10 Employers	1.920	2.227
Total Market	96.808	85.449
Top 10 Market Share	44%	46%
Top 5 Market Share	33%	31%
Top 2 Market Share	20%	19%

Source: S&P Reinsurance Highlights 2002

1.4 Regulation changes in Brazil

The establishment of IRB, *Decreto-Lei nº 1.186* of 3rd of April 1939, resulted in a monopoly over reinsurance, coinsurance and retrocession in Brazil. Before reinsurance was done almost exclusively abroad either directly or indirectly via foreign companies operating in Brazil. IRB was designed to strengthen the nation's insurance companies by maximizing their retention and, given the chronic shortage of capital at that time, to keep reinsurance premiums inside Brazil. On the 21st of November 1966, new regulation, *Decreto-Lei nº 73,* granted IRB the legal powers: to inspect all compulsory and facultative reinsurance in Brazil and abroad; to organize and administrate consortia; to liquidate losses, to distribute the unretained part of insurance amongst the insurance companies; to place the excess risk on the domestic market abroad, and to take out any reinsurance (retrocession) of interest to the country; Vieira (2007). In 1999 a new law, *Lei nº 9.932*, came into force, in which IRB lost several regulating powers and which was considered the first step to the opening of the Brazilian reinsurance market. However the necessary follow-up regulation to end IRB's monopoly was delayed for nearly 10 years.

Finally on 15 January 2007 an amendment to the insurance regulation, *Lei Complementar nº 126*, came into force. This new law outlined the basics for a more open reinsurance market. It gave regulating power to the Brazilian insurance supervisor SUSEP, *Superintendência de Seguros Privados*, decreed that reinsurers are subject to the same regulation as Brazilian insurers and stipulated the three formats under which reinsurers can operate; namely as an Occasional, as an Admitted or as a Local reinsurer. Resolutions 168 till 173, issued by SUSEP, fine-tuned the exact rules that apply to companies that want to engage in reinsurance activities in Brazil. The short version of these resolutions is that the more operational activities take place in Brazil and the more capital is deployed locally, less restrictions apply. An example is the fact that insurance companies are obliged to offer a minimum percentage, currently 40%, of their reinsurance business to Local reinsurers, which in return need to invest locally a minimum of BRL 60 mln. On the other side of the spectrum a company registered as an Occasional reinsurer is not required to deploy any capital in Brazil, nor to establish an office locally, however Brazilian insurers can grant only up to a maximum of 10% of their reinsurance premiums to these Occasional reinsurers.

All in all, the Brazilian market became more open than before, but to state that the market is fully open and free would be an exaggeration. In December 2010 adjustments to the

aforementioned resolutions were announced, effectively limiting competition with the prohibition of inter-group cessation of reinsurance contracts and a 40% mandatory part of reinsurance that needs to be written by local reinsurers. What direction the market will take further remains to be seen.

2   RESEARCH TOPIC

The goal of this paper is to determine the impact on the insurance industry of the change-over from a closed monopolistic reinsurance market to a relatively more open and international market. The focus will be on premiums, as a price decrease was one of the most anticipated benefits of the new market structure, however without much detailed, prior research to substantiate such expectations.

The following basic question will be addressed in this paper:

I.   *Did the ending of the reinsurance monopoly have an effect on the insurance sector in Brazil?*

Because of the potential broadness of above question on one side, and the ability to measure, plus the availability of data on the other side, focus in this paper has been on the aspect of pricing. The outcome of this research makes it possible that a sensible answer to the basic question is at least (partly) attainable.

In case this paper's investigation shows that reinsurance premiums are lower now than under IRB's monopoly, ceteris paribus, the logical conclusion will be that there has been an effect and Brazilian insurers are better off in the new market situation than before. If on the contrary no price level changes were to be found, the anticipated benefits to the market of lower prices are not there, contravening popular belief. In that case effects, if any, need to be looked for in other areas.

Before drawing strong conclusions it is important to keep in mind that although a monopolistic market ceased to exist, the Brazilian reinsurance sector did not change into a fully free and open market. The current market version embeds considerable entry barriers, and various restrictions on non-domestic reinsurers (still) exist, without which there might be an effect on prices, currently not (yet) visible.

To answer the basic question at a satisfactory level, two focussed (sub-)questions can be formulated and should be answered first.

II.   *Were reinsurance prices higher in Brazil in the period 2001-2007 than in the Rest of the World?*

Given economic theory, a.o. Hicks (1935), a monopolist can charge a higher price than

an open market participant where other reinsurers will enter and competitive pressure will force prices to come down. In order to answer the question if prices have come down as a result of a new market order, firstly the old situation needs to be assessed. Similar research for the period after the opening of the market, makes it possible to analyse if there have been changes, or not.

III. Are reinsurance prices similar in Brazil in the period 2008-2010 in comparison to the Rest of the World?

Answering questions II & III will hopefully give a partial answer to the basic question I. But before dealing with these questions, an overview of related literature will be presented in the next chapter.

3   LITERATURE REVIEW

In this section the different aspects of the reinsurance industry in general, and the influence of a reinsurance monopoly on the insurance sector in particular will be discussed. Firstly the influence of a monopoly on prices and the effects of market liberalisations in Brazil will be dealt with, followed by (re-)insurance prices, the influence of so-called underwriting cycles, supply and demand for reinsurance and finally by research on the opening of the reinsurance market.

3.1   Influence of a monopoly on prices

Contrary to a firm operating in a competitive market, a monopolist can charge higher prices and preserve excess profits because barriers to entry prevent competitors from entering the market and eroding margins; Stigler (1982). It is argued that monopolies tend to become less efficient and innovative over time as well, because they do not have to be efficient or innovative to compete in the marketplace. Other effects might be discriminated selling practices, in the sense that for different customers different products are offered and/or different prices charged, as has been demonstrated for insurance markets; Stiglitz (1977).

3.2   Effects of market liberalisation in Brazil

Amann Baer (2007) finds a clear association between the opening up of particular sectors and positive alterations in productivity in Brazil during the recent era of liberalization, notably in the 1990s. However, this relationship does not hold good in all sectors. In the case of textiles and electrical / communications equipment, for example, productivity change is actually negative despite a substantial opening up of those sectors to external competition. Aside from driving up productivity, another response to import competition could be seen through innovation, either in new products or technologies.

In many sectors liberalisation has been accompanied by privatization. So far this has not been the case for reinsurance and IRB, despite that Anuatti et al. (2003) confirmed previous findings that Brazilian firms become more efficient after privatization.

3.3   Insurance price

The price of insurance can be defined as the ratio of premiums to (discounted) losses.

However premiums are not necessarily unbiased predictors of expected losses, as the arbitrage theory suggests, but rather that the difference between premiums and expected losses is inversely related to the stock of financial capital. Thus, prices / premiums are predicted to be relatively low when capital is high and high when capital is low; Cummins Danzon (1997). Unfortunately trends in the price of insurance, defined as the loading or ratio or premium to expected losses for a given policy, cannot be directly measured from insurance accounting statements, which report aggregate premiums, price times quantity; Winter (1994). For comparing reinsurance prices between markets, in stead of comparing prices over time, this will be less of an issue, because the reinsurance market is considered to be truly global and therefore any capacity restrictions will be spread over all markets, not affecting price comparability between markets.

3.4 Reinsurance price

In insurance circles it is generally assumed that there exists a well defined reinsurance market price, at least for some particular forms of reinsurance. It is also said that Lloyd's in London is willing to quote a price for any kind of reinsurance cover. In real life, reinsurance treaties are concluded after lengthy negotiations, often with brokers acting as intermediaries. The concept of prevailing market prices plays a part in the background of these negotiations, but the whole situation is more similar to an n-person game than to a classical market with utility maximization when the price is considered as given; Borch (1962).

Transferring risk to reinsurers can be expensive. In an examination of the catastrophe reinsurance market, Froot (2001) finds that insurers pay several times the actuarial price of the risk transferred. The high price of reinsurance relative to expected losses could be explained by the combinations of many factors affecting the reinsurance market equilibrium. The shortage of capital in reinsurance and the resulting capacity shortfall drive-up the price of reinsurance, especially following large losses. The agency problems that reinsurers face, due to shareholder - manager incentives conflict and the lack of transparency, increase the costs of reinsurance capital and consequently increase reinsurance prices. Furthermore, it seems that reinsurers' market power has intensified over time with the increase in the capital and market shares of large reinsurers; Cummins Weiss (2000), Cummins et al. (2008).

