CATASTROPHE CONTRACTS : THE COVERAGE OF EXTRAORDINARY RISKS AND THE LOSS RATIO IN SPAIN

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ABSTRACT

In this paper we analize the protection against the extraordinary risks in Spain provided by the "Consorcio de Compensación de Seguros". We present a loss ratio, of similar characteristics of the CBOT ones, for the Spanish case between the years 1971 and 1993. To do so, we work on an annual ratio and with four quarterly ratios, and we fix the statistic specifications of the series.

KEYWORDS

extraordinary risks, catastrophe insurance, catastrophe contracts.

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RESUME

Dans cet article nous analysons la protection contre les risques extraordinaires en Espagne munis par le "Consorcio de Compensación de Seguros". Nous présentons un "loss ratio" obtenu par trimestres et annuellement à travers les années 1971-1993, avec les mêmes caractéristiques que celles du CBOT.

MOTS-CLES

risques extraordinaires, assurément de catastrophes, contrats à terme sur catastrophes.

1.- Introduction

Since 1992, the CBOT holds catastrophe future and options contracts whose settlement price is based on a losses index obtained with annual and quarterly frequency. The index relates the losses caused by extraordinary risks to the total premiums of the industry on certain lines of ordinary insurance. The losses are reported by the insurance companies to the Insurance Service Office (ISO) and the premiums are stated according to the historical experience. The losses depend on the number and amount of extraordinary risks claims, so they constitute a random variable. The accumulated index experience is, at the moment, very short difficulting the pricing of the contract in the market.

A special system held by the Consorcio de Compensación de Seguros (CCS) has been in existence since 1941 in Spain as a protection against the extraordinary risks. It consists of a compulsory coverage of all the insured in certain lines (property damage and personal accident) whenever the claim is caused by any extraordinary natural or man-made event.

In this paper we present first of all the activity developed by the CCS. We then analyse the losses and premiums series giving special emphasis to the difference between the catastrophic losses and the less important ones. We build up one annual and four quarterly losses ratio following a similar methodology to the one used by the CBOT. To sum up, we offer a series of 23 observations separating the effects of the catastrophic claims and those of a lesser amount.

2.- The coverage of extraordinary risks in Spain

Since 1941 an ouststanding mechanism is running in Spain as a protection to the extraordinary risks. The insurance must be done by the Consorcio de Compensación de Seguros (CCS) which is a State organization that must adjust its activities to the legal rules and regulations of the private

sector [CCS, 1993a][1].

The objective of the CCS is to indemnify for losses *caused by extraordinary events,* whenever any of the following situations arise:

a) When the extraordinary risk is not specifically and explicity covered under any insurance policy

b) When, being covered under an insurance policy, the obligation of the insurance company cannot be fulfilled because it has been declared bankrupt, in suspension of payments, or it has been put into forced liquidation by the receiver, if insolvent.

The insurance against extraordinary risks is compulsory whenever a policy is taken out under certain lines of insurance (property and personal ones). These lines are as follows:

- Fire and perils of nature.
- Motor vehicles (only vehicle damage).
- Vehicles running on rails.
- Other damage to property (theft, plate glass windows, machinery breakdown, electronic equipment and computers, and damage to completed civil works).
- Personal accidents.

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[1] English and French versions available.

However the following classes of insurance are excluded: Life, Aviation, Marine Hull, Cargo, Public liability, Loss of profits, Illnes, Legal expenses and Travel. Note that these are the classes rendering a service.

The CCS only covers the following extraordinary risks produced by natural and man-made phenomena[2]:

- Earthquakes and seaquakes.
- Floods[3].
- Volcanic eruptions.
- Uncharacteristic cyclonic storms.
- Fall of astral bodies and meteorites.
- Terrorism.
- Rebellion, insurrection, riots and civil commotion.
- Acts or actions of the Armed Forces and Security Forces in time of peace.

From the actuarial point of view, the losses of the extraordinary risks are compensated temporarily and among all the insured (including both property and personal damages).

The coverage is made without taking into account the number of

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[2] The Chicago Board of Trade   accepts as cause earthquake, wind, hail, riot and flood [CBOT, 1994].