Insurers and reinsurers are concerned with risk management and capital allocation. Managers perceive that the Modigliani Miller (1958) irrelevance theorems fail and, therefore,

see that risk management can raise value. This provides another possible explanation for why reinsurance prices are high relative to expected loss, and for why prices rise and quantities of reinsurance supplied fall in the aftermath of large event losses; Froot (2003).

Because of coverage definition and interpretation of loss and exposure statistics, the degree of risk relative to premium volume is usually much greater for reinsurance than for primary insurance. Additional pricing risk arises from the low claim frequency and high severity nature of many reinsurance coverages, from long delays between occurrence, reporting and settlement of many covered loss events, and also from the leveraged effect of inflation upon excess claims. Therefore for some reinsurance covers, the higher moments, or at least the underwriter and/or actuary's beliefs regarding uncertainty and fluctuation potential, determine the technical rate and not solely expected losses; Patrik (2001).

Another line of thinking, as examined in Jean-Baptiste Santomero (2000), is the role of reinsurance relationships in the trading of underwriting risk when this trade actually takes place in an environment that is characterized by asymmetric information and in which information is revealed only over time. Information problems affect the efficiency of the allocation of risk between insurer and reinsurer, and long-term implicit contracts between insurers and reinsurers allow the inclusion of new information in the pricing of both future and past reinsurance coverage. Because of these features, the ceding company purchases a more efficient quantity of reinsurance over time at a price closer to its own risk profile.

3.5 Underwriting cycles

One area where there has been quite some research on insurance prices is on a phenomenon known as underwriting cycles. Particularly property and liability insurance markets alternate between hard and soft markets; Cummins Danzon (1997). In soft markets, U/W standards are relaxed, prices and profits are low, and the quantity of insurance increases. In hard markets U/W standards become restrictive and prices and profits increase, resulting in an U/W cycle. Underwriting cycles are unexpected in a structurally competitive industry where financial capital is the major determinant of output capacity; Cummins Outreville (1987), Meier Outreville (2003). Arbitrage theories explain U/W cycles as largely an artefact of institutional lags and reporting practices. Capacity-constraint theories view insurance markets as characterized by real frictions that cause U/W cycles by temporarily reducing the industry's capacity to insure risks. Arbitrage theories imply no systematic relationship between capacity

and U/W margins, while capacity-constraint hypotheses predict a negative relationship; Gron (1994). Under the assumption that insured risks are dependent, insurers′ net worth determines the market capacity, since it is necessary to back contractual promises to pay claims. And secondly, raising net worth by attracting external equity is more costly than internal equity via the retention of profits; Winter (1994), Besson et al. (2009). This could explain the variation in premiums and insurance contracts over the U/W cycle. Changes in the cycle, especially from a soft to a hard market, can be sudden and severe enough that these are referred to as liability crises; Choi et al. (2002).

3.6   Demand for reinsurance

Blazenko (1986) introduces a theoretical framework to analyse the demand for reinsurance under several market conditions, amongst others a market with a monopolistic reinsurer. It predicts, that in contrast to the perfectly competitive market the risk in a monopolistic market is not completely spread amongst insurers and reinsurers. Therefore in order to maximize profits, it is in the interest of the reinsurer to restrict the use of reinsurance and charge higher premiums.

The demand-induced theory of reinsurance is consistent with the capital market equilibrium in a mean-variance world. This theory explains why reinsurance is compatible with the share price maximisation objective of the insurance companies. More importantly, it implies that even in the absence of regulations designed to protect policyholders' interests, there is sufficient motivation on the part of insurance companies to spread risks through reinsurance; Doherty Tinic (1981).

In long-run equilibrium (and perfect capital markets), the supply of reinsurance capital should be completely elastic. Thus loss shocks that deplete reinsurer capital should have no impact on the supply of reinsurance, reinsurers would just raise additional capital in the equity market. In the short run, however, financial market imperfections may make it costly to issue capital after a catastrophe or loss shock; Winter (1994), Gron (1994). As a result, prices would increase and quantities decline after a loss shock that reduces reinsurer capital below the long-run equilibrium level; Weiss Chung (2004).

Many reinsurance demand studies, a.o. Mayers Smith (1990), Garven Louberge (1996), Jean-Baptiste Santomero (2000), Garven Tennant (2003), Cummins et al. (2008), Carneiro Sherris (2009), consider that insurers purchase reinsurance for the same reasons that

motivate firms in other industries to purchase insurance or to actively manage their risks: limiting the expected costs of financial distress, stabilizing sources of funding, decreasing expected taxes by exploiting the convex structure of the tax code and gaining comparative advantages in real services production, or just simply maximizing expected utility.

Examination of reinsurance purchases by Property & Casualty insurance companies provides evidence on the effects of ownership structure, size, geographic concentration and line-of-business concentration on the demand for reinsurance, Mayers Smith (1990).

Shortridge Avila (2004) demonstrate that the utilization of reinsurance decreases as the level of institutional ownership increases. Institutional investors hold well-diversified investment portfolios, and therefore prefer insurers to minimize the utilization of reinsurance. This suggests that the diversification of the owners' portfolios is a determinant of the insurers' reinsurance decisions.

3.7   Supply of reinsurance

Just creating the opportunity does not imply that international reinsurers would be motivated to enter the Brazilian market. However they did so in large numbers, demonstrated by the more than 80 reinsurers that have registered with SUSEP since the opening of the market. Cole et al. (2007) examined the decision of U.S. reinsurers to internationalise. While some firm-specific factors do affect the amount of foreign reinsurance assumed, location specific factors are significant for the decision to enter. Especially the size of the market and the loss experience in the foreign market impact the amount of reinsurance to assume from particular countries. In the case of Brazil both factors are considered favourable. Additionally, Cole et al. (2008) found that the condition of the U.S. reinsurance industry as a whole can impact the decision and ability of U.S. reinsurers to do business in foreign markets. This effect might have influenced reinsurance groups' willingness to deploy capital and write reinsurance business in Brazil for the crisis years 2008 – 2009.

3.8   Opening of the Brazilian reinsurance market

Vieira (2007) contains an analysis of the effects of the opening of the Brazilian reinsurance market. It forecasts a more than 200% leap in demand for reinsurance over three years and an increase of some 40% in direct insurance revenues in the same period. The major assumption

underlying the expected increases in the use of reinsurance is a decrease in price. Also Da Silva et al. (2008) assumes a price decrease as the driver for volume increase. Salum (2010) notes that a price decrease seems not to have materialised in the last 2 years. In this paper the aforementioned assumption and subsequent observation will be empirically investigated.

4   METHODOLOGY

In this chapter the used methodology to answer the research questions is explained in detail; firstly reinsurance prices in general, than how to get representative prices for Brazil versus the Rest of the World (RoW), and finally the limitations of the chosen methodology.

To compare the price of reinsurance across markets and companies a commonly used ratio is proposed to serve as a proxy for charged price levels: the Combined ratio and its two underlying components Loss ratio and Expense ratio.

4.1   Loss ratio

The Loss ratio is an indication of how much of premiums are eventually returned to customers in the form of claim payments. It represents the (pure) risk premium charged by reinsurers to insurers. The denominator, Earned premium, is income for which the insurer already bore the risk. As it is common practice that premiums are paid before policies become active, premiums are initially reserved and than released over time to become earned. In the nominator of the Loss ratio are the Incurred losses. This number is a result of paid out claims plus reserve additions for claims that will have to be paid out in the future, minus reserve releases linked to claims currently paid out. In essence Incurred losses are the insurer's best guess of its (future) claims, adjusted for actual loss experience, for the risk it runs and for which premium has been received.

Without competition you expect the Loss ratio to be lower in a monopolistic market than in a competitive market, because it will be possible to charge more premium per risk unit or provide less risk per premium unit.

4.2   Expense ratio

The Expense ratio indicates the efficiency of the operations. How much of earned premium is used to cover the expenses of the company. Expenses are defined as all costs of the insurance operation, without the benefit payments, i.e. claims, to customers.