[3] Flooding includes: run off of water from rain or thaw, overflowing of sea, lakes or rives, and dasing of the sea against the land. And does not include: bursting of damms, conduits or drains, unless this is caused by flood; leakage, seepage or damp; subsidence, landslip, landslide, or soil erosion not caused by flood; direct rain action [CCS, 1993a].

affected insured, the width of the territorial damaged area and the magnitud of the losses. One of the advantage of this position is that it does not require any official declaration of catastrophe or disaster area.

The characteristics of the CCS coverage allow that this is a suitable model that can be applied to the settlement of those losses that arise from any type of extraordinary event, due to the fact that this system is founded on a large financial capacity and a specialized management.

The protection against extraordinary risks and against other risks is absolutely independent. The extraordinary risk coverage is always identical on terms and conditions for the events which are taken into account, having to be the sum insured of the same amount of that of the risks covered under the ordinary insurance policy. The deduction to be applied to any property damage indemnity paid by the CCS is in general the 10 per cent of the loss amount. According to the waiting period, coverage shall begin with effect from 30 days following the date of inception of the policy.

The distribution of property damage loss in 1987-1992 is shown on Table 1. It can be highlight that flood is the cause of the 87.69 per cent of the total claims paid. Terrorism represents almost a 12 per cent, being of very little significance the remainder of the perils . On the contrary, in the case of personal injuries, terrorism is responsible for more than 90 per cent of the indemnities.

TABLE 1 DISTRIBUTION OF PROPERTY DAMAGE LOSS EXPERIENCE PER CAUSES (1987 - 1992)							
FLOODS	EARTH-QUAKE	VOL-CANIC ERUPTION	STORMS	FALLING METEORITES	TERRO-RISM, RIOTS	ACTS OF ARMED FORCES	MISCEL-LAN-EOUS
87.69	0.12	0.00	0.33	0.01	11.81	0.03	0.01
Source: Consorcio de Compensación de Seguros 1993 a,b							

The tariff of the CCS for the coverage of these extraordinary risks is applied on the insured sums. The general level of the annual tariff is as follows:

a) For the insurance of property:

- Housing and offices: 0.092 per mille.

- Businesses: 0.18 per mille.

- Industrial risks: 0.25 per mille.

- Motor vehicles: a fixed amount according to the tipe of vehicle (private cars: Ptas. 740 per vehicle).

- Civil works: various rates according to their type, ranging from 0.35 per mille for motorways up to 2 per mille for non-recreational harbours.

b) For insurances of personal accidents: a general rate of 0,0096 per

mille[4]

What is unique about the tariff of the CCS is that it constitutes an
obligatory surcharge that must be incorporated into the premium charged for
every insurance policy which belongs to the classes mentioned above. The
EEC Council Directive in respect of the freedom to provide services of
insurance other than life assurances (2nd Directive) was very aware of this.
The first paragraph of article 25 which states that:

"Without prejudice to any subsequent harmonization, every insurance
contract shall be subyect exclusively to the indirect taxes and parafiscal
charges on insurance premiums in the Member State in which the risk
is situated as defined in Article 2(d), and also, in the case of Spain, to
the surcharges legally established in favour of the Spanish "Consorcio
de Compensación de Seguros" for the performance of its functions
relating to the compensation of losses arisingfrom extraordinary events
occuring in that Member State" [5]

The CCS incomes are its own premiums and the returns on its reserves,
being forced to constitute the apropriate Technical Reserves and to maintain
a Solvency Margin. In addition to this, it is important to stress that Law
provides that CCS has to constitute a special accumulative provision. It is a

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[4] This tariff may vary in special cases.

[5] Third Directive in respect of insurance other than life insurance (92/49/EEC, 18th June 1992),
article 46.

real "extra catastrophe reserve"[6]. The total profits of the CCS has to be assigned to increase that reserve. The constitution of this type of reserve has turned out to be absolutely necessary, due both to the cyclical character and the irregularity of the coverage. Obviously, the compensation of losses needs to be produced over periods of time far in excess of a year.

Being the State the owner of the CCS and given its hazardous character, it is backed up by a State guarantee which would cover up the potential high losses. However, this guarantee has not been used within the 50 years of the CCS existence.