In absence of competitive pressures, and with the ability to pass on costs to customers, you could expect that expenses will be higher in a monopolistic market environment. Therefore higher Expense ratios are an indication for less efficient operations and subsequently higher prices for customers. A simple analysis of the number of employees

compared to gross written premiums illustrates the concept. IRB for example had 545 employees at the end of 2009 versus 3,969 for Munich RE, around 7 times as much, but GWP was around 17 times as much for Munich RE.

Table 7. Definitions of ratios

$$Combined\ ratio\ =\ Loss\ ratio\ +\ Expense\ ratio$$

$$Loss\ ratio\ =\ \frac{Incurred\ losses}{Earned\ premium}$$

$$Expense\ ratio\ =\ \frac{Expenses}{Earned\ premium}$$

Earned premium	=	*Total net premiums, that have been earned based on the ratio of time passed to their effective duration of the underlying policies. Net implies exclusive of the part of premiums ceded to reinsurance.*
Incurred losses	=	*Insurance claims paid during the year, plus loss reserves existing at the end of the year, minus loss reserves existing at the beginning of the year.*
Expenses	=	*The cost of operating the insurance business exclusive of losses.*

4.3 Combined ratio

The Combined ratio provides insight in how well a (re-)insurance company, and in aggregate, how an entire market is doing. Highly simplified you could argue that if the ratio is above 100% more cash leaves the insurer / market, via losses and expenses, than it enters the sector via premiums. However in practice above 100% ratios, also referred to as making an operational loss, are not unusual, because of the positive effect of investment income. Generally premiums are collected before claims are paid out and the difference in timing can be considerable, even stretch for many years, in which the insurer receives investment income on the accumulated assets, compensating operating losses sufficiently if all goes well.

In the table below an, ex-ante, explanation for the various Loss / Expense ratio outcome possibilities is presented.

Table 8. The explanation for the anticipated different Loss and Expense ratio outcomes of the comparison between the figures for Brazil and those for the Rest of the World.

	Loss ratios' comparison		
Subsequent Expense ratio comparison	*Higher Loss ratio (= lower pure risk prices)*	*No delta (= equal pure risk prices)*	*Lower Loss ratio (= higher pure risk prices)*
Higher Expense ratio (= lower price loadings)	Conclusion will depend on the magnitude of both ratios => compare Combined ratios	BR reinsurance was either inefficiently managed or generated more profit, both resulting in higher reinsurance prices	BR reinsurance was either inefficiently managed or generated more profit, both resulting in even higher reinsurance prices
No Delta (= equal price loadings)	BR reinsurance was either efficiently managed or generated less profit, both resulting in lower reinsurance prices	There was no difference between reinsurance prices in BR compared to the RoW	
Lower Expense ratio (= higher price loadings)		BR reinsurance was either efficiently managed or generated less profit, both resulting in lower reinsurance prices	Conclusion will depend on the magnitude of both ratios => compare Combined ratios

The expectation is that reinsurance prices were high in Brazil prior to opening, and that these would come down afterwards. The causes for expected higher prices would be over-pricing of risk and operational inefficiency, both caused by the monopolistic market structure. The expected results are therefore that Loss ratios were lower and Expense ratios were higher pre-liberalization in Brazil, from 2001 to 2007, and that there will be no significant differences for the years thereafter.

4.4   Brazil versus the Rest of the World

One of the advantages of a monopoly is that data from one company immediately represents the entire market, but to determine ratios for the rest of the world, arguably an oligopolistic market, proves more cumbersome. Individual data for the various reinsurers is available, and given the truly globalised character of the industry and the high concentration of the market, the approach in this paper is to take the ratios for the largest reinsurers, apply an appropriate weighting, based on premium volume in this case, and take the weighted average as a representation for the world price of reinsurance.

4.5   Limitations

The use of the above described price ratios makes only sense for Property & Casualty

(re-)insurance. For life insurance, and to a lesser extent for health insurance, these ratios are not appropriate because of the significance of an asset accumulation element in and the multi-year character of the underlying policies. Therefore the scope of this paper to test the influence of the opening of the market is limited to P&C (re-)insurance only.

The global P&C reinsurance industry is characterised by irregular large disasters, which let the Loss ratio fluctuate from one year to the next, sometimes substantially. With the alleged absence of large insured (natural) disasters in Brazil, at least until a few years ago, or the contrary with such a disaster occurring in Brazil, the comparison of the Loss ratio might be distorted. Fortunately a substantial part of the available data on Loss ratios makes a distinction between regular losses and irregular large losses, by which we can adjust the comparisons to eliminate this effect.

5   DATA BASE

In this chapter the data that have been used to test if there were any reinsurance price effects will be presented.

5.1   Brazil

Data for the Brazilian market up to 2007 can be extracted from the annual reports of IRB. The calculated Combined, Expense and Loss ratios are essentially the market averages of all rates individually charged to the various insurers. For the years 2008 – 2010, information from the new reinsurance entrants was added to get the required market numbers for Brazil for this period as well.

All insurance and reinsurance companies supervised by SUSEP are required to report their financial position on a monthly basis. SUSEP makes most information on-line available. This database has been used to supplement missing data, whenever required and possible.

5.2   Rest of the World

As the global reinsurance market is very concentrated, taking data from the 5 to 10 largest reinsurers will give a good proxy for the international market price. All these larger companies publish their annual reports in which (most of) the required information can be found. The goal was to get a market representation of 50 to 70%, depending on the year under observation and the availability of information for the underlying reinsurance companies. In practice for older years less information was readily available; and for some large reinsurers, notably Berkshire Hathaway, it proofed nearly impossible to subtract the required information from publicly accessible sources, as their consolidated numbers did not discriminate between direct insurance and reinsurance business. Also market concentration increased over time, implying that a similar absolute number of reinsurers, represented a smaller market share the further you go back in time.

Figure 1. Percentage of the total reinsurance market (RoW) included in the database for the comparison calculations of the overall Combined ratios and the Combined ratios excluding Catastrophe losses.
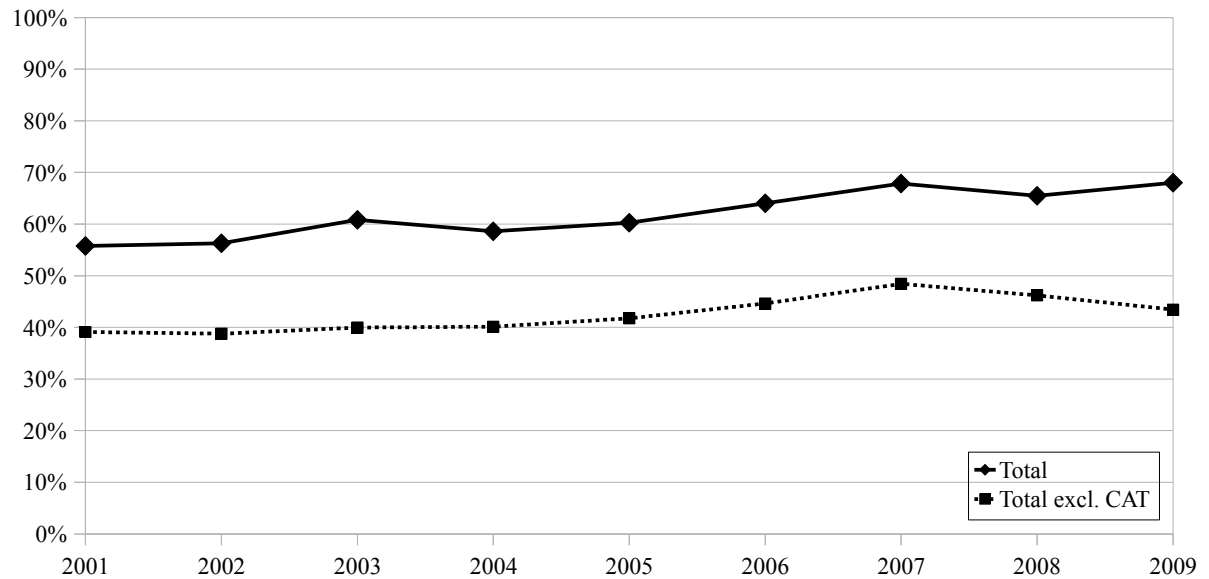
source: S&P Reinsurance Highlights

5.3 Large losses

Fortunately many reinsurers are well aware of the importance of disclosing information on catastrophes and therefore publish separate figures for losses incurred during ordinary course of business and those caused by extreme events, like for example 9/11, large oil spills, hurricanes and earthquakes. Large single losses are not uniformly defined by the reinsurance industry but those that disclose this information define these generally as above USD 5mln to EUR 10mln (natural) disasters. Fully aware that complete comparability is lost by non-uniformity of the used definitions, the adjusted results should give an indication of what factually happened, as the idea of this research is to identify price trends and discover the general price picture, and not the exact number differences between Brazil and the rest of the world.