Given the historical experience of the CCS, there are available data series about insurance premiums, claims and catastrophe . With the aid of these data, it is possible to build up a "loss index" between 1971 and 1993. Table 2 shows the time series of premiums and claims expressed at a constant value (the value as in January 1994). The premiums volume increases are due not only to the rise of the amount of people buying insurance but also to the fact that commercial risks have also grown at a steady slope (see Table 3).

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[6]. The total amount at the end of 1993 was 104.850 million pesetas [CCS, 1994c].

TABLE 2	PREMIUMS AND LOSSES IN PROPERTY DAMAGE			
	PREMIUMS	TOTAL LOSSES	LESS AMOUNT LOSSES	CATASTROPHE LOSSES
1971	10,122	59,337	▪ 5,246	54,091
1972	10,382	2,361	▪ 2,361	0
1973	11,148	289	▪ 289	0
1974	12,068	55	▪ 55	0
1975	13,137	337	▪ 337	0
1976	13,998	2,146	▪ 2,146	0
1977	14,241	11,827	▪ 5,114	6,713
1978	14,320	5,287	▪ 5,287	0
1979	14,886	4,411	▪ 4,411	0
1980	15,673	9,426	▪ 5,303	4,122
1981	15,927	6,513	▪ 6,513	0
1982	16,358	41,507	▪ 6,454	35,053
1983	16,793	95,879	▪ 2,801	93,078
1984	16,902	4,076	▪ 731	3,345
1985	18,329	3,473	▪ 3,473	0
1986	19,324	9,122	▪ 6,223	2,898
1987	19,278	36,931	▪ 5,174	31,757
1988	19,218	11,494	▪ 6,094	5,400
1989	21,367	29,988	▪ 4,147	25,841
1990	24,596	4,921	▪ 4,921	0
1991	26,558	6,578	▪ 3,720	2,858
1992	28,552	7,153	▪ 3,461	3,693
1993	30,205	3,438	▪ 3,438	0
TOTAL	403,382	356,547	▪ 87,698	268,849
NUMBER	23	23	▪ 23	23
MEAN	17,538	15,502	▪ 3,813	11,689
ST.D.	5,449	22,723	▪ 1,993	22,345

▪ Million of constant value pesetas (January 1994)
▪ Premiums on the basis of the up to date tariff
rates applied
Source: CCS 1994a

TABLE 3	CONSORCIO DE COMPENSACION DE SEGUROS	
	NUMBER OF POLICIES	SUMS INSURED (PROPERTY DAMAGE)
1990	15,123,466	119 TRILLIONS
1991	15,820,591	134 TRILLIONS
1992	17,059,659	155 TRILLIONS

The losses caused by extraordinary risks include the catastrophe losses that generate high damages ("catastrophe losses") and the losses of events of less importance ("less amount" losses). Hence, we distinguish in Table 2 the total amount of losses, the "less amount" losses (first level) and the "catastrophe losses" (second level). The catastrophic events occur with rather low frecuency but they cause high damages. The less amount events take place with much higher frecuency but they cause less damages. The CCS has defined catastrophe as any event that produces damages above 2.000 million pesetas (constant value as at January 1994), $16.000.000 approx. Figure 1 displays the annual total amount of losses as the addition of the first and second level and a line is fitted to the data showing the trend. The annual average value of the total losses is 15,502 million with a standard deviation of 22,723.
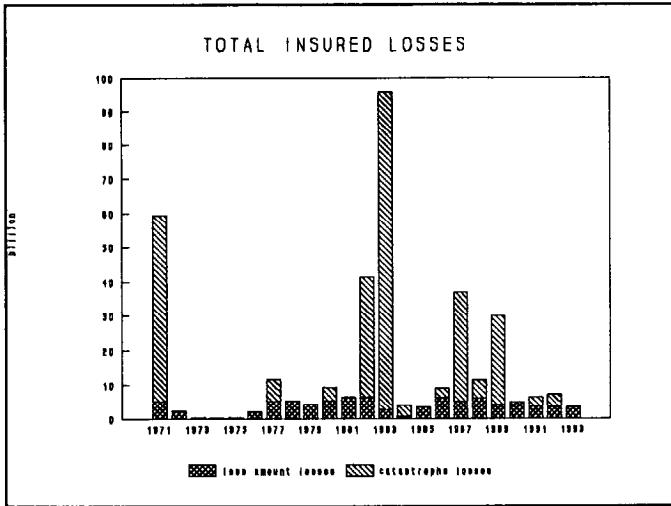
Figure 1

Using the trended value of total losses as the expected one, any deviation from this level would affect the coverage results (see figure 2). It is important to point out the negative impact of the great catastrophes (1971,1982,1983). This justifies the compensation over periods of time longer than a year of the extraordinary risks covered to face the unexpected payments.