6   RESULTS

Using the data described in the previous chapter the Loss, Expense and Combined ratios have been calculated and results have been compared. Loss ratios in Brazil were considerably lower and Expense ratios were slightly higher before 2008. Therefore it appears that reinsurance prices were indeed higher in Brazil in the period 2001 – 2007, prior to opening of the market, than elsewhere. This would be in line with the expectation for a monopolistic market. For the period thereafter no difference seems apparent, though it should be noted that the number of observations for this period is limited. In the paragraphs below the various calculations and comparisons will be presented in more detail.

6.1   Loss ratio

The Loss ratios in Brazil were significantly lower than those in the rest of the world in the period 2001 – 2007, for all observed years. The largest difference of more than 50% occurred in 2005, a year in which the ratio appeared exceptionally low in Brazil and high in the world. The smallest difference of 8% was noted in 2002 were Loss ratios were high in Brazil and relatively high in the rest of the world as well. The standardised average difference over the observed period, using the world Loss ratio as base, was 32,1%, implying that Brazilian insurers, grosso modo, paid a bit above 30% more than its pears in other countries for pure risk coverage under the purchased reinsurance programs.

For the period after the opening there seems to have been a convergence of the Loss ratios in Brazil to world market levels, and maybe even a (small) tendency to be higher, implying lower prices for insurers. That would not be a surprise with many new entrants trying to establish a position in the market on one side and a defending former monopolist on the other side.

Table 9. Overall comparison between Brazil and the Rest of the World. Loss ratio is defined as Net incurred losses over Net earned premiums. Weighted average is based on premium volume. For RoW the Berkshire Hathaway numbers are represented by GenRe and Koln Ruck when available; and RGA has been left out as it only deals with life reinsurance. For Brazil IRB represents the entire market till 2008, thereafter Others is the premium weighted average of the rest of the Local Reinsurers (Munich Re Brasil, Mapfre Re, XL Re & J.Malucelli Re). A paired t test establishes the likelihood that BR Loss ratios are lower than for RoW for the period 2001 – 2007. (n/a: not available)

| Loss ratio | weighted average | | | Brazil | | RoW | | | | | | | |
year	Brazil	RoW	delta	IRB	Others	Munich Re	Swiss Re	GenRe/Koln	Hannover	SCOR	Lloyd's	Transatlantic	PartnerRe
2001	69,1%	99,0%	-29,9%	69,1%	-	104,5%	95,0%	92,0%	93,5%	106,8%	n/a	87,2%	101,2%
2002	77,1%	85,4%	-8,3%	77,1%	-	95,8%	77,0%	89,0%	77,7%	87,2%	n/a	75,8%	70,4%
2003	39,4%	71,4%	-32,0%	39,4%	-	69,6%	72,7%	78,0%	85,1%	94,7%	56,3%	70,4%	65,7%
2004	47,0%	70,8%	-23,8%	47,0%	-	71,0%	72,7%	73,0%	76,1%	69,4%	62,6%	75,3%	65,7%
2005	37,1%	88,5%	-51,4%	37,1%	-	83,5%	89,3%	63,0%	89,4%	73,8%	104,1%	85,0%	87,3%
2006	49,2%	62,3%	-13,1%	49,2%	-	64,7%	63,2%	64,0%	73,7%	67,0%	46,8%	68,3%	54,8%
2007	46,1%	63,1%	-17,0%	46,1%	-	67,9%	61,9%	73,2%	74,7%	68,0%	47,7%	67,6%	50,8%
Opening of BR Reinsurance Market													
2008	75,7%	66,8%	8,9%	76,3%	60,0%	69,6%	68,9%	64,4%	70,8%	70,5%	53,8%	71,5%	63,9%
2009	62,9%	61,0%	1,9%	61,8%	71,3%	65,7%	60,5%	n/a	72,8%	68,0%	43,4%	66,3%	52,7%
2010 H1	76,8%	75,7%	1,1%	82,8%	55,5%	76,2%	78,1%	n/a	74,3%	74,5%	n/a	73,1%	73,9%

			t-value	p-value
Years 2001 – 2007:			-5,3721	0,9991
Years 2008 – 2010:			1,6009	0,8747

source: Annual Reports, SUSEP, S&P Reinsurance Highlights

In above table weighted averages are compared. For better understanding of the underlying data the individual company Loss ratios have been plotted in a graph as well. As can be observed below, not only Brazil's, i.e. IRB's, Loss ratio is significantly lower than the world average in the pre-opening period, but it was actually lower than almost all observations for all assessed companies, bare a few. This would underline the idea that IRB was able to charge a premium over the risk it was accepting probably because of its monopolistic position.

Figure 2. Loss ratios over the period 2001 –2010 (first 6 months), for the largest global reinsurers, IRB and the weighted market averages for Brazil and RoW.
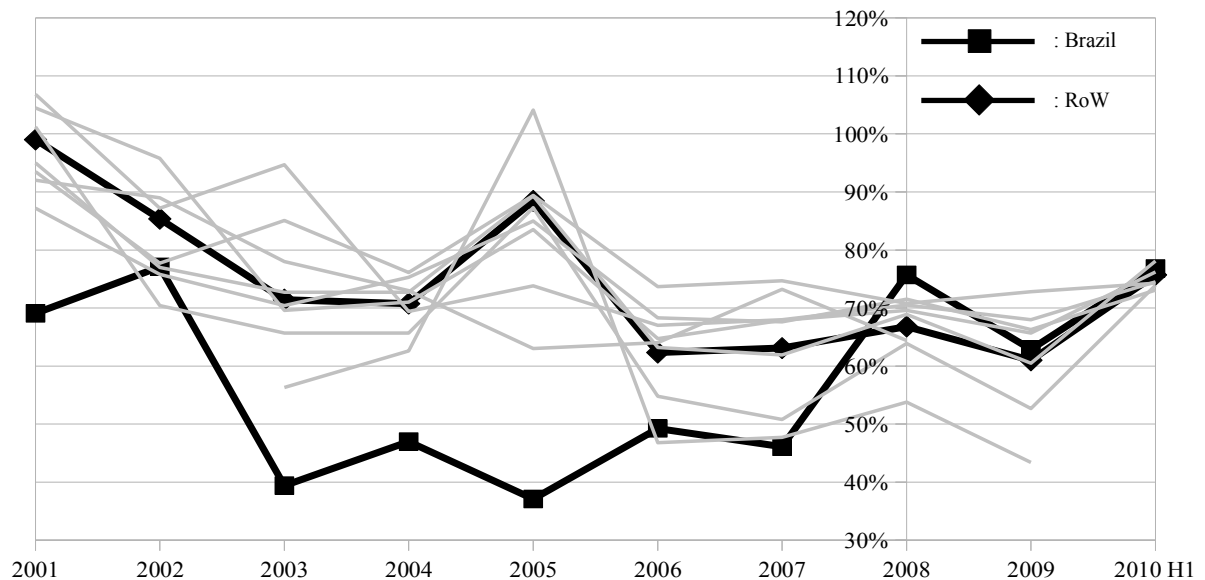
source: Annual Reports, SUSEP, S&P Reinsurance Highlights

6.2 Expense ratio

The development of the Expense ratio shows a more diffuse picture, where Brazilian ratios prior to the opening of the market did not statistically differ from those seen in the rest of the world. Both hoovered around a ratio of 28%, with a slightly higher amplitude for the Brazilian numbers.

After 2007 the Brazilian Expense ratios appear to be higher than in the rest of the world. It is hard to distinguish if this is the result of a denominator effect, meaning that the ratio has gone up because of lower prices. Or this has been caused by a nominator effect, i.e. costs have gone up for the sector because for example the new entrants are investing heavily to establish a market position and IRB is on a spending spree to protect its dominant position?

Table 10. Overall comparison between Brazil and the Rest of the World. Expense ratio is defined as Net expenses over Net earned premiums. Weighted average is based on premium volume. For RoW the Berkshire Hathaway numbers are represented by GenRe and Koln Ruck when available; and RGA has been left out as it only deals with life reinsurance. For Brazil IRB represents the entire market till 2008, thereafter Others is the premium weighted average of the rest of the Local Reinsurers (Munich Re Brasil, Mapfre Re, XL Re & J.Malucelli Re). A paired t test establishes the likelihood that BR Expense ratios are higher than for RoW for the period 2001 – 2007. (n/a: not available)

Expense ratio	weighted average				Brazil		RoW							
year	Brazil	RoW	delta		IRB	Others	Munich Re	Swiss Re	GenRe/Koln	Hannover	SCOR	Lloyd's	Transatlantic	PartnerRe
2001	31,5%	29,1%	2,4%		31,5%	-	30,6%	29,0%	31,7%	22,6%	32,8%	36,0%	27,7%	29,0%
2002	32,0%	26,0%	6,0%		32,0%	-	26,6%	27,1%	31,8%	18,5%	28,0%	36,0%	26,5%	27,5%
2003	22,6%	25,9%	-3,3%		22,6%	-	27,1%	25,7%	29,5%	10,9%	26,6%	33,0%	26,1%	27,7%
2004	25,0%	27,1%	-2,1%		25,0%	-	27,9%	24,5%	30,7%	21,1%	32,4%	32,0%	26,2%	28,9%
2005	28,2%	27,5%	0,7%		28,2%	-	28,2%	24,8%	32,3%	23,3%	32,7%	31,0%	27,2%	29,0%
2006	29,2%	29,0%	0,2%		29,2%	-	27,9%	27,3%	33,6%	27,8%	29,4%	34,0%	27,6%	29,6%
2007	28,5%	29,2%	-0,7%		28,5%	-	28,5%	28,2%	32,4%	25,9%	29,3%	34,0%	27,6%	29,6%
Opening of BR Reinsurance Market														
2008	34,3%	28,9%	5,4%		34,3%	34,5%	29,8%	29,0%	33,2%	24,9%	28,1%	30,0%	27,1%	30,2%
2009	29,5%	29,6%	-0,1%		28,3%	38,5%	29,6%	27,8%	n/a	24,5%	30,8%	35,0%	27,2%	29,1%
2010 H1	44,5%	28,7%	15,8%		45,4%	41,5%	30,2%	27,8%	n/a	25,5%	29,4%	n/a	28,7%	29,9%
			t-value	*p-value*										
	Years 2001 – 2007:		*0,3719*	*0,6386*										
	Years 2008 – 2010:		*1,5071*	*0,8646*										

source: Annual Reports, SUSEP, S&P Reinsurance Highlights

As for the Loss ratios, the individual Expense ratios have been plotted in a graph below. As was shown in the statistical analysis, there was no clear difference between the Expense ratios observed in Brazil with those in the rest of the world prior to 2007, but thereafter there seems to have occurred an increase in Brazil.

Figure 3. Expense ratios over the period 2001 – 2010 (first 6 months), for the largest global reinsurers, IRB and the weighted market averages for Brazil and RoW.
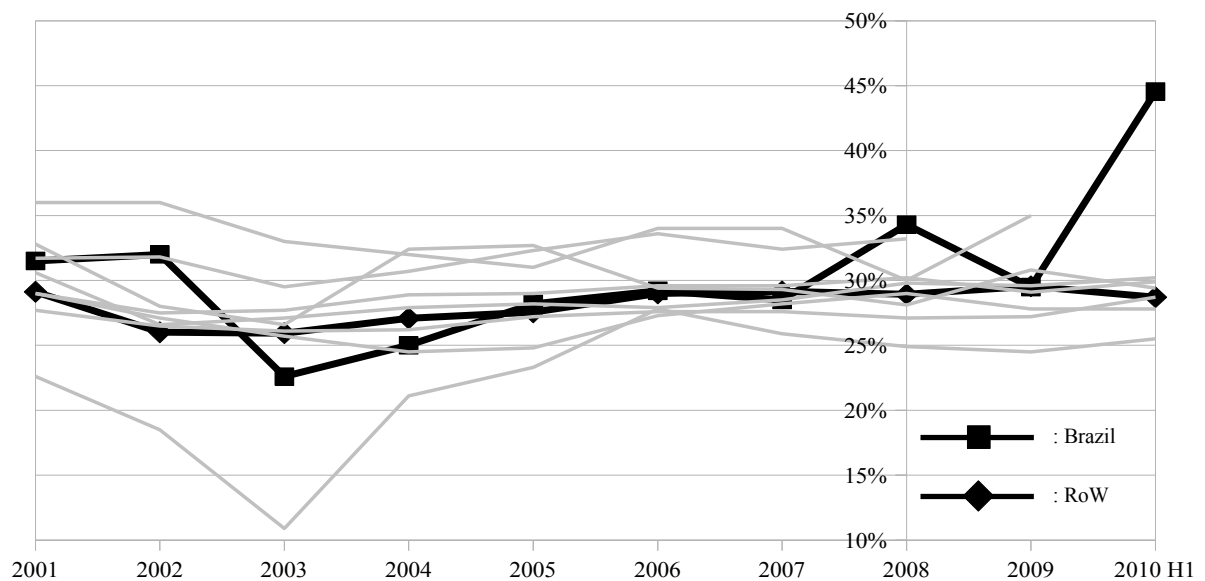
source: Annual Reports, SUSEP, S&P Reinsurance Highlights

6.3 Combined ratio

Given the high significance of lower Loss ratios in Brazil and comparable Expense ratios, almost naturally the Combined ratio has been significantly lower than in the Rest of the World for the period 2001 – 2007.

For the period after the opening there seems to have been a convergence of the Combined ratios in Brazil to world market levels. This would confirm what sometimes can be heard in the market, that IRB is trying to protect its position, by matching competitor's prices and / or offering better prices, at substantially lower levels than in the past. However with only 2,5 years of experience it is too early to draw statistically significant conclusions on these observations.

Table 11. Overall comparison between Brazil and the Rest of the World. Combined ratio is defined as Loss ratio plus Expense ratio. For Brazil IRB represents the entire market till 2008, thereafter Others is the premium weighted average of the rest of the Local Reinsurers (Munich Re Brasil, Mapfre Re, XL Re & J.Malucelli Re). A paired t test establishes the likelihood that BR Combined ratios are lower than for RoW for the period 2001 – 2007. (n/a: not available)

Combined ratio	weighted average			Brazil		RoW							
year	Brazil	RoW	delta	IRB	Others	Munich Re	Swiss Re	GenRe/Koln	Hannover	SCOR	Lloyd's	Transatlantic	PartnerRe
2001	100,6%	128,1%	-27,5%	100,6%	-	135,1%	124,0%	123,7%	116,1%	139,6%	n/a	114,9%	130,2%
2002	109,1%	111,4%	-2,3%	109,1%	-	122,4%	104,1%	120,8%	96,3%	115,2%	n/a	102,3%	97,9%
2003	62,0%	97,4%	-35,4%	62,0%	-	96,7%	98,4%	107,5%	96,0%	121,3%	89,3%	96,5%	93,4%
2004	72,0%	97,8%	-25,9%	71,9%	-	98,9%	97,2%	103,7%	97,2%	101,8%	94,6%	101,5%	94,6%
2005	65,3%	116,0%	-50,7%	65,3%	-	111,7%	114,1%	95,3%	112,8%	106,5%	135,1%	112,2%	116,3%
2006	78,4%	91,3%	-12,9%	78,4%	-	92,6%	90,5%	97,6%	101,5%	96,4%	80,8%	95,9%	84,4%
2007	74,6%	92,3%	-17,7%	74,6%	-	96,4%	90,1%	105,5%	100,6%	97,3%	81,7%	95,2%	80,4%
Opening of BR Reinsurance Market													
2008	110,0%	95,7%	14,3%	110,5%	94,5%	99,4%	97,9%	97,6%	95,7%	98,6%	83,8%	98,6%	94,1%
2009	92,4%	90,5%	1,8%	90,1%	109,7%	95,3%	88,3%	90,6%	97,3%	98,8%	78,4%	93,5%	81,8%
2010 H1	121,3%	104,4%	16,9%	128,2%	97,0%	106,4%	105,9%	n/a	99,8%	103,9%	n/a	101,8%	103,8%

	t-value	*p-value*
Years 2001 – 2007:	*-4,4513*	*0,9978*
Years 2008 – 2010:	*2,4407*	*0,9326*

source: Annual Reports, SUSEP, S&P Reinsurance Highlights

The graph below with the individual Combined ratios plotted against the averages of Brazil and the world confirms the earlier observation that prior to 2008 the Combined ratios in Brazil were lower. Therefore we can conclude that prices were higher for Brazilian insurers than for their peers in other jurisdictions. The picture seems to be straightened out after the opening and insurers are getting a better price for their reinsurance purchases. However it can not be emphasised sufficiently that these better prices do not necessarily mean that the absolute prices are lower from one year to the other for the individual insurer, but merely that these are better for the entire market in comparison to what insurers pay in other countries' markets.