INSURED LOSSES
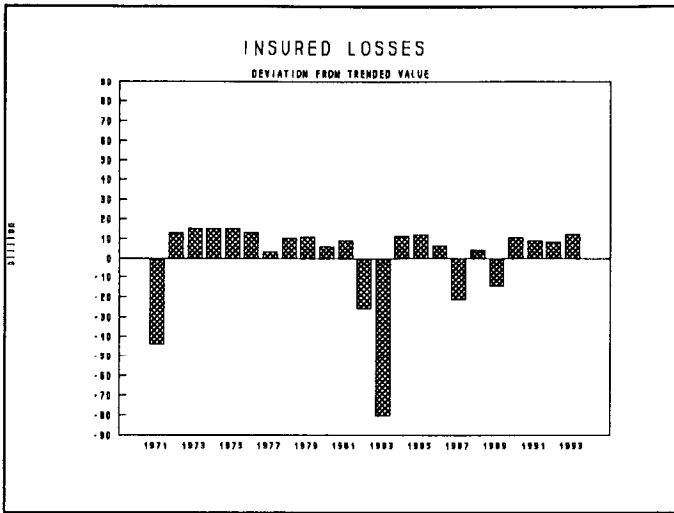DEVIATION FROM TRENDED VALUE

Figure 2

3.-   *Catastrophic events in Spain*

The whole group of catastrophes between 1971 and 1993 is developed
in detail on Table 4 pointing out the year and the quarter as well as the cause
of each event. By analyzing the number and size of the largest claims[7], we
find that almost all of them were due to floods. The only exceptions can be
found on the events registered in Madrid in 1982 caused by a terrorist attack
and in Galicia in 1984 caused by an uncharacteristical cyclonic storm.We can
observe a temporary and geographical concentration of the claims. Most of
them took place on the third and fourth quarters of the year and in the
mediterranean coast.

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[7] CCS insured losses only.

The natural peril which more frecuently and intensively affects Spain is, without any doubt, flooding[8], and there are two factors which have a decisive influence on this: the geographical characteristics and the type of climate. Spain is one of the most mountanious regions in Europe and in some areas the mountains slope is very steep. With regard to rainfall, Spain has three clearly defined climatic regions: the wet zone with over 1.000 mm. of rainfall per annum in the North and Northwest of the Peninsula, the semi-wet zone (rainfall between 400 and 1.000 mm. per annum) situated in the large basins of the major rivers, and the arid zone with a very low rainfall which prevents the stable permanence of a cover of vegetation (the South and the Mediterranean Coast). After warm summers, the strong rains during the third and fourth quarter may cause important floods over all the coastal areas [De Mingo, 1991; Inst. Geológico, 1992].

As the acumulated experience is not long enough, some of the catastrophical causes do not appear in the series. However they should also be kept in mind. Although Spain has a moderate degree of seismic activity, it is in no way free of earthquakes and tsunamis. The last earthquake took place in 1884 and the theoretical interval of time between two earthquakes lies between 75 and 100 years. There is only historical evidence of a seaquake in 1755 (theoretical interval of time between two of these events: from 1000 to 10000 years). Additionaly, Spain is considered out of volcanic activity except for the Canary Islands that registered an eruption in 1730.

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[8] The 88.8 per cent of the number of catastrophes and the 96.8 per cent of the losses are due to floods.

TABLE 4		CATASTROPHIC[9] EVENTS IN SPAIN		
YEAR	QUARTER	INSURED LOSSES	LOCATION	CAUSE
1971	3	54,091	CATALUÑA	FLOOD
1977	2	6,713	PAIS VASCO	,,
1980	1	4,122	C.VALENCIANA	,,
1982	2	6,096	MADRID	TERRORISM
	4	5,997	C.VALENCIANA	FLOOD
	4	22,960	CATALUÑA	,,
1983	2	86,505	P.VAS.NAV.CANT.	,,
	4	6,572	C.VALC.CATALUÑA	,,
1984	4	3,345	GALICIA	STORM
1986	3	2,893	C.VALENCIANA	FLOOD
1987	4	3,270	CATALUÑA	,,
	4	28,488	C.VALC.MURCIA	,,
1988	3	5,400	PAIS VASCO	,,
1989	3	6,213	C.VAL.MURCIA	,,
			BALEAR.ANDAL.	,,
	4	16,190	ANDAL. C.VALC.	,,
	4	3,439	MADRID	,,
1991	4	2,858	C. VALENCIANA	,,
1992	2	3,693	P. VASCO	,,
TOTAL		268,844		
MEAN		14,936		
ST.D.		21,479		
RANGE		2,858-86,505		

Million of constant value pesetas (January 1994)
Source: CCS, 1993a and 1994

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[9] In 1993 no catastrophic event took place in Spain, but in the last quarter of 1994 strong rainfalls in the mediterranean coast (Cataluña) produced losses that are expected to reach the amount of more than 2,000 million, so it will be considered as a catastropic event.

4.-   *Loss Ratios*

The aim of this section is to elaborate loss ratios similar to the ones used by the CBOT but using the data supplied by the CCS concerning the Spanish territory. The ratios pick up the effects of the extraordinary risks covered and relate the losses supported by the CCS with the industry premiums in the lines already considered.

Due to the fact that the data employed consist of the experience accumulated between the years 1971 and 1993, both the numerator and the denominator of the ratio are known variables. On that score, we can highlight the difference with the elaboration of a real index, always following the CBOT methodology, in which the numerator is a random variable.

The obtained results could be used to make simulations about the theoretical behaviour of the ratios, stating the difference between catastrophic and non-catastrophic events.

We elaborate one annual and four quarterly loss ratio. By this means, it is possible to aproximate the loss experience to the period of the year in which the extraordinary event takes place, in order to single out the concentration of claims on certain quarters of the year.

The two necessary components to build up the ratios are the industry premiums and the extraordinary risk losses. The annual premiums are the ordinary insurance ones on the lines considered by the CCS. These have been obtained from the State statistics gathered on annual groups as follows

[Dirección General de Seguros, 1971-1992]:

- Until 1981: Fire, Theft, Plate glass windows and Other lines.
- Between 1982 and 1990: Fire and Other property damage.
- From 1991: Fire, Other property damage and Multiple peril.

Following the CBOT methodology, we obtain the quarterly premiums by dividing the annual amount by four. Table 5 shows the total premiums experience of the industry in pesetas (constant value as in January 1994) of the above mentioned lines.

The annual losses are separated in amount levels (see Table 2). However, in order to elaborate the quarterly ratios, it is necessary to point out the distribution of the payments all over the year. We propose an analysis of each level separately so as to improve on the allocation of each annual loss to its quarter.

- For the "less amount" losses (first level), the CCS provides the monthly indemnity payments due to floods. Based on this data, we have obtained the following quarterly distribution of flood losses (except from catastrophes):

first quarter: 7.72 %
second quarter: 12.09%
third quarter: 24.33%
fourth quarter: 55.86%

As floods represent the 87.69 per cent of the total loss experience (see

Table 1), we will use this distribution as representative of the whole.

-               According to the second level we can relate each catastrophe
loss to its quarter (see Table 4).

Now then, the annual index is obtained dividing the losses from Table
2 by the annual premiums from Table 5. As a result, we obtain the ratios on
Table 5. We can highlight the impact of the catastrophes, specially in 1983
and 1971 (see Figure 3).

The quarterly ratios are built dividing the quarterly losses by the
quarterly premiums. Table 6 shows the results for each quarter, without
specifying the loss levels (see Figures 4,5,6,7). In that case it is necessary to
point out the impact of the catastrophes in the third and fourth quarters,
rising their means remarkably and specially their standard deviations with
respect to the first and second quarters ratios.