Figure 4. Combined ratios over the period 2001 – 2010 (first 6 months), for the largest global reinsurers, IRB and the weighted market averages for Brazil and RoW.
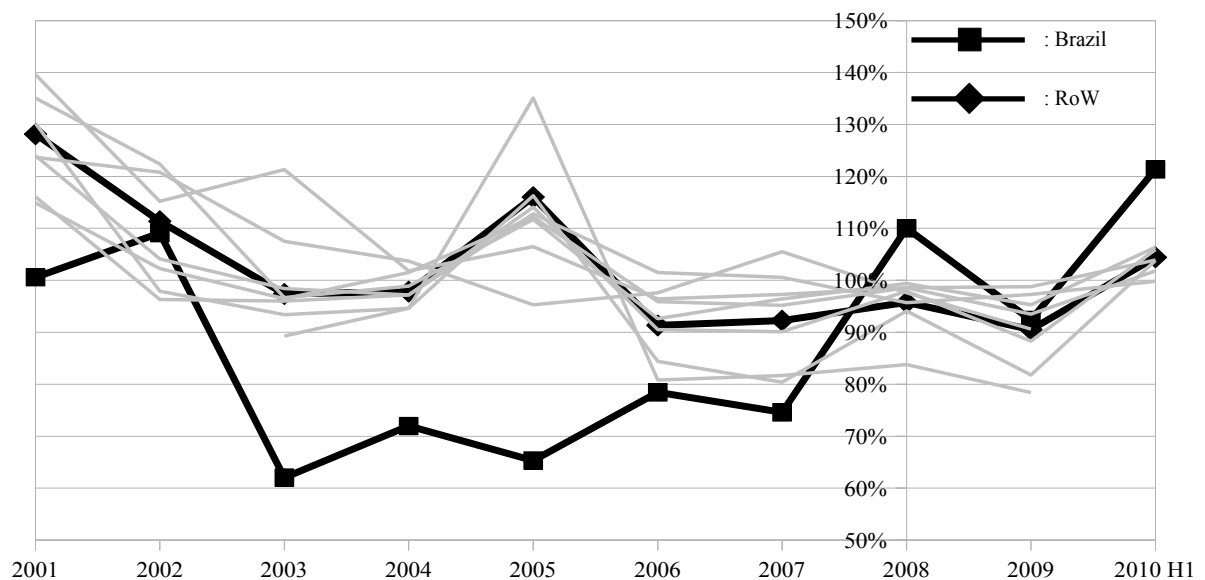
source: Annual Reports, SUSEP, S&P Reinsurance Highlights

6.4 Ratios adjusted for catastrophe losses

As one of the elements that would distort a reinsurance price comparison between countries, large and exceptional losses spring to mind. Fortunately many reinsurers are well aware of the importance of this information and disclose separate figures for losses caused by ordinary business and those caused by extreme events. In this paragraph the Loss and Combined ratios have been adjusted for these large single losses.

Table 12. Comparison between Brazil and the Rest of the World, where Catastrophe losses are excluded. Loss ratio is defined as Net incurred losses over Net earned premiums. Weighted average is based on premium volume. For RoW the Berkshire Hathaway numbers are represented by GenRe and Koln Ruck when available; and RGA has been left out as it only deals with life reinsurance. For Brazil IRB represents the entire market till 2008, thereafter Others is the premium weighted average of the rest of the Local Reinsurers (Munich Re Brasil, Mapfre Re, XL Re & J.Malucelli Re). A paired t test establishes the likelihood that BR Loss ratios are lower than for RoW for the period 2001 – 2007. (n/a: not available)

Loss ratio, excl. CAT	weighted average			Brazil		RoW							
year	Brazil	RoW	delta	IRB	Others	Munich Re	Swiss Re	GenRe/Koln	Hannover	SCOR	Lloyd's	Transatlantic	PartnerRe
2001	69,1%	79,2%	-10,1%	69,1%	-	78,7%	n/a	92,0%	70,5%	99,8%	n/a	71,8%	n/a
2002	77,1%	76,1%	1,0%	77,1%	-	75,3%	n/a	84,3%	72,5%	84,2%	n/a	75,8%	n/a
2003	39,4%	68,5%	-29,1%	39,4%	-	67,9%	n/a	78,0%	83,6%	n/a	55,1%	70,4%	n/a
2004	47,0%	63,9%	-17,0%	47,0%	-	66,0%	n/a	73,0%	67,8%	67,0%	51,3%	69,4%	n/a
2005	37,1%	66,4%	-29,3%	37,1%	-	64,3%	n/a	61,0%	63,1%	60,0%	73,3%	68,9%	n/a
2006	49,2%	61,6%	-12,3%	49,2%	-	63,7%	n/a	63,4%	71,4%	67,0%	46,4%	67,5%	n/a
2007	46,1%	59,8%	-13,7%	46,1%	-	63,2%	n/a	63,4%	68,4%	65,5%	43,9%	64,2%	n/a
Opening of BR Reinsurance Market													
2008	75,7%	58,3%	17,5%	76,3%	60,0%	63,4%	n/a	58,1%	60,1%	63,9%	41,1%	67,1%	n/a
2009	62,9%	59,3%	3,5%	61,8%	71,3%	64,3%	n/a	n/a	68,2%	62,9%	41,3%	66,3%	n/a
2010 H1	76,8%	64,5%	12,3%	82,8%	55,5%	63,4%	71,1%	n/a	58,9%	61,4%	n/a	65,1%	n/a
		t-value		*p-value*									
Years 2001 – 2007:		-3,9479		0,9962									
Years 2008 – 2010:		2,1215		0,9160									

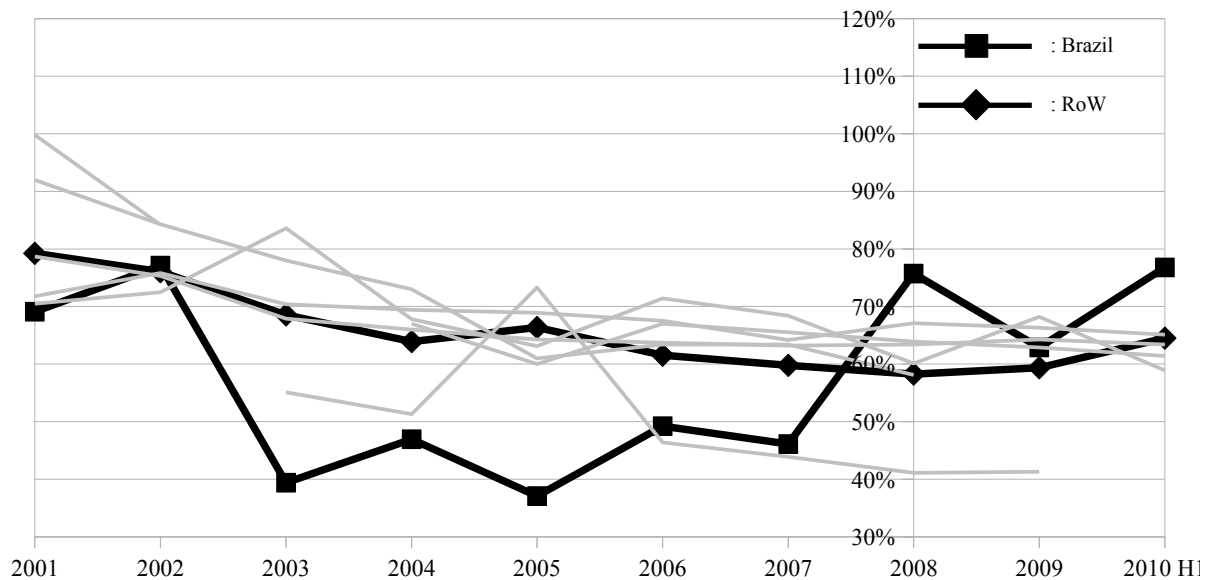*source: Annual Reports, SUSEP, S&P Reinsurance Highlights*