TABLE 5	ANNUAL	LOSS	RATIO
	INDUSTRY PREMIUMS	LESS AMOUNT RATIO	CATASTROPH RATIO	ADDITION RATIO
1971	78,219	0.067	0.692	0.759
1972	83,433	0.028	0.000	0.028
1973	93,761	0.003	0.000	0.003
1974	104,406	0.001	0.000	0.001
1975	111,914	0.003	0.000	0.003
1976	117,603	0.018	0.000	0.018
1977	120,289	0.043	0.056	0.099
1978	127,441	0.041	0.000	0.041
1979	136,214	0.032	0.000	0.032
1980	143,240	0.037	0.029	0.066
1981	144,353	0.045	0.000	0.045
1982	148,595	0.043	0.236	0.279
1983	151,221	0.019	0.616	0.635
1984	153,119	0.005	0.022	0.027
1985	159,500	0.022	0.000	0.022
1986	165,575	0.038	0.018	0.056
1987	180,388	0.029	0.176	0.205
1988	208,586	0.029	0.026	0.055
1989	225,796	0.018	0.114	0.132
1990	247,397	0.020	0.000	0.020
1991	268,739	0.014	0.011	0.025
1992	287,101	0.012	0.013	0.025
1993	293,249*	0.011	0.000	0.011
	MEAN	0.025	0.087	0.112
	ST.D.	0.016	0.185	0.193
	RANGE	0.067	0.692	0.759
		0.001	0.000	0.001

- Premiums in constant value peseta   (January 1994)
* Provisional

| TABLE 6	QUARTERLY LOSS RATIO			
	1st.QUART	2nd.QUART	3rd.QUART	4th.QUART
1971	0.021	0.032	2.831	0.150
1971	0.009	0.014	0.028	0.063
1973	0.001	0.001	0.003	0.007
1974	0.000	0.000	0.001	0.001
1975	0.001	0.001	0.003	0.007
1976	0.006	0.009	0.018	0.041
1977	0.013	0.244	0.041	0.095
1978	0.013	0.020	0.040	0.093
1979	0.010	0.016	0.032	0.072
1980	0.011	0.133	0.036	0.083
1981	0.014	0.022	0.044	0.101
1982	0.013	0.185	0.042	0.877
1983	0.006	0.009	2.306	0.215
1984	0.001	0.002	0.005	0.098
1985	0.007	0.011	0.021	0.049
1986	0.012	0.018	0.107	0.084
1987	0.009	0.014	0.028	0.768
1988	0.009	0.014	0.132	0.065
1989	0.006	0.009	0.128	0.389
1990	0.006	0.010	0.019	0.044
1991	0.004	0.007	0.013	0.073
1992	0.004	0.057	0.012	0.027
1993	0.004	0.006	0.011	0.026
MEAN	0.008	0.036	0.257	0.149
ST.D.	0.005	0.062	0.719	0.223
RANGE	0.021	0.244	2.831	0.877
	0.000	0.000	0.001	0.001