Table 13. Overall comparison between Brazil and the Rest of the World. Combined ratio is defined as Loss ratio plus Expense ratio. For RoW the Berkshire Hathaway numbers are represented by GenRe and Koln Ruck when available; and RGA has been left out as it only deals with life reinsurance. For Brazil IRB represents the entire market till 2008, thereafter Others is the premium weighted average of the rest of the Local Reinsurers (Munich Re Brasil, Mapfre Re, XL Re & J.Malucelli Re). A paired t test establishes the likelihood that BR Combined ratios are lower than for RoW for the period 2001 – 2007. (n/a: not available)

Comb. ratio, excl. CAT	weighted average			Brazil		RoW							
year	Brazil	RoW	delta	IRB	Others	Munich Re	Swiss Re	GenRe/Koln	Hannover	SCOR	Lloyd's	Transatlantic	PartnerRe
2001	100,6%	108,4%	-7,8%	100,6%	-	109,3%	n/a	123,7%	93,1%	132,6%	n/a	99,5%	n/a
2002	109,1%	101,5%	7,6%	109,1%	-	101,9%	n/a	116,1%	91,0%	112,2%	n/a	102,3%	n/a
2003	62,0%	94,4%	-32,4%	62,0%	-	95,0%	n/a	107,5%	94,5%	n/a	88,1%	96,5%	n/a
2004	72,0%	91,9%	-19,9%	71,9%	-	93,9%	n/a	103,7%	88,9%	99,4%	83,3%	95,6%	n/a
2005	65,3%	94,7%	-29,4%	65,3%	-	92,5%	n/a	93,3%	86,4%	92,7%	104,3%	96,1%	n/a
2006	78,4%	91,1%	-12,6%	78,4%	-	91,6%	n/a	97,0%	99,2%	96,4%	80,4%	95,1%	n/a
2007	74,6%	89,2%	-14,6%	74,6%	-	91,7%	n/a	95,8%	94,3%	94,8%	77,9%	91,8%	n/a
Opening of BR Reinsurance Market													
2008	110,0%	87,1%	22,9%	110,5%	154,5%	93,2%	n/a	91,3%	85,0%	92,0%	71,1%	94,2%	n/a
2009	92,4%	89,4%	3,0%	90,1%	181,0%	93,9%	n/a	n/a	92,7%	93,7%	76,3%	93,5%	n/a
2010 H1	121,3%	93,1%	28,3%	211,0%	152,4%	93,6%	98,9%	n/a	84,4%	90,8%	n/a	93,8%	n/a
		t-value		*p-value*									
Years 2001 – 2007:		-2,7733		0,9839									
Years 2008 – 2010:		1,9003		0,9011									

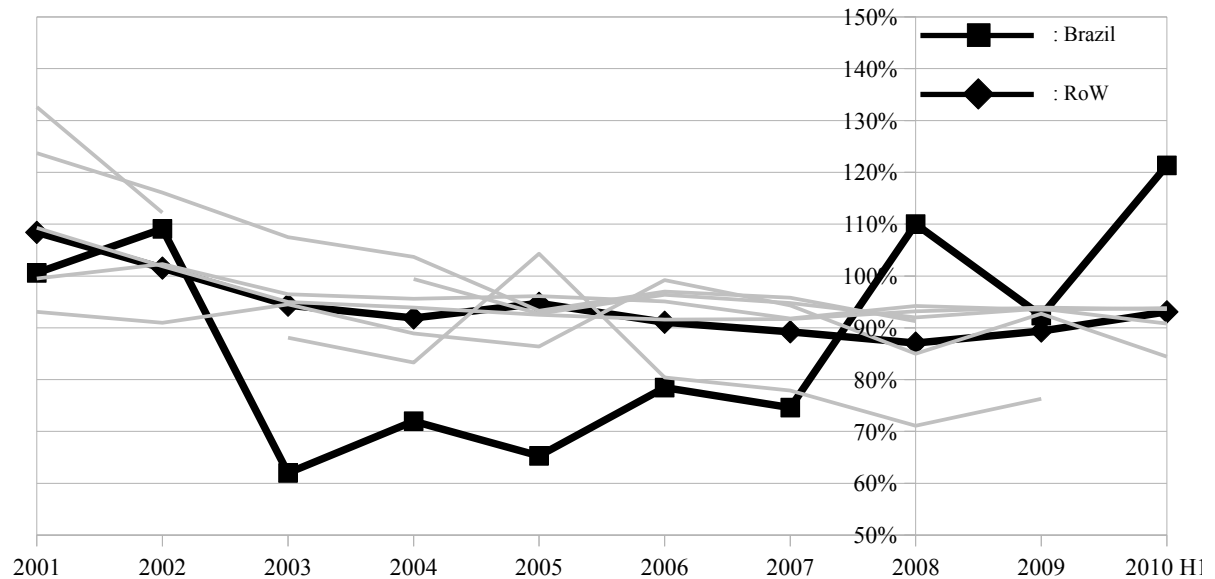*source: Annual Reports, SUSEP, S&P Reinsurance Highlights*

Adjusting the Loss and Combined ratios with the exclusion of large losses did not differ from the results encountered when these losses were included. Still the Brazilian ratios were lower before the opening of the market and seem to have gone up afterwards. This further confirms the idea that prices were high in Brazil in the past and that the opening of the market seems to have had a positive effect on the reinsurance prices charged to insurance companies.

Figure 5. Loss ratios adjusted for Catastrophe losses over the period 2001 – 2010 (first 6 months), for the largest global reinsurers, IRB and the weighted market averages for Brazil and RoW.

source: Annual Reports, SUSEP, S&P Reinsurance Highlights

Figure 6. Combined ratios adjusted for Catastrophe losses over the period 2001 – 2010 (first 6 months), for the largest global reinsurers, IRB and the weighted market averages for Brazil and RoW.

source: Annual Reports, SUSEP, S&P Reinsurance Highlights

6.5   Influence of investment income

What has been done so far is to compare prices and to assume that the observed differences are explained by a change in market organisation. However other factors might explain the differences. An important factor could be the influence of investment income which will be assessed below. Harington (1984) points out that items like inflation and legal environment influence pricing significantly, and subsequent Loss / Combined ratios too.

Investment income on the accumulated assets to back-up reserves for future claims payments is an important source of income for insurers. However when using the Combined ratio for a price analysis, investment returns are not considered. Therefore a difference in the returns achievable on Brazilian assets in comparison to other investments could trigger reinsurers to accept a difference in price. In the table below the market returns on equity and on fixed income in Brazil are compared with a world benchmark. For equity BOVESPA, expressed in USD, is compared to the MSCI All Country World Investable Market Index, and for fixed income CDI is compared to Citibank's World Government Bond Index.