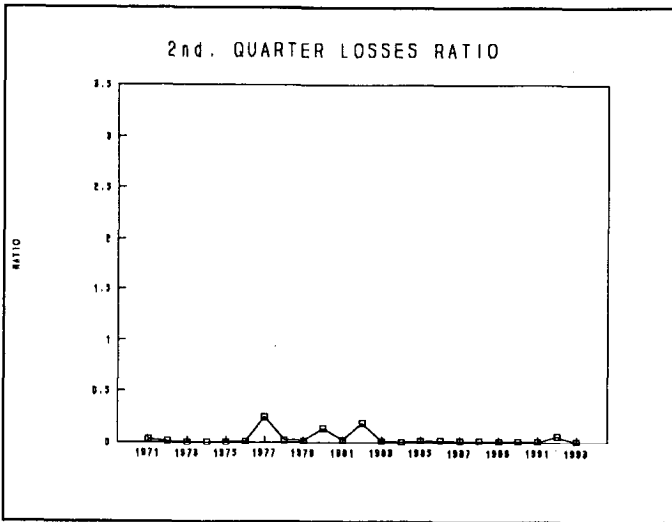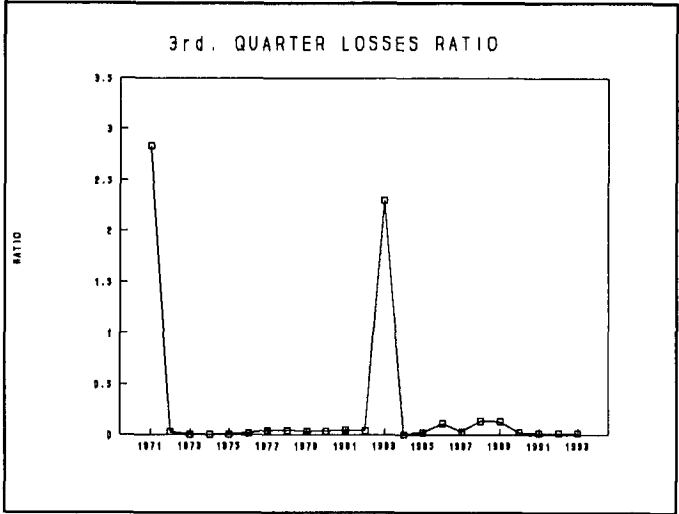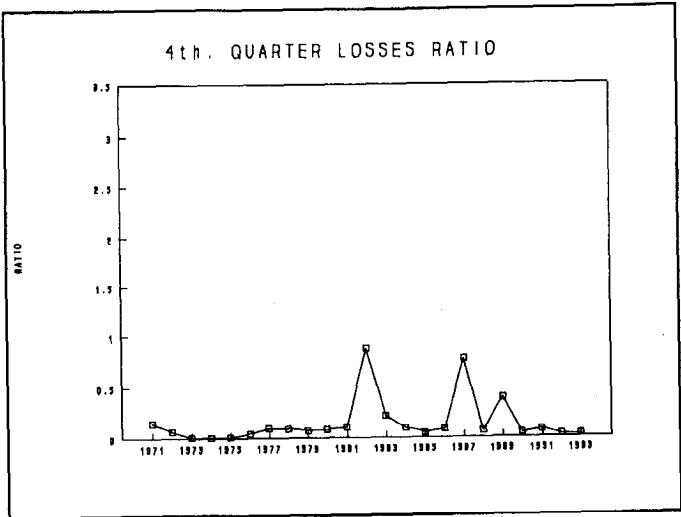ANNUAL LOSSES RATIO
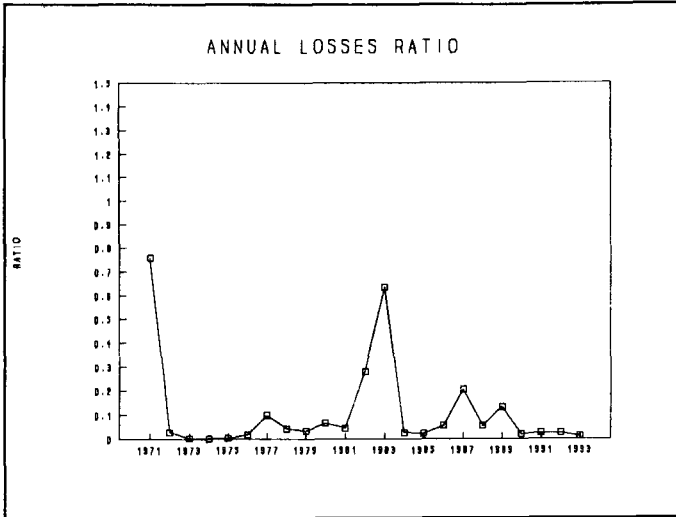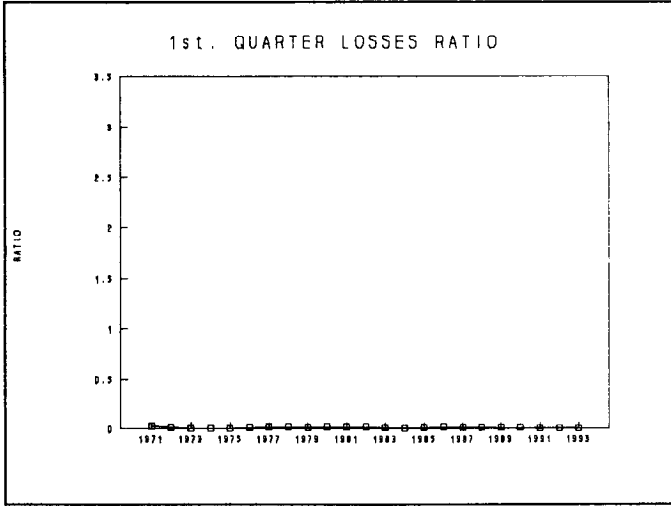
Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

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