Table 14. Comparison between equity and fixed income returns in Brazil and the Rest of the World. USD/BRL is the exchange rate difference between the beginning and the end of the mentioned year. BOVESPA is the brazilian equity market index. BOVESPA USD is the market return expressed in annual USD. ACWI IMI is the MSCI All Country World Investable Market Index expressed in USD. CDI is the Brazilian interbank over-night rate, widely used as the fixed income return benchmark for Brazil. The CDI number shown here is the accumulation of the daily rates during the mentioned year. CDI USD is the CDI return expressed in USD. WGBI is Citibank's World Government Bond Index which acts as an investable world fixed income benchmark.

year	USD / BRL	BOVESPA	BOVESPA USD	ACWI IMI	delta Equity	CDI	CDI USD	WGBI	delta Fixed Income
2000	-6,5%	-10,7%	-16,5%	-16,1%	-0,4%	17,4%	17,0%	1,6%	15,4%
2001	-5,5%	-11,5%	-16,4%	-16,7%	0,3%	17,3%	17,7%	-1,0%	18,7%
2002	17,8%	-16,6%	-1,7%	-18,8%	17,1%	18,9%	39,2%	19,5%	19,7%
2003	20,2%	97,3%	137,1%	33,3%	103,9%	23,1%	150,9%	14,9%	136,0%
2004	7,4%	17,8%	26,5%	14,6%	12,0%	16,1%	30,0%	10,4%	19,6%
2005	-12,5%	27,7%	11,7%	9,6%	2,1%	19,0%	21,5%	-6,9%	28,4%
2006	11,5%	32,9%	48,2%	18,9%	29,3%	15,2%	48,9%	6,1%	42,8%
2007	10,7%	43,7%	58,9%	9,2%	49,7%	11,9%	67,5%	11,0%	56,5%
2008	-4,7%	-41,2%	-44,0%	-43,7%	-0,3%	12,2%	11,9%	10,9%	1,0%
2009	3,0%	82,7%	88,1%	33,4%	54,8%	10,0%	70,2%	2,6%	67,6%
2010	-6,5%	1,2%	-5,4%	12,1%	-17,5%	9,7%	-9,5%	5,2%	-14,6%

Source: Bloomberg, BM&F Bovespa, MSCI Barra, XE.com

If the investment climate differs across markets, which is reasonable to assume, insurers are willing to operate at different Loss and Expense ratios. So an observation of a lower Combined ratio in year *t*, indicating a higher price, might be explained by the reinsurer compensating for lower investment income in year *t-1*; or assuming complete foresight in financial markets together with observation timing issues, even in year *t*. And for a higher Combined ratio we should see the opposite. As shown in the table below, this has not been the case, actually the opposite happened for the period under investigation, lower Combined ratios are seen together with higher investment returns for year *t* and for year *t-1*. This observation is further fortifying the idea that reinsurance was more expensive in Brazil than in other markets.

Table 15. Comparison of the observed differences in Combined ratio (with and without correction for Catastrophes) in Brazil versus the Rest of the World and the difference in investment income for Fixed Income and Equity.

year	delta Combined ratio	delta Comb. rat excl. CAT	delta Fixed Income Return	delta Equity Return
2000	n.a	n.a	15,4%	-0,4%
2001	-21,5%	-10,1%	18,7%	0,3%
2002	-2,1%	1,0%	19,7%	17,1%
2003	-36,3%	-29,1%	136,0%	103,9%
2004	-26,4%	-17,0%	19,6%	12,0%
2005	-43,7%	-29,3%	28,4%	2,1%
2006	-14,1%	-12,3%	42,8%	29,3%
2007	-19,1%	-13,7%	56,5%	49,7%
2008	14,9%	17,5%	1,0%	-0,3%
2009	2,0%	3,5%	67,6%	54,8%
2010	16,2%	12,3%	-14,6%	-17,5%

This paper has emphasised that reinsurance is a global business, implying the ability of reinsurers to allocate their assets as efficiently as possible in whatever location and / or class deemed to be appropriate. Even part of IRB's assets were invested abroad, cautioning to overestimate the significance of any observed price delta attributable to a different investment climate.

7 CONCLUSIONS

The goal of this paper was to determine the impact on the Brazilian insurance industry of the change-over from a closed monopolistic reinsurance market to a more open market. The focus has been on premiums, as a price decrease was one of the most anticipated benefits of the new market structure, though not substantiated by prior research.

7.1 The market opening benefitted the insurance industry

To compare the price of reinsurance across markets the widely available Combined ratio and its two underlying components Loss ratio and Expense ratio were used. Besides being widely available, these ratios provide insight in the price (re-)insurers charge for risk and the efficiency of their operations. When comparing Brazil to the Rest of the World, significant lower Combined ratios have been observed for the period 2001 – 2007. In the period after the market opening there seems to have been a convergence of the Combined ratios in Brazil to world market levels. This would confirm what can be heard in the market, that IRB has been trying to protect its position, by matching competitor's prices and / or offering better prices, at substantially lower levels than in the past. It also indicates that the Brazilian insurance sector seems to benefit from the opening of the market by paying a lower price for reinsurance now than in the past.

The Loss ratios in Brazil were significantly lower than those in the rest of the world in the period 2001 – 2007, for all observed years. This implies that IRB charged the Brazilian insurance industry substantially more than reinsurers did in other markets for pure risk. Since 2008 this situation appears to have changed, and insurers seem to be charged prices for risk in line with their peers in other countries. Expense ratios show a more diffuse picture, where Brazilian ratios prior to the opening of the market did not statistically differ from those seen in the rest of the world. After 2007 the Brazilian Expense ratios appear to be higher than in the rest of the world. It is hard to distinguish if this is the result of a denominator effect, meaning that the ratio has gone up because of lower premiums. Or this has been caused by a nominator effect, i.e. costs have gone up for the sector because for example the new entrants are investing heavily to establish a market position and IRB is on a spending spree to protect its dominant position.

Looking at ratios across markets embeds potential comparability problems. A potential big issue is the occurrence of exceptional large losses, which affect Loss ratios in one location

but not necessarily in another. However adjusting the data for these large Catastrophe losses, data which is widely available, did not have an influence on the observed results. Still the Brazilian ratios were lower before the opening of the market, confirming the idea that prices were high in Brazil in the past, and ratios seem to have gone up afterwards, pointing to evidence that a decrease in reinsurance prices indeed took place.

Return on investments is a substantial source of income for the insurance and reinsurance industry. Therefore a difference in attainable investment income might explain a difference in (re-)insurance pricing between markets. The expectation is that (re-)insurers can accept lower prices in a high investment income environment than in a low return environment, and therefore operate with higher Combined ratios. But in fact lower Combined ratios have been seen together with higher investment returns for Brazil. This observation rather fortified the idea that reinsurance was more expensive in Brazil, than that it has been able to explain the observed differences in prices in the past.

The presented conclusions point to a notably improved reinsurance environment with lower prices for Brazilian insurers. However these conclusions should be treated with some caution as only 2,5 years of experience is available since the liberalisation of the reinsurance industry and many other factors, beside a market structure change, could have been influencing the observed reinsurance price development.

7.2   Potential data issues

A few issues can be raised that would influence the encountered results to a considerable extent. First of all one of the important assumptions underlying the adequacy of using Loss ratios is the notion that reserving has been done adequately and consistently over time. If this would not be the case, losses would be unevenly spread over years when trying to compare different markets for the same period. Apparently in the past there was a lesser need for IRB to spend much effort to get its reserves completely balanced, as the monopolist all losses would come to them eventually in any case. But in recent years the determination of reserves gained more importance, resulting in certain adjustments. Unfortunately no relevant data were encountered to test any effect caused by this reserving enhancement.

Another assumption has been that the reinsurance product mix for the world and for Brazil would be more or less equal. If this would not be the case it could be that comparing averages hides underlying distribution differences. Also a change over time in product mix

could distort results in a similar fashion. In Brazil it seems that there has been a shift from non-proportional to proportional reinsurance contracts, since the opening of the market, however no data to substantiate this claim and / or to test any influence from this shift has been encountered.

7.3   Future research

Unfortunately it is impossible to be complete. Additional analyses for separate insurance lines, like e.g. for motor, engineering and/or property, would give a better picture what effect the opening of the market had on different segments. It is well imaginable that the impact on individual high value contracts would be more substantial than on your bread-and-butter smaller ticket policies like e.g. motor or personal accident.

Another improvement would be the inclusion of more reinsurers to get an even broader representation of the world market rates. Though a market representation of up to 70% has been attained, this still leaves a considerable part outside the database. Additional database gains could be made by extending the period under investigation, both more historical data and more future data, i.e. repeat the shown calculations when the reinsurance industry has had more years under the competitive market regime.

Another omission is the exclusion of life reinsurance, although currently a small market segment in Brazil (premium volume in 2009 of around BRL 200mln), it would benefit from international expertise and broaden the primary life insurance market. However to investigate any effects within life reinsurance another instrument than Combined ratio needs to be considered to get relevant results.

Perhaps the best improvement could be realised in investigating other variables that could explain the observed differences, for example differences in tax structure, regulatory burden, inflation, etc. In this manner the effect of a market regime change could be observed in more isolation.

